A Professional Development Program for Science Adjunct Faculty: The Mentoring-Learning Community (MLC)

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A PROFESSIONAL DEVELOPMENT PROGRAM FOR SCIENCE ADJUNCT FACULTY: THE MENTORING-LEARNING COMMUNITY (MLC)

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Institutions of higher education have become increasingly dependent on adjunct faculty. These faculty members are often unfamiliar with current teaching strategies emphasizing an active learning approach. To support science adjunct faculty in learning about active learning, a professional development program was designed and implemented by the authors of this study, the Mentoring-Learning Community. The Mentoring-Learning Community program design was informed by literature regarding the use of professional development programs that focused on adjunct faculty. To determine the impact of this program, participants in the Mentoring-Learning Community were observed and interviewed over one semester. Mentoring-Learning Community participants transformed through all three Transformative Learning Theory dimensions, felt more empowered to utilize active learning approaches in their classrooms, and modified some aspects of their instruction.

Keywords: adjunct, instructional change, professional development, transformation, Transformative Learning Theory

INTRODUCTION

For many years, the demands of the growing student population in higher education were met by administrators hiring a significant number of adjunct faculty (Association for the Study of Higher Education [ASHE] Higher Education Report 2010; Flaherty 2018). This hiring trend resulted in roughly 70% of all faculty in institutions of higher education (IHE) having the status of 'adjunct' (Flaherty 2018). These faculty members often work part-time and have limited term contracts (Leslie 1998), and are called upon to teach introductory level courses due to their high student demand in IHE (Bettinger and Long 2005; Ehrenberg and Zhang 2005; Yakoboski and Yakoboski 2017).

The hiring of adjunct faculty is not without challenges, especially in STEM areas. One of the fastest growing academic areas in institutions of higher education (IHEs) is biology due to its pathway into medical careers. A growing student population only supports the continued hiring of adjuncts to meet teaching demands of this field. While many adjuncts are familiar with the science content needed to teach, they often lack access to teaching strategies. In 2011, *Vision and Change* (American Association for the Advancement of Science [AAAS] 2011) issued a nationwide call to expand active learning and teaching practices for biology instructors to ensure "all [students] graduate with a well-defined level of functional biological literacy and critical thinking skills," and students learn this "through direct experience with methods and processes of inquiry" (p.

4-5 and 7). While much has been done to educate tenure-track faculty on these new teaching strategies, many adjuncts do not have the same resources available to them (Derting et al. 2016; Webb et al. 2013).

The importance of professional development and the inclusion of adjunct faculty

While IHEs have developed Centers for Teaching and Learning to increase access to professional development programs (PDP) on campus, there is still a great need for PDPs aimed at adjunct science faculty (D'Avanzo 2013; Friedrichsen et al. 2016). Adjuncts often have piecemeal schedules preventing them from participating in traditional programs offered by universities. Unfortunately, PDPs for those in higher education tend to consist of one-day workshops or short-term intervention programs designed for tenure-track faculty members who need the program for promotion qualifications (Ebert-May et al. 2015). Despite the high numbers of adjunct faculty involved in the delivery of science instruction, most institutions have not dedicated time and resources to support and provide professional development for adjuncts in the same way they have supported tenure-track faculty (Marshall 2003; Miles 2017). Adjunct focused PDP should be specific to new perspectives and actions, of ample duration, and accessible by all faculty members, especially adjuncts.

By providing timely professional development designed to educate adjunct faculty on active learning teaching strategies, this study aims to find ways to best support adjunct science faculty. Many studies have demonstrated that PDP models including 1) mentoring and 2) learning communities offer several benefits to adjunct faculty. These benefits include gaining confidence in the classroom using active learning strategies and becoming more engaged in a community by sharing teaching resources (Banasik and Dean 2016; Ziegler and Reiff 2006). This study seeks to merge components of these two professional development models into one model, a *Mentoring-Learning Community* (MLC) which aims to engage adjuncts in meeting the call for Vision and Change (AAAS 2011).

