Advances in Peer-Led Learning

Number 1 Fall 2021 Article 2

More Than Content: Training Peer Leaders in Mentoring Leadership

Mark S. Cracolice
University of Montana
mark.cracolice@umontana.edu

Audrey Broffman
University of Montana

Recommended Citation

Cracolice, M.S., & Broffman, A. (2021). More Than Content: Training Peer Leaders in Mentoring Leadership. *Advances in Peer-Led Learning,* 1, 3-11. Online at https://doi.org/10.54935/apll2021-01-02-03

Advances in Peer-Led Learning
2021, Number 1, 3-11

More Than Content: Training Peer Leaders in Mentoring Leadership

Mark S. Cracolice* and Audrey Broffman

Department of Chemistry and Biochemistry
University of Montana
Montana, Montana 59812
*mark.cracolice@umontana.edu

Abstract

Training peer leaders to mentor students is an essential component of any peer-led team learning training program. This training method article begins by establishing a definition of mentoring and describing its theoretical underpinnings. Piagetian disequilibrium is one component of why mentoring is effective because interpersonal interaction efficiently assists students in learning how to deal with mental discomfort and grow intellectually from it. A four-part theoretical definition of the components of mentoring serves as the theory base for our training curriculum: (1) psychological and emotional support, (2) goal setting and career paths, (3) academic subject knowledge support, and (4) existence of a role model. In translating theory into practice, we train leaders to follow five key tenets as mentors: (1) be a learning coach, not a tutor, (2) create a trusting environment among your team members, (3) assist students in learning how to learn from feedback, (4) assist students in learning time management skills, and (5) meet with students one-on-one periodically to provide personalized academic and social support. The time commitment to training by a peer leader is 35 hours per semester via a combination of pre-semester training, in-semester group training, and in-semester one-on-one training. Practical suggestions on how to train leaders are provided.

Keywords: College STEM Courses, Mentoring, Mentoring Relationship Theory, Peer-led Team Learning, Training Methods

Introduction

In the first author's more than two decades of utilizing modified forms of Peer-Led Team Learning (PLTL) (Gosser et al., 2001; Varma-Nelson & Cracolice, 2020) in teaching general chemistry, the greatest change in our leader training strategy has been an ever-increasing emphasis on directly teaching study methods and guiding students' emotional management. Without changing total training time, we have decreased the emphasis on content knowledge training and increased the emphasis on "people training." In this training method essay, we address how college STEM practitioners can adopt selected approaches that we have used successfully in our program for instructing leaders in how to mentor students. We use the term *mentor* to refer to a relationship where a more knowledgeable and experienced person guides one who is less experienced.

Theory

Solving a true problem in a science course is a complex process. We use the term *true problem* to describe a question that a student cannot immediately categorize into a general group of question types and know the general structure of the solution. In contrast to a true problem is a question that can be solved by applying an *algorithm,* which is a step-by-step list of rules that can be used to solve a general category of questions (Bodner, 1987).

We hypothesize that, while solving a single true problem, a student can encounter as many as three "decision points" where she has to decide whether or not to continue to put mental effort into solving the problem. The exact number of these decision points depends on a student's individual experience with problem solving and level of relevant content knowledge. The Swiss psychologist Jean Piaget coined the term *disequilibrium* to describe the mental process that occurs when a student must make a decision about continuing problem-solving effort. Like the term implies, disequilibrium is a mismatch between cognitive stability, or equilibrium, and what a student is currently experiencing as input from the environment. An example is when a student realizes that he does not know what to do next at any decision point while involved in solving a problem. Curricula must be designed to induce disequilibrium because it is the mental process that drives cognitive growth. Piaget wrote, "Disequilibria alone force the subject to go beyond his current state and strike out in new directions." (p. 10) (Piaget, 1975/1987).

Disequilibrium is, therefore, a necessary component in the process of learning how to solve true problems. However, it is very difficult for a student to read a textbook passage or an article or listen to a lecture to learn how to deal with the emotional uncomfortableness associated with disequilibrium. Learning by doing, in conjunction with human-to-human

mentoring, is the optimal strategy to help students learn how to deal with the potential barriers inherent in the process of learning how to solve problems. Furthermore, mentoring is also the optimal method for helping students make the high school-to-college science transition, where they must learn to transition from a "cramming works" study approach to the more consistently distributed temporal approach needed for success in intensive, problem-solving oriented courses such as general chemistry.

