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Peer-leaders' Perceived Roles: An Exploratory Study in a Postsecondary Organic Chemistry Course

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Peer-led team learning (PLTL) is a pedagogical method in which former students, i.e., those who have successfully completed the course, assist current students in learning course material either through supplemental instruction or in the classroom setting. The impact on student learning for students participating in a PLTL course is widely documented; however, there have been few studies about peer leaders' experiences and the impact of PLTL on peer leaders. Fifty-two peer leaders assisting with a postsecondary organic chemistry course completed weekly journals about their experiences; the final journal entry prompted peer leaders to describe their relationship with their students by choosing a role that best described that relationship and providing an example of how they filled that role during the term. These entries were coded and analyzed for patterns. Results suggest that when peer leaders describe their relationships, some express they are teachers, others consider themselves guides or facilitators, and some view their role as mentors. We argue that there is a progression of increasing depth in the student-leader relationship that is demonstrated by the description of the roles ascribed by the peer leaders.

Peer-led team learning (PLTL) is a pedagogical technique used to improve student learning through the use of peer leaders to assist students in learning course content and skills (Hockings, DeAngelis, & Frey, 2008). PLTL is built on a constructivist theory of learning as informed by Vygotsky (1978). Peer leaders, i.e., students who have successfully completed the course in which they are assisting, are assumed to have a good understanding of the gaps in student understanding and how to fill those gaps. Thus, peer leaders can assist in identifying zones of proximal development for students and provide the necessary support to catalyze learning (Cracolice, 2000). PLTL has been shown to have particular success in increasing conceptual understanding (e.g., Smith et al., 2009). Research on the efficacy of PLTL has mainly focused on student learning and engagement (e.g., Chan & Bauer, 2015; Drane, Smith, Light, Pinto, & Swarat, 2005; Hockings et al., 2008; Mitchell, Ippolito, & Lewis, 2012; Tenney & Houck, 2003); much less research has focused on the peer leaders and their experiences (e.g., Brown, Sawyer, Frey, Luesse, & Gealy, 2010; Gafney & Varma-Nelson, 2007; Hug, Thiry, & Tedford, 2011; Snyder & Wiles, 2015; Tenney & Houck, 2004). Our study is focused on the latter and considers the roles in which peer leaders perceive themselves as enacting during peer leading sessions. Our work provides a framework for developing and refining whole group discussions and reflection activities for peer leader training programs. The roles that some peer leaders are filling are different from what the PTLT literature sets as the ideal or standard. The role of mentor is mentioned in PLTL literature as a possible side effect but not the key role of the peer leader (Gosser et al., 2001). By examining the reflections of peer leaders who both choose this role mentor, or choose a different role, a theme of personal involvement emerged. We use this theme to argue for a potential pathway of deepened student-peer leader relationships.

Literature Review

Peer Mentoring

Mentoring has been a concept that many people have tried to define. Jacobi (1991) stated that "although many researchers have attempted to provide concise definitions of mentoring or mentors, definitional diversity continues to characterize the literature" (p. 506). Merriam (1983) stated:

> The phenomenon of mentoring is not clearly conceptualized, leading to confusion as to just what is being measured or offered as an ingredient in success. Mentoring appears to mean one thing to developmental psychologists, another thing to business people, and a third thing to those in academic settings. (p. 169)

Thus, defining mentoring in the context of research is critical. With this in mind, we use a definition of mentoring as articulated by Kram (1983).

Kram (1983) argued that mentoring is the relationship between a senior or more experienced individual (known as the mentor) and a junior individual (known as the protégé). The relationship serves two functions. The first is that the mentor gives advice or guidance about development behaviors that can lead to success in the protégé's choose field. The second function is personal support. This can come in the form of socialization or emotional support, known collectively as

psychosocial support (Bozeman & Feeney, 2007; Eby, 1997; Kram, 1983). Informal and formal mentoring has been shown to have positive outcomes in both career and professional development (e.g., Campbell & Campbell, 1997; Chao, Walz, & Gardner, 1992). It has been shown that individuals with informal or formal mentors had improved socialization, satisfaction, and salary (e.g., Chao et al., 1992) and improved GPA and retention (e.g., Campbell & Campbell, 1997) when compared to individuals without mentors. Zachary (2002) stated that "teachers who prepare themselves as mentors increase their potential to enhance student growth and development, help students maximize education experiences, and enrich their own teaching experience and professional development" (p. 27); preparation to be a mentor is associated with higher potential for a positive impact on the mentee.