Engaging adjunct faculty members in opportunities developed for them can be beneficial in many ways. For instance, adjuncts can become more engaged faculty members, they can improve their instruction, and they can potentially provide leadership within the department (Webb et al. 2013). This study implements the proposed MLC model and assesses its effectiveness in reaching adjunct faculty. Assessing multiple PD approaches (e.g., mentoring and learning communities), their effectiveness on faculty views of thinking, instructional practice, and student response is a rarely used but needed approach (Wheeler 2021).

Guiding Research Question

What impact does a Mentoring-Learning Community have on science adjuncts' views of teaching and their classroom practices?

Framing Literature
Theoretical Framework

This study is guided by the Transformative Learning Theory (TLT), which was proposed by Mezirow in the 1970s as he explored how women returned to college (Mezirow and Marsick 1978). Mezirow's (1978) Transformative Learning Theory framework focuses on three aspects of learning, psychological (learning new information), convictional (shifting beliefs), and behavioral (transformative action takes place) process. The appeal of TLT is its broad, yet personal, view of learning. It recognizes that individuals hold a frame of reference that can be transformed in response to different situations (Mezirow 1997; Mezirow 2012). For example, reframing can occur as a person engages in a new role, assesses new information, recognizes the need for change, or plans for a course of action (Mezirow 2012). The ongoing reframing of one's reference point is a result of reflection and discourse, which happen in a specific context and in conjunction with other individuals.

As an individual engages in reflection and discourse, habits of mind and points of view support the reframing process (convictional dimension of TLT). Habits of mind are ways of thinking, feeling, or acting. Points of view are the emerging positions about some group, individual, or entity. An important outcome of the reframing process is that individuals become more empowered and autonomous, leading to transformation (behavioral dimension of TLT). The TLT framework lends itself to this study as the participants in the MLC PDP had the opportunity for collaboration with others, reflection, and transformation.

Literature Review

Research in the area of adjunct professional development is lean, but there are a few studies that reveal how mentors and learning communities impact institutional inclusion and meets adjuncts' needs (Dailey-Hebert et al. 2014; Elliott et al. 2016; Webb et al. 2013). While there is a wealth of literature surrounding K-12 educational PDP, they are not suitable for adjunct faculty development as K-12 PDP does not take into account the time constraints many adjuncts face. While there can be ideas drawn from K-12 PDP literature such as learning communities, we felt it was important to consider literature that focused on higher education as a start for our work. Previous findings on the benefits of adjunct professional development were important in creating a model of professional development programming that can be successful for the instructors who receive the training and can also be used as a way to assess the effectiveness of the overall program (Rodesiler and McGuire 2015). To gain a new insight on PDPs that includes adjunct faculty, literature surrounding the use of mentoring and learning communities was drawn upon.

Mentoring

Research on mentoring indicated that mentors are vitally important to the growth and development of adjunct faculty (Ziegler and Reiff 2006) and that providing feedback is a valuable part of any professional development model (Brownell and Tanner 2012; Dailey-Hebert et al. 2014; Loucks-Horsley et al. 2010; Lyons 2007). Additionally, PDP

participants noted the importance of providing quality and timely feedback (Ebert-May et al. 2011; Gormally et al. 2014). For adjunct Science, Technology, Engineering, and Math (STEM) faculty, many adjuncts mentioned a lack of feedback limited their professional growth as an instructor (Diegel 2013). By offering a mentoring relationship that encourages these benefits, noted by van der Weijden et al. (2015), an institution would help create a community in which faculty can exchange teaching strategies and engage in collaborations that lead to a significant and lasting impact on faculty development.