A four-part theoretical framework for the college student mentoring relationship was proposed by Crisp and Cruz (2009). The first cognitive construct is labeled *psychological and emotional support*. This includes listening to students, which we believe is far too rarely incorporated formally into college science curricula. It also includes forming an emotionally supportive relationship, where students have the opportunity to discuss with someone who recently succeeded in the course the emotional issues associated with dealing with what is generally their first truly challenging course. Offering encouragement is also included in this category.

The second cognitive construct is called *goal setting and career paths.* Within this domain, perhaps the most critical feature is training leaders to respectfully question and challenge students' choices and decisions about how they invest their outside-of-class time; we work to strongly establish the necessity of the relationship between time studying efficiently and cognitive growth and content-knowledge acquisition. Similarly, this domain includes linking the student's long-term career goal with their intermediate-term educational goal and their day-to-day academic behaviors. This category also includes development of the ability to reflect, thinking beyond simple first-order cause-and-effect relationships.

The third variable in the theoretical framework is *academic subject knowledge support*. This is what has traditionally been emphasized in most PLTL training models. There are two essential components within this domain. One is supporting students' academic success in the classroom through coaching learning. Leaders must learn how to maximize their efficiency in guiding students towards learning how to become independent problem solvers. The second component is supporting students' success outside of the classroom. This involves helping the course instructor in identification of the strengths and weaknesses of the workshop questions and homework sets and providing the instructor with feedback about the alignment of in-class and out-of-class activities.

The fourth and final theoretical construct is the *existence of a role model.* There is a great deal of value to students in having a relationship with a student who recently succeeded in a course, but this is a problematic relationship to form when not formally structured within a

curriculum. Leaders must be trained to learn that it is not only acceptable, but, in fact, encouraged to share their experiences in their coursework and their related emotions. The leader also provides guidance on how to navigate the cultural and social aspects of the specific course and how it fits within the broader institutional culture.

Selected relevant literature and analysis

Amaral and Vala (2009) evaluated the benefits of mentoring in a college preparatory chemistry course to the mentors themselves by comparatively evaluating mentors' grades in first-semester general chemistry. Mentoring was defined as working on problem solving in class with a group of 4-to-6 students. Students who initially took preparatory chemistry and then were enrolled in general chemistry while mentoring in the preparatory chemistry course outperformed students who did not participate in the mentoring program.

Essex (2011) conducted a mixed-methods study on ten high school students in England preparing for the Advanced Supplementary Year 12 Chemistry Examination. Mentoring was defined as having three constituent parts: (1) the sharing of knowledge and understanding by the mentor, modeling of thinking skills, and facilitation of metacognition, (2) supporting the student's changing sense of self-identity, and (3) helping students move from imitation of the mentor toward critical examination and analytical thinking about the subject. The findings were classified into three categories. First, students lacked study skills and were deficient in employing metacognitive strategies, and they looked to their mentors to learn how to learn. Second, no significant difference was found in exam scores of the mentored versus unmentored students (although it is important to note the sample size was small and the standard deviations of the mean scores were large). Third, students perceive mentoring as beneficial, but there is a range of perceived aspects of mentoring that cause the benefit.

Shields et al. (2012) analyzed the effectiveness of supplementary help activities on total scores of underprepared students in general chemistry, where one of the treatment groups included a peer mentoring component. The peer mentoring sessions were designed with the goal of teaching students to utilize an active learning approach to achieve study effectiveness. Individual interaction and individual student questions discussed in a group were the focus of the mentoring sessions. The most relevant quantitative result from this study was that, when controlling for prior content knowledge and coursework, a group with peer mentoring and other curriculum enhancements scored 0.5 standard deviation higher than a group with the same curriculum enhancements but no peer mentoring. Additionally, students' attitudes about the usefulness of peer-mentoring groups were highly positive, with over 85% strongly agreeing or agreeing that mentoring helped performance.

Analysis of the literature indicates that researching the effects of mentoring is challenging because, in part, it is nearly impossible to isolate, control, and individually investigate clearly-defined constituents of the complex process of mentoring. Nonetheless, the research showed that there are benefits of the aspects of mentoring that extend beyond the confines of traditional academic tutoring. These benefits included: the mentors themselves benefit academically from the mentoring process, students perceive the mentoring experience as positive, and mentoring has a neutral to positive effect on academic performance.

Selected approaches for instructing leaders in how to mentor students

In the bulk of the remainder of this article, we describe how we train peer leaders to mentor students. These are selected techniques for which we have received positive feedback, with no implications about relative efficacy or priority. We suggest that you consider gradually implementing techniques that look appealing, taking care to be sure that you can comfortably integrate any of the choices into your course culture. We purposefully omit discussion of instructing leaders in tutoring content knowledge and problem-solving to keep the focus on mentoring.