Mentorship of students by peer leaders has been observed in the context of PLTL (Gosser et al., 2001); however, the extent to which mentoring occurs nor mentorship training for PLTL peer leaders has not been documented in the literature. Research on mentoring shows that formalized and explicit mentorship training has an effect on achievement in postsecondary courses and persistence in postsecondary degree programs (e.g. Becvar, Dreyfuss, & Dickson, 2008; Colvin & Ashman 2010). In the context of non-PLTL settings, peer mentorship programs have been shown to increase retention (e.g., Damkaci, Braun, & Gublo, 2017), a desired outcome of PLTL efforts. Peer leading sessions provide an ideal context for mentorship, as described by Buntinga & Williams (2017), namely that meaningful engagement in a learning environment is advantageous for peer mentorship. Peer leaders, having previously taken the course as students, are ideally situated to provide mentorship. This kind of mentorship, as articulated by Colvin and Ashman (2010), can be in the form of answering questions on what future classes to take, which professors are preferred, how to properly study for the current class, how to get more involved with undergraduate research, and how to become a mentor in the future; Colvin and Ashman (2010) were focused on peer mentors for a First-year University Student Success class that was designed to mentor students through their first year of college.

Peer-Led Team Learning – Pedagogy and Student Learning

Peer-led team learning is a pedagogical strategy that pairs a peer leader with groups of three to four students for the purpose of completing an instructional activity (e.g., end-of-the-chapter problems or guided-inquiry worksheets; Gosser et al., 1996). Peer leading sessions are typically held once per week for the duration of the term; sessions can be held as optional activities outside of scheduled course times (e.g. Chan & Bauer, 2015), during scheduled recitation or help sessions (e.g., Mitchell, Ippolito, & Lewis, 2012), or replacing scheduled classroom time (e.g., Robert, Lewis, Oueini, & Mapugay, 2016). Students participating in courses with PLTL are shown to have increased achievement (e.g. Drane et al., 2005; Hockings et al., 2008; Mitchell et al., 2012; Stewart, Amar, & Bruce, 2007; Tenney & Houck, 2003); researchers have found that PLTL has a positive impact on underrepresented students and at-risk students (e.g., Drane et al., 2005; Stewart, Amar, & Bruce, 2007). PLTL has been found to be an effective pedagogy in an array of disciplines and learning environments (Wilson & Varma-Nelson, 2016).

In their review of over 67 published studies on peer leading Wilson and Varma-Nelson (2016) found a variety of undergraduate disciplines using the PLTL method including: general chemistry (Chan & Bauer, 2015; Hockings et al., 2008; Lewis, 2011; Lyon, & Lagowski, 2008; Mitchell et al., 2012); organic chemistry (Rein & Brookes, 2015; Tien, Roth, & Kampmeier, 2002; Wamser, 2006); allied health, which is also called GOB (Akinyele, 2010); introductory biology (Drane et al., 2005; Peteroy-Kelly, 2007); anatomy and physiology (Finn & Campisi, 2015); bioinformatics (Shapiro, Ayon, Moberg-Parker, Levis-Fitzgerald, & Sanders, 2013); mathematics (Flores, Becvar, Darnell, Knaust, Lopez, & Tinajero, 2010; Reisel, Jablonski, Munson, & Hosseini, 2014); computer science (Horwitz et al., 2009); engineering (Johnson, Robbins, & Loui, 2015); psychology (Miller, Amsel, Kowalewski, Beins, Keith, & Peden, 2011); and physics (Drane et al., 2005). This plethora of STEM disciplines gives reason to understand how to this pedagogy is affecting the peer leaders themselves since they are coming from so many different disciplines.

Peer-Led Team Learning – Peer Leaders

Peer leaders are typically selected based on success completing the course for which they are peer leading. Compensation varies based on course and institutional context, with peer leaders receiving class credit, hourly wages, or letters of recommendation for professional and graduate school as remuneration (Gosser, Kampmeier, & Varma-Nelson, 2010). Training programs range from one day to week-long workshops before a term begins or weekly workshops during the term. Peer leaders are defined as facilitators throughout PLTL literature (e.g., Gosser et al., 1996; Hockings 2008; Kampmeier, Varma-Nelson, & Wedegaertner, 2000). Training is focused on facilitating learning, facilitating group work, and refreshing course content and skills (Kampmeier et al., 2000). Weekly workshop training formats are typically modeled after the

peer leading sessions with the instructor of the course acting in the role of the peer leader and the peer leaders acting in the role of the students.