Learning Communities

Learning communities can serve as a catalyst for building community and improving the inclusion of adjunct faculty. Researchers have previously described many models of learning communities such as an apprentice-style model or a fully integrated mentoring style within a department, both of which have been shown to be effective ways to integrate adjuncts (Grimes and White 2015; Ziegler and Reiff 2006). Creating environments of collaboration for adjunct faculty can also help improve their sense of belonging. One study suggested that institutions that share part-time adjuncts could partner to provide joint PDP opportunities that would enrich the community feel for adjuncts (Banasik and Dean 2016). This might be beneficial, however, it would be challenging to implement cross-institutional PDPs. Banasik and Dean (2016) suggested that while faculty learning communities have increased in practice, there is little research available about their effectiveness for use in adjunct faculty populations. Perhaps more should be done to create learning communities for adjuncts within IHE to provide community and teaching resources.

Overall, studies have shown a positive correlation between the use of faculty learning communities, the use of mentors in PDPs and an increase in motivation to participate in programs designed around adjunct needs (Banasik and Dean 2016; Furco and Moely 2012). As with other forms of professional development programming, one consistent challenge is designing it to fit adjunct schedules so they will be available to participate. Similarly, helping adjuncts recognize student gains in the classroom, as a result of the PDP, will help motivate them to continue to participate (Banasik and Dean 2016; Furco and Moely 2012).

Although mentoring and learning community models have overwhelmingly shown to offer benefits to adjunct faculty (Banasik and Dean 2016; Ziegler and Reiff 2006), there is still a lack of literature demonstrating the impact of adjunct faculty participating in professional development (Dailey-Hebert et al. 2014; Webb et al. 2013). Previous studies reported that adjuncts appreciate the value of having a mentor to connect with (Dailey-Hebert et al. 2014; Grimes and White 2015; Webb et al. 2013) and they also feel more included in the university when they are connected through a learning community setting (Elliott et al. 2016). While these studies evaluated the use of each of these models of professional development programming separately, we could not find any studies that converged components of the two models, mentoring and learning communities, into a unified program that provided multiple benefits specific to the adjunct community.

A newly proposed model: Mentoring-Learning Community (MLC)

Based on an analysis of the studies, we propose a new model. Our proposed model will seek to bridge the lack of resources available to adjunct faculty by providing timely professional development designed to connect them with full-time faculty mentors while also engaging faculty in active learning teaching strategies. This model aims to merge components of two professional development strategies into one design which we call a Mentoring-Learning Community (MLC). Separately, these strategies have shown great promise, especially with adjuncts who desire that more personalized connection (Diegel 2013; Gormally et al. 2014; Grimes and White 2015; Makinson 2002; McCourt et al. 2017; Ziegler and Reiff 2006). This model is designed to utilize both strategies simultaneously to engage adjuncts in aligning to the goals of Vision and Change of creating community and improving teaching practices.

MATERIALS and METHODS

This exploratory semester-long program was designed to utilize multiple features from various PDP approaches simultaneously to engage adjunct faculty in learning about student-centered teaching approaches (interactive, inquiry-based, and collaborative) called for in the sciences (AAAS 2011; NRC 2012). These features included mentoring, feedback, and a learning community, allowing adjunct faculty to engage with full-time faculty in a different way than they had previously. The structural components of this program included ongoing mentoring, monthly learning community meetings, and program times specifically catered to the adjunct faculty participants. Additionally, this study aimed to determine the impact of this program on adjunct faculty teaching transformations, whereby new information and changing views of learning are implemented in the classroom (TLT behavioral change dimension). For this study, views of learning are active or passive learning and teaching transformation is defined as an observed change in teaching approach. The following section describes the implementation of these features into the overall design of the MLC (Table I).

Participant Selection

This study took place at a southeastern U.S. regional university with a student population of approximately 20,000. The university is a teaching-focused university where tenure-track faculty have a teaching expectation of 60%, and part-time adjunct faculty teach multiple, small sections (24-48 students) of introductory level courses. As an exploratory study, we implemented the MLC using biology adjunct faculty, as this university had a higher number of adjunct faculty in biology (six) compared to other science disciplines.