Learning Coach: Starting almost from the beginning of pre-academic-year training, we emphasize the philosophy that leaders are learning coaches, not tutors. A tutor is someone who provides direct instruction in a content area, most commonly instructing by encouraging students to imitate the tutor's behavior. Typically, an "I'll show you how to recognize and solve this problem type, and then I'll watch you do one" pattern is employed.

In contrast, a coach does not perform the activity herself. We stress the analogy to being a strength and conditioning coach. The coach cannot lift the weights, perform the exercises, nor run the distances for their students; instead, they must let the students do the activities and then actively guide them while they are attempting the activities. Our primary goal in promoting this philosophy is that by making the workshop an active learning environment, students gain in both content knowledge *and thinking skills.*

Promoting Trust: A goal is to make each workshop team into a group of people who trust one another emotionally. This is essential because learning efficiency is maximized when a student will unhesitatingly reveal what he does and does not know. The greater the willingness of a student to literally think out loud, the easier it will be for the leader to identify and diagnose any misunderstandings, knowledge gaps, and misconceptions. Once these fixable problems are discovered, they can be corrected.

To facilitate the development of trust within a team, we train leaders in use of a common technique, the ice breaker. An ice breaker is conventionally defined as a team-building activity designed to facilitate person-to-person interaction, particularly among people who do not have a previously-established relationship, so that the team members begin to gain knowledge of one another. As team members become more familiar with one another, they become more likely to focus less on editing their thoughts to "impress" their classmates and focus more on revealing what they are honestly thinking.

Our ice breakers are conducted in both leader meetings and team meetings. In training, we conduct a series of icebreakers, and we encourage leaders to model these activities and lead ice-breaking activities with their teams. The general strategy is to start with more superficial, less-vulnerability-provoking questions such as "If you were a non-human animal, what would be most like your personality and why?" and carefully increase the emotional vulnerability associated with the questions to something like "What was the most embarrassing thing that happened to you this week?" We believe that when students can share socially embarrassing stories, for example, they can also share misunderstandings about solving science problems.

Feedback Loop: Although many of these activities happen in varying degrees and in repeated temporal loops that depend on when an individual student is ready to assimilate the information, once the nature of the role of the leader as a learning coach has been established and the emotional barriers to thinking out loud have begun to be removed, the next step is to help students learn how to learn from academic feedback. We accomplish this in two primary ways: high feedback frequency and explicit leader mentoring. High feedback frequency is provided by daily one-hour homework assignments, quizzes at each class meeting, midterm examinations every three weeks, and a comprehensive final examination.

Peer leaders are introduced to the concept of the feedback loop during the initial pre-term training sessions, and it is briefly mentioned to students in lecture and the textbook. But we generally allow students to study of their own accord until the first midterm exam. Peer leaders are then instructed to begin their workshops by creating two lists on a whiteboard: "What Worked" and "Could Be Improved." The peer leaders are told to facilitate a group discussion and encourage students to contribute to the lists by identifying the study methods that they used that were effective or ineffective. This type of discussion is carried out after every midterm exam.

Time Management: At the first workshop, peer leaders are instructed to devote a portion of the session instructing the students to write out a weekly schedule hour-by-hour, listing all activities, both personal and academic. Our first goal is to be sure that students

schedule no less than two hours outside-of-class for every hour in class. Relatedly, we want students to see that a full college credit load requires only approximately 50 of the 168 hours in a week.

Another goal is to make students think of homework as equally obligatory as attending a class (if not more so!). Leaders provide guidance in efficient time management and may advise students to study with others in ways such as private or group tutoring, the instructor's office hours, a learning center on campus, or form groups in which the students can collaborate to better understand the material and avoid social isolation.

One-on-One Meetings: Peer leaders are encouraged to keep track of each of their students' quiz and exam scores to monitor the trends in their students' progress. During the workshop that takes place the week before the second midterm, peer leaders are asked to conduct the first individual check-ins with each of their students. They assign a long problem set to the team and privately pull students aside one-by-one. Leaders ask the students how they are feeling about their progress in the class, and then they help the students create a study plan for the period of time through the next upcoming exam. This is accomplished by asking the student to reflect on their study habits leading up to the just-completed exam and to consider what methods that they used that were effective or ineffective, as well as by giving the student advice about using specific study skills that the leader knows to be beneficial. The peer leader then ties this discussion back to the student's weekly schedule. Students are instructed to write study plans created during the check-ins and follow the leader's "prescription."