There are limited examples of PLTL researchers using journal entries of the peer leaders to examine the personal experiences of those peer leaders. Using journals, leaders can learn from their experiences through retrospective reflection (Boud, 2001). Boud goes on to state that reflective thinking is not simply a process of thinking, but one that involves feelings, emotions, and decision-making to identify important events and analyze the significance of these events. Johnson and colleagues (2015) looked at journal entries of how chemistry peer leaders self-reflected about their peer leading experience. Within fourteen journal entries, they found few mentions of peer leaders that stated that they found fulfillment from helping others and no mentions of a leader expressing a feeling of obligation to help others. Johnson and colleagues, (2015) theorized that this was because their peer leaders may have been too focused on the mechanics of facilitating individual team meetings to recognize the broader implications of their actions on their students. By focusing our self-reflection journal entry prompt on perceived roles, we hoped to see examples of how the peer leaders' interactions with students were exemplified.

Facilitators and mentors are two distinct yet overlapping roles from which to consider peer leaders. From a broad, overarching perspective, these two roles lead to different peer leader-student interactions and thus theoretically two different learning experiences for the students. Colvin and Ashman (2010) found that in the context of a first-year peer mentoring program the roles peer mentors perceived themselves as enacting had an impact on the types of relationships the peer mentors had with their students.

While facilitator, guide, and mentor are roles that are identified in the PLTL literature (e.g., Gosser et al., 1996; Hockings et al., 2008; Kampmeier et al., 2000), we conjecture that peer leaders could perceive themselves in other roles including teacher, instructor, coach, or advisor, for example. We are interested in identifying the roles peer leaders perceive themselves as enacting in the contest of peer leading. Through an understanding of these roles, peer leader training programs can be refined to promote more meaningful student learning and more impactful experiences for the peer leaders and students.

Research Questions

We sought to answer these questions through our study:

RQ1: How do peer leaders view their role in the context of peer-led team learning?

RQ2: How are these roles related to the peer leaders' self-reported interactions and relationships with their students?

Methods

Our study was conducted in the Fall 2015, Spring 2016, and Fall 2016 academic terms at a large research-intensive university in the southeast United States. Peer-led team learning was incorporated into half of the lecture sessions of the first semester of a yearlong postsecondary organic chemistry course. Content instruction was provided via a flipped-classroom approach using online videos (c.f., Robert, Lewis, Oueini, & Mapugay, 2016). Peer leaders received weekly training on a worksheet activity that the students would complete, common misunderstanding and mistakes made by students, and how to promote learning. Teaching assistants for the course ran 50-minute weekly recitation sections on Fridays in addition to the lecture sessions. These teaching assistants were graduate students and were also responsible for proctoring and grading exams outside of set class time and had limited interaction with the peer leaders. The course and peer leader training sessions were taught by the same faculty member for all iterations of the study. Peer leaders completed weekly reflective journal assignments following each peer leading session; the last assignment focused on the peer leaders' perceived role. Peer leaders received college credit for their peer leading training course and were only allowed to be a peer leader once.

Participants

A total of 52 peer leaders participated in the course over the three iterations. Each iteration had approximately 240 students enrolled in the course. The peer leaders (16 to 18 per iteration) were assigned three to four student groups, giving each peer leader responsibility for about 12 to 15 students total. Peer leaders were compensated with junior-level chemistry course credit and the opportunity to receive a recommendation letter from the peer leading coordinator.

Data Collection

After each peer leading session, peer leaders completed a reflection journal entry that included an explanation of areas of ease and difficulty for the students in completing the worksheet, identification of insights about student learning gained by the peer leader, and an evaluation of how well assigned small groups worked together. Weekly reflection journal assignments were graded for completion; the peer leaders were encouraged to be open and honest in their reflections on their experiences as a peer leader. The last reflection journal entry of the term asked the peer leaders to "Choose ONE (1) of the following roles you feel best describes you in relationship to the students

Table 1
Themes Across Perceived Peer Leader Roles.