      Using purposeful sampling (Creswell and Plano 2011), adjunct faculty and mentors for this study were identified and an email solicitation was sent. The participant selection requirements were:

1. Must have been an adjunct for at least one full semester prior to participating.

   a. A mentor must have been at the host institution for at least one full academic year and teach introductory courses.

2. Must teach introductory biology at the regional university during the semester participating.

3. Must be a biology faculty member.

Participants were not incentivized for their participation in the MLC.

Table I. Mentoring-Learning Community (MLC) organizational design: timeline for meeting times, topics, activities, and data collection for a four-month academic semester. Classroom teaching observations followed COPUS protocol for recording faculty teaching and student learning behaviors (Smith et al. 2013).

Timeline	Meeting	Activity
3 months before semester		Solicit Participants / Plan MLC Program
Pre-semester	PRE-INTERVIEW	
1st month of semester	COPUS CLASSROOM TEACHING OBSERVATION	
	1st MLC meeting	MLC Team Building/Outline-mentoring and instructions for program
2nd month of semester	2nd MLC meeting	MLC Teaching Strategies – Formative Assessment, Diagrams (Gallery walk), Concept Mapping
	COPUS CLASSROOM TEACHING OBSERVATION	
3rd month of semester	3rd MLC meeting	MLC Teaching Strategies – Technology to engage students and provide formative feedback; Clickers, Top Hat, Kahoot!
	COPUS CLASSROOM TEACHING OBSERVATION	
4th month of semester	Final MLC meeting	MLC Wrap up session- What has worked for you? Demonstrations from participants and other faculty.
	COPUS CLASSROOM TEACHING OBSERVATION	
Post-semester	POST-INTERVIEW	

Introduction to the Adjunct Faculty Participants

Two of the six biology adjunct faculty members volunteered to participate in this program. Bobby and Joe were both part-time adjunct faculty in the biology department of the study institution. Both had taught an introductory nonscience-major biology course for the past three years. Bobby was a full-time researcher at another institution and taught evening courses; this was his only teaching appointment. Joe taught courses during the day. Joe had an additional adjunct appointment at another institution and was previously a physician's assistant.

Mentoring Implementation

During the semester-long MLC, each adjunct member was paired with a tenure-track faculty member who served as a mentor. Mentors also volunteered and were not incentivized. The mentors were biology faculty and had taught at the host institution for nine and four years. Both mentors were student-centered, used active learning in their classrooms, and participated in learning communities during their time at the host institution. Prior to the beginning of the MLC, the mentors were provided expectations and a description of the role they would provide during the course of the program. These expectations included instructions for giving peer observation feedback to the adjunct faculty mentee and suggestions on ways to offer additional support. Mentors and mentees met or communicated weekly or biweekly to reflect and discuss ways to implement what was learned during the MLC. Pairing of the mentors and mentees was based on schedule availability of the participating faculty, again, to be mindful of the time adjunct faculty had available. Both the mentor and mentee pairs participated in the monthly learning community group together, learning the same teaching strategies. This approach allowed the pair to have accountability, community, and common ground to build a relationship during the program.

Learning Community Implementation

To create a learning community, certain features must be considered. For the MLC, these features consisted of a safe environment for open sharing, collaboration, relevance, and empowerment (Cox 2004). As collaborators, adjunct faculty participants played an active role in designing the monthly MLC group schedule to ensure their ability to participate. The MLC utilized a learning community with a relevant theme of learning student-centered teaching strategies that have been encouraged in science education. Specifically, the focus topic of the program was engaging students using formative assessment. Each monthly meeting discussed various strategies that could provide formative assessment feedback to the students regarding their learning progress. This strategy is specifically aligned with the goals of implementing *Vision and Change in Undergraduate Biology Education* (AAAS 2011) in biology classrooms as a way to activate students' knowledge and allow faculty members to identify gaps or misconceptions as the course progresses. As this strategy can take on many forms in the classroom, the monthly learning community meetings offered an opportunity to introduce various ways formative assessment might look in the classroom, empowering faculty with choices for implementation.