Leaders' time commitment to training

In leader training, an overarching goal is to maximize the leaders'-development-to-time-training ratio; in other words, we strive to maximize efficiency (Cracolice & Queen, 2019). Given that our leaders are unpaid volunteers, it is imperative that we use their time efficiently.

Pre-semester training occurs in a single five-hour session, with three hours led by the leader coordinator and two hours led by both the coordinator and the course instructor. This session covers a broad swath of topics ranging from course policies to our course-specific leadership techniques to the fundamental tenets of the seminal peer-led team learning program (Roth, Goldstein, & Marcus, 2001).

In-semester training occurs in part as a group via weekly 50-minute meetings. These meetings are structured into three parts: (a) a check-in with the leaders to inquire about their perceptions of recent course and student progress, (b) presentation of written leader's guides

for the upcoming week and a discussion of chemistry content, and (c) presentation of a two-page essay about a topic related to educational psychology, learning, or leadership and a discussion of how the topic applies to the leaders or the students.

In-semester training also occurs via one-to-one communication between each leader and the course instructor through weekly written leader logs. Logs are submitted by leaders in a semi-structured format that address four topics: (a) reflection upon the individual's personal growth, (b) feedback on the curriculum to shape future offerings of the course, (c) recording the learning history of a rotation of individual students, and (d) information about what is working in the course and what is not to develop students' content knowledge and reasoning ability. The course instructor replies to each leader log to provide support and feedback and to challenge the leader to improve.

An average leader in an average week works about an hour in reviewing content and writing their leader log, which are activities that we consider to be training. Thus, for a 15-week semester, each leader invests about 5 hours before classes begin, 15 hours in group training, and 15 hours in individualized training, totaling 35 hours.

Conclusions

Many of these activities may seem as if they are something that would naturally happen in the absence of specific training, but we have found that the quality of our courses has increased significantly since we have explicitly incorporated them into training, so there must be a benefit to explicitly training leaders on the topics. As academics who love the subject matter we teach, we may easily become over-enthusiastic about focusing on content knowledge in training, but teaching is a human endeavor, and we must move beyond exclusively covering content knowledge and furthermore train leaders in how to mentor human emotions and behaviors.

Acknowledgments

All of the training methods discussed in this article were developed and refined in collaboration with dozens of peer leaders over multiple years. It is impossible to single out each leader's specific contribution, but all deserve acknowledgment. Sharon Loa, our peer leader coordinator from Autumn 2017 to Spring 2019, was particularly instrumental in shifting the emphasis in leader training toward mentoring.

References

Amaral, K. E., & Vala, M. (2009). What teaching teaches: Mentoring and the performance gains of mentors. *Journal of Chemical Education, 86*(5), 630-633.

Bodner, G. M. (1987). The role of algorithms in teaching problem solving. *Journal of Chemical Education, 64*(6), 513-514.

Cracolice, M. S., & Queen, M. (2019). Maximizing learning efficiency in general chemistry. In M. Blaser, T. Clark, L. Lamont, & J. J. Stewart (Eds.), *Active learning in general chemistry: Whole-class solutions* (pp. 55–67). American Chemical Society.

Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in Higher Education, 50,* 525-545.

Essex, J. (2011). An exploration of the effects of mentoring on post-16 chemistry students' exam performance. *Chemistry Education Research and Practice, 12,* 68-73.

Gosser, D. K., Cracolice, M. S., Kampmeier, J. A., Roth, V., Strozak, V. S., & Varma-Nelson, P. (Eds.) (2001). *Peer-led team learning: A guidebook.* Prentice Hall.

Piaget, J. (1975/1987). *The equilibration of cognitive structures: The central problem of intellectual development* (T. Brown & K. J. Thampy, Trans.). The University of Chicago Press.

Roth, V., Goldstein, E., & Marcus, G. (2001). *A handbook for team leaders.* Prentice-Hall, Inc.

Shields, S. P., Hogrebe, M. C., Spees, W. M., Handlin, L. B., Noelken, G. P., Riley, J. M., & Frey, R. F. (2012). A transition program for underprepared students in general chemistry: Diagnosis, implementation, and evaluation. *Journal of Chemical Education, 89*(8), 995-1000.

Varma-Nelson, P., & Cracolice, M. S. (2020). Peer-Led Team Learning. In J. J. Mintzes & E. M. Walter (Eds.), *Active learning in college science: The case for evidence based practice* (pp. 205-218). Springer.