	Student Readiness	Want to be Guide	Probing Questions	Process of Learning	Psychosocial Support	Outside Time
Mentor	14 %	0 %	18 %	45 %	95 %	32 %
Guide/Facilitator	8 %	0 %	28 %	84 %	28 %	0 %
Teacher	33 %	100 %	33 %	0 %	0 %	0 %

Notes: Percentages are the percent of peer leaders within that role that had at least one code of that theme.

you worked with this semester: teacher, facilitator, instructor, guide, mentor, promoter, coach, assistant, advisor. Describe one concrete example of your interaction with a student(s) that best illustrates you serving in that role." Definitions for the roles were not supplied to the students, thus allowing for self-interpretation. The role options mirror those enacted by teachers in environments adopting a constructivist paradigm (e.g., Gergen, 1995; Mayer, 1996) and in studies of roles espoused by peers in similar situations and contexts (e.g., Colvin & Ashman 2010).

Data Analysis

Journal entries were coded by hand individually by the first author using an open-coding approach based on thematic content analysis techniques (Guest, MacQueen, & Namey, 2012). This involves reading the journal entries and looking for passages that demonstrate a theme or thought of the individual. These themes can then be compiled and, for our research, categorized based on the role described by the peer leader. Familiarization by reading through the data was done twice to get a sense of overarching themes. Following this, data were sorted by the roles selected by the participants. Themes such as "pointing students in the right direction" or "meeting with students outside of class" were noted based on examples provided by the peer leaders in their responses. Data were reread and reanalyzed through the constant-comparative technique (Charmaz & Belgrave, 2012). This technique involves looking back through all previous entries whenever a new theme is discovered to verify that the theme was new and should be included in the codex when coding the data. Coded data were compiled and simplified into a coherent set of themes by the roles selected by the peer leaders. Finally, themes were compared across selected roles to look for similarities and differences that the roles had for the peer leaders' interactions with their students. Peer review was done through discussing themes and roles with colleagues who were not connected with the project but familiar with qualitative coding methods during group meetings and personal communication (Lincoln & Guba, 1985). After compiling the main themes across the set roles, twelve journal entries were randomly selected by the primary author and coded by the second author. Agreement with the proposed themes was met for those entries after initial coding and discussion.

Results and Discussion

Peer leaders selected and provided examples of six of the specified roles in the reflection journal prompt: assistant (n = 1), promotor (n = 2), teacher (n = 3), facilitator (n = 8), guide (n = 17), and mentor (n = 22). Data for the assistant and promotor chosen roles were insufficient to warrant discussion; therefore, these data have been removed from our analyses. While it is possible that peer leaders could have misinterpreted the definition of the role that they selected, explanations given by the peer leaders did not contradict their role choice. Coherent themes were identified for the teacher, facilitator, guide, and mentor groups. We present a discussion of the themes by role and then argue for how these perceived roles fit a framework of increased depth of peer leader-student relationships that is informative for peer leader trainers. While some themes are more prevalent than others, it can be seen that certain roles have a richer collection of themes than others (see Table 1). Teachers wanted to be more of a guide to their students, guides/facilitators followed the process of teaching prescribed by using didactic or probing questioning, and mentors focused more on the psychosocial support and outside time. The last theme, 'student preparedness and readiness for peer leading sessions', spanned each of the selected roles; we present this theme first to situate the discussion for each role and our proposed relationship progression.

Student Readiness for Peer Leading Sessions

Active learning pedagogies mandate a level of engagement and readiness of students. In particular, for flipped-classroom pedagogies, students must engage with the out-of-class content (mainly instructional videos) before coming to class (c.f. Robert, Lewis, Oueini, & Mapugay, 2016). Peer leaders from each of the selected role groups noted that many of their students had not watched the videos prior to coming to

the peer leading session. Given by a peer leader who selected the mentor role: "The most difficult part was when students had to start learning actual reactions with reagents and products. This was very difficult because if the students never watched the videos or read ahead of time, they had no clue." A peer leader who selected the role of guide mentioned that "a lot of students in my section had often not watched the videos." Finally, a teacher peer leader stated that "I often noticed myself teaching the concept at the beginning of class because most of the students [sic] have not watched the videos or had no clue about the material." Several peer leaders reported feeling obligated to spend time teaching the material: "I felt like I needed to guide them to either watch the videos, go to the book, or show them how to do the basics." Time was used instructing instead of engaging the students in completing the problem set worksheet. There are multiple instances reported by the peer leaders irrespective of the perceived role they had in the peer leading session. PLTL trainers may consider how to best address student preparedness with their peer leaders and offer strategies for how to provide assistance to underprepared students while providing more meaningful experiences for prepared students.