The learning community was developed, organized, and led by the lead author and consisted of the two adjunct faculty, their two mentors, co-author JDL, and collaborators from the College of Science and the College of Education faculty at the host institution (collaboration with the College of Education recommended by AAAS 2011; Cox 2004; NRC 2012). College of Education faculty provided demonstrations of assessment tools during the monthly meeting and instructions on how to format them for the science classroom. Additionally, this cross-disciplinary interaction during the learning community allowed for the participants to gain knowledge from various faculty members, connect with faculty outside of their discipline, and gain exposure to various teaching strategies designed to engage biology students through active learning methods.

As the program progressed during the semester, these meetings included demonstrations from biology faculty already implementing a variety of engaging, student-centered teaching styles in the classroom. Additional information on technology resources, such as clicker question systems, game-based platform Kahoot!, learning platform Top Hat, case studies, discussion, and group activities were also demonstrated (Table I). These tools have been mentioned as ways to effectively encourage peer-learning and discussion in the classroom (AAAS 2011; NRC 2012). Overall, the goal of the group meetings was to provide an environment that fostered open collaboration between faculty members and provide resources that would empower participants to enact these new teaching strategies in their classrooms.

This study's research question, "What impact does a Mentoring-Learning Community have on science adjuncts' views of teaching and their classroom practices?" was informed using a mixed methods approach (qualitative and quantitative data collection) because using multiple data sources provides insights to help inform the transformation of adjunct faculty views of learning and teaching practices through the use of the MLC program (Creswell and Plano 2011). We concurrently analyzed the qualitative (pre- and post-MLC semi-structured interviews) and quantitative (classroom observations) data (Creswell and Plano 2011). The TLT framework (psychological, convictional, and behavioral) was important as a means to view, analyze, and interpret the data over the duration of the MLC program. To ensure validity of the results, we used methodical triangulation (Brewer and Hunter 2006; Roulston 2010), in which multiple forms of data are used to cross check findings. Triangulation of this data occurred through the involvement of several researchers, the use of multiple data sources, and collecting the data over time, which contributed to the validity of the conclusions (Creswell and Plano 2011).

Data Collection

We used interviews and classroom observations to evaluate the views of learning that science adjunct faculty members experienced during the MLC and the resulting impact on transforming adjunct teaching practices. The data included both qualitative and quantitative measures and were both utilized to inform the findings of the study using the TLT. All faculty participants' names were changed to protect the confidentiality of the participants and allow for nonbiased interpretation of results. Data collection was done with permission granted by the host institution and appropriate IRB agreements (MOD00005871).

Interviews

This study sought to gain in-depth, first-hand knowledge from the adjunct faculty members regarding their experiences during the MLC program and their views of learning. Roulston (2010) stated that phenomenological interviews are the best route to generate detailed, in-depth descriptions of such lived experiences. The interview data captured a snapshot of the experiences, feelings, and perspectives of the participants before and after their participation in the MLC (see Table II with question themes).

All interviews utilized a semi-structured interview guide designed and aligned with the overall research question for the study and sought to understand any resulting transformative views and perspectives of the adjunct faculty as a result of participating in the MLC program. Interviews were recorded, transcribed, and open coded to look for themes (Bogdan and Biklen 2006; Gallman 2013). Codes and themes were discussed by the researchers until they had agreement on the overall themes from the interviews. In this study the interview questions helped to support the classroom observation findings over the course of the semester so that our interpretation of the interview findings were not the sole source of data. For example, questions such as, "Which strategies from the MLC have you implemented in your classroom?" also allowed the participants to reveal information that we might not have captured using the classroom observations.

Table II. Themes of the semi-structured interview questions asked of adjunct faculty before (pre) and after (post) participating in the Mentoring-Learning Community (MLC) program.