Given constraints of amount time per class, the large lecture hall setting, and the number of students that each peer leader had to work with, the experiences the peer leaders had were relatively the same. Despite these constraints, peer leaders used "student preparedness" as a reason for why they felt they fulfilled a particular role in the peer leading sessions.

Teachers

Three of the 52 peer leaders perceived themselves as teachers in the context of peer leading. Teacher peer leaders expressed frustration rooted in their desire to be more than just teachers. Their frustration was directed towards the preparedness of the students: "the lack of familiarity the students had [with the material they should have watched before coming to class] led to my having to act as a teacher and explain concepts to them that they should have already seen." A teacher peer leader commented, "[I] often notice myself teaching the concept at the beginning of class because most of the students hadn't watched the videos or had no clue about the material." The lack of preparedness diminished the potential of the student acquiring meaningful learning during the peer leading session. Teachers struggled to get unprepared students to a level where those students could meaningfully engage in the activities.

There was a desire by these peer leaders to be more than just a teacher. These peer leaders collectively stated that while they felt like teachers, they wanted to be more of a guide to their students: "I really wanted to be more of a guide…" "…I tried not to 'teach' the students the material and instead guide them through it." These peer leaders wanted to be more than 'givers of information.' The teachers recognized that what they were doing was not as effective "…[I] would have been more beneficial to serve as a guide." Teacher peer leaders felt hindered by the unprepared students.

Guides and Facilitators

Twenty-six of the 52 peer leaders chose guide or facilitator as the role they most espoused in the context of peer leading. Guides and facilitators are reported as a single group because of the overlap of themes between these two selected roles and because 'guide' and 'facilitator' are used synonymously in the PLTL literature (e.g., Brown et al., 2010; Johnson et al., 2015). These peer leaders noted that their job was not to teach, but to be an assistant in the learning process. Guides and facilitators understood that students could not expect to receive answers and that "students actually showed visual frustration because sometimes I would not give them answers directly, or I would ask them open ended questions to get them to think for themselves." This set up is a Socratic interaction whereby peer leaders posed questions to the students to help direct the student to more meaningful learning. Guides and facilitators felt that by answering a question with another question, the students would think more deeply about the topic and arrive at an answer by themselves.

Guide and facilitator peer leaders emphasized the process of learning, rather than reinforcing an obtained correct answer:

- Knowing why they got the answer is more important than knowing what the answer is.
- I would ask questions from the students when they presented me with their answers, such as why did you do this, why didn't you consider this, do you remember these concepts, etc.

Facilitating learning by having the students teach each other was a common method employed by guides and facilitators. "I point the students in the right direction… They can deviate slightly but still reach the correct answer." The peer leaders in this group acknowledged that their roles were not to give away answers but to give nudges in the right direction and let the students do the legwork. "Most of the time students would know what they were doing, they just needed a little push." This is how the peer leading processed is ideally enacted; fulfilling these roles would constitute a successful peer leader (c.f., Brown et al., 2010; Johnson et al., 2015).

No facilitators mentioned personal interactions or relationships with their students. They made no reference that they viewed their role as more than simply helping students learn in their 75-minute weekly

interaction. From the guides there were three instances where "help students set goals" and "give advice on how to study" were mentioned. There was one mention of psychosocial support: "[I]f they know a peer can get through it, so can they." These two role categories comprised the majority of the surveyed peer leaders. Only a small fraction of this majority reported any type of psychosocial or developmental support which is to be suspected due to their choice of role.

Mentors

Twenty of the 52 peer leaders felt they espoused a mentor role in peer leading sessions.

Mentors believed that by connecting their own experiences with the course, it would allow the students to develop a deeper understanding of the material: "I was open about my own struggles when I first took the course and I saw a difference in her [a specific student the peer leader was working with] demeanor." Sharing personal experiences with students varied:

> [A student] told me he was having trouble with time management and feels like he is drowning in work… I informed him that I was once exactly like him and in his situation… I answered all of his questions, tried to guide him through a plan of how to get more involved.
>
> I had one student who broke down… due to the class being overwhelming… After talking to her and consolidating her, I began to talk to her about my experience in Organic Chemistry, what I needed to do to succeed, the dynamic of the course, how much I studied, how I studied, and introduced her to students who did understand the concepts well so they could study outside the course together.

Mentor peer leaders communicated their personal struggles in learning the course material and how they overcame those struggles; the mentors' goals were to relate to the students and help the students develop a hope-based perspective on achievement in the course.

These peer leaders shared with their students that it is possible to understand organic chemistry despite struggling: "I gave [the student] personal stories… I told [the student] how I studied organic chemistry and how many hours I would spend studying it." Some mentors voiced to their students' gaps in their own understanding of the material; instead of letting it be a hindrance, these peer leaders were willing to note their deficiencies: "…I for one didn't know everything and even found myself making silly mistakes [when working with the students in the peer leading session], but that I also could help them learn from my experience." This humanization of the learning process led to a sense of approachability and a level of trust and friendship that the teachers, guides, and facilitators did not report.

Mentors described instances where they created an environment where students could feel comfortable coming to them: "I made sure to set myself in the same plane as them, let them know I am a student, step off that illusion of me being a teacher and made sure that I was not condescending." Thus, mentors created an environment that was about more than just learning the content and being able to solve the problems. Building a high level of trust was important to establish for mentor peer leaders. Almost 60% of the mentors reported that they took a "personal interest in or became friends with their students" during the course of the semester. *Mentors* felt "personally responsible" for the success of their students.

Mentors reported looking for ways to describe how the current concepts in the course were tied into their overall educational experience and courses for their major. This approach demonstrated a substantial investment of time on behalf of the peer leader, more than what was required of the peer leader. One mentor noted that they would "review night before to be able to help teach information to students who would be lacking." These peer leaders looked for other resources that students may not have been aware of:

- I incorporated outside sources other than straight organic chemistry to enhance the learning environment.
- In addition to helping out with the problems I offered a lot of advice on studying habits and techniques.

Some mentors reported they "stayed after class." Others reported that "they met with groups of students in the library for a more relaxed and personal setting" and "were asked if they could tutor outside of class." "[Students] had access to contact me outside of the class to ask questions or advice. It felt great to know that I was there to help them both inside and outside of the classroom." Being asked "for an email address" was mentioned by several mentors to allow for continued contact after the class was completed.

These outside of classroom experiences show a desire to connect with their students beyond the confines of the classroom and prescribed experience. Mentors supported students whenever and wherever opportunities presented themselves. This level of support was unique in that these mentors had similar students and time commitments as the other peer leaders. Despite these constraints, mentor peer leaders expressed a desire for outside of class interactions and anticipation of student needs. These outside interactions were exclusively mentioned by mentors.

Every group of peer leaders stated that they had students who would not come to class prepared and were not engaged. A key difference between mentors and other perceived role groups was that mentors viewed their students as having the potential to improve but lacking the skills and motivation to grow. Mentors reported they would "help students set goals" or "learn better study habits." This mentality of bettering students showed responsibility for their students' learning that extended beyond the typical PLTL experience. There was no indication that the mentors did not embrace their role as facilitators. The difference between guide/facilitator and mentor can be summed up with this peer leader's statement:

> I wanted to say that I saw myself as a facilitator, by answering questions with a question my students slowly got to the right answer but from my experience I think being a peer leader is much more than that. I see myself more of as a mentor to the students. I made sure to set myself in the same plane as them.

Implications for Peer Leader Training

"Teacher, then guide and facilitator, then mentor" forms a progression in peer leader-student relationships. Teaching is helpful; however, this role does not embrace the engagement envisioned for PLTL and is merely an extension of a lecture mode of instruction. Facilitators and guides are the ideal roles envisioned by the developers of PLTL (Becvar et al., 2008). Mentorship has been observed in classrooms implementing peer leading; however, this role is not formally addressed in the PLTL literature (c.f., Wilson & Varma-Nelson, 2016) nor emphasized in PLTL training programs. Since peer leading is a multi-discipline teaching pedagogy, the mentoring of young STEM majors could help bridge the continued gap of representation in disciplines where females and URM students are still underrepresented such as technology, engineering, applied physics and math (Wilson & Varma-Nelson, 2016).

Guides and facilitators are focused on promoting meaningful learning beyond teaching students the content or demonstrating a failsafe method for solving a problem. The Socratic method of questioning is the ideal PLTL pedagogical strategy. Peer leader training programs are intended to provide guidance on learning pedagogies involving groups and opportunities to practice promoting student engagement. Peer leaders are to identify the needs of their students and provide targeted, individualized assistance. Peer leaders are to support collaborative and autonomous (i.e., apart from a formal instructor) learning. Based on these ideal activities of peer leaders, a guide or facilitator role best describes the archetype peer leader (c.f., Becvar et al., 2008). These roles though embrace a perspective that the peer leaders and students are different. The theoretical foundation of PLTL, however, acknowledges the importance of the similarities between peer leaders and students that begs and creates an opportunity for a more mentorship-style relationship.

Mentors stated more often than the other roles about building deeper, more personal relationships with their students. From a peer mentor perspective, these relationships provide a means for broader conversations about the course (e.g., how to best study for examinations), future course enrollments (e.g., Dr. Bartlett provides similar peer leading experiences in their recitation sessions), and shared experiences (e.g., when I took this course, I had a similar struggle learning this particular material). Having a peer with similar shared experiences participating in these conversations could prove beneficial as Seymour and Hewitt (1997) implied that the decision undergraduates make to leave science, math, and engineering was always based on a culmination of discussions that the students have with others. This mentoring process does not need to overshadow the PLTL program but encouraging peer leaders to be open about their experiences when interacting with students may allow for this process to happen more organically. While we do not have quantitative data to specifically support this claim, the research literature suggests that a peer leader who espouses a more mentor-style role is more effective at promoting meaningful learning and retention in STEM (e.g., Becvar et al., 2008; Colvin & Ashman 2010; Damkaci et al., 2017; Martin & Dowson, 2009). Moore and Amey (1988) point out that mentoring can also be covered in a multitude of different roles, e.g., guide, teacher, patron, depending on the needs of the protégé.

Limitations and Future Directions

We wonder how solidified these roles are, how influences beyond preparedness or participation have led to particular perceived roles, and if these roles are fluid and responsive to student needs each session. We also wonder if students perceived these roles espoused by their peer leaders and how these roles may have influenced the students' experiences and learning. Classrooms observations of peer leader-student interactions and observations of peer leader training sessions were not conducted as part of this study; this limits our ability to corroborate the situations described by the peer leaders and to evaluate the influence that training sessions may have had on the roles peer leaders perceived they were to espouse, including how the peer leaders were referred to by the instructor in these training sessions.

Not every peer leader mentor mentioned what interactions specifically caused them to have this identity of mentor to their students. However, as this journal entry was the final entry of the semester and was asking for their overall view of themselves throughout the course, it can be assumed that there were experiences that happened to cause them to think of themselves as such. It is possible that this holistic view of an entire semester does not account for individual moments of mentoring that could have been done by those peer leaders in other role categories and the peer leader simply did not view that as their main role during the semester.

Despite these limitations and new questions asked, there is an opportunity for more mentorship-oriented training to be included in peer leader training programs that capitalize and formalize mentoring that is informally occurring in the context of PLTL. Non-PLTL peer mentoring programs have shown promise in chemistry contexts (e.g., Damkaci et al., 2017). Coupling PLTL with peer mentoring can provide a more holistic approach to promoting achievement and retention. Mentoring could be in several forms, but based on our analysis it should be used as both a psychosocial and developmental format.

Conclusion

Our results demonstrate that peer leaders perceive their roles in the classroom based on experiences had during their interactions with students through implementing the anticipated PLTL pedagogy of facilitation and use of guiding questioning and a desire to build relationships with the student both inside and outside the classroom setting. Peer leader trainers should be cognizant of how peer leaders enact their roles, especially for identifying when peer leaders settle on a more teacher-focused role which can be caused by a lack of student preparedness. Mentoring should be encouraged and integrated into peer leader training programs; PLTL and peer mentoring share many commonalities from which a synergistic combination could lead to greater achievement and retention. This integration can be simple and does not have change the principles of PLTL, but discussion of how to be empathetic to their students, as well as how to look for opportunities to mentor students, could be discussed in weekly trainings. Understanding how these perceived roles impact student experiences and learning would provide needed evidence for the importance of promoting a more mentorship-style of peer-led team learning.

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