Interview Question Themes	
Pre	● Reason for Participating in the MLC ● Teaching Background and Experience ● Familiarity with teaching strategies ● Learning Goals for MLC
Post	● Reason for Participating in the MLC ● Goals achieved in MLC ● Shifts in teaching practices or views ● Impact of the MLC

Classroom Observations

To gain an understanding of the instructional impact of the MLC on adjunct faculty, we conducted four classroom observations of each instructor over the course of the MLC. These observations were conducted using the Classroom Observation Protocol for Undergraduate STEM (COPUS; Smith et al. 2013; Smith et al. 2014). This observation method has been previously utilized to measure and understand transformations faculty members make due to teaching reform efforts (see Ebert-May et al. 2011; Lund et al. 2015; Smith et al. 2014). Observations were done before the first MLC meeting to gather an

initial teaching assessment, and then participants were observed every two weeks after an MLC meeting. This data provided insight to the activity in the participants' classroom and allowed us to back up the interview findings with actual classroom data. These observations were distributed evenly throughout the semester. MLC participants provided a syllabus at the start of the MLC program to allow us to schedule observations around any exams to capture only teaching activity. Additionally, observations were unannounced to the participants so that the data collection captured unbiased classroom activity.

Before using the COPUS we underwent training suggested by Smith et al. (2013) and used interrater reliability (IRR) to ensure convergence in observations made throughout the study. To compare observer IRR across all 25 codes in the COPUS protocol, we calculated Cohens Kappa IRR scores using SPSS (2013). Researchers maintained an IRR of 0.90 throughout the study, indicating validity and cohesiveness in observations. This IRR is considered very high and thus indicates good IRR for this study (Fleiss et al. 2013; Landis and Koch 1977). As a result of having a high IRR, researchers were able to alternate observations to prevent any bias in coding of the participants throughout the study. We also cross-checked codes with one another frequently and discussed observations to ensure cohesiveness throughout the length of the MLC.

Data Analysis
Interviews

For purposes of analysis, the semi-structured interviews were audio recorded and transcribed within a week after the interview. To gather an in-depth understanding of the participants' feelings, experiences, and views, the interviews were coded thematically using inductive categorization. We drew upon patterns in the text of the transcript to develop codes. Second, those codes were categorized into clusters (Gallman 2013; Roulston 2010) utilizing the frequency function within the Nivo 12 plus software program (QSR International 2017). This process allowed the data to be reduced to its "essential meaning" (Roulston 2010, p. 161). Finally, themes were created and grouped together by commonality or their link to the research question. The constant comparative method was utilized to look for transformations in attitudes and views as a result of the adjunct faculty participation in the MLC (Boeije 2002; Glaser and Strauss 1967).

Classroom Observations

For each two-minute interval of the class, designated activities of the instructors (e.g., lecturing and posing questions) and their students (e.g., listening and answering questions) were recorded. We followed Smith et al.'s (2014) protocols for grouping behaviors for analysis. For instructors, we assessed (a) presenting, (b) guiding, (c) administration, and (d) other. For students, we assessed (a) receiving information, (b) talking to the class, (c) working, and (d) other (Smith et al. 2014). To capture what instructors and students were doing throughout a class period, we determined the percent of time a group of behaviors occurred throughout a class (i.e., the number of two-minute time periods a behavior was recorded / the total number of two-minute time periods). We used percent of time periods instead of percent of total behaviors because it better

represented what occurred throughout the entire class period (Lund et al. 2015; Smith et al. 2014).

RESULTS

The goal of this study was to evaluate the use of a Mentor-Learning Community program to provide knowledge and resources about current teaching practices and a supportive community designed specifically for adjunct faculty. Interviews and classroom observations were used to analyze the impact of this program and gage the overall transformation of adjunct faculty teaching practices.

Interviews: Mentoring-Learning Community led to changes in views of teaching and teaching practices

In seeking to understand how adjunct faculty viewed their teaching, interview questions were asked about why they wanted to participate in the MLC, familiarity with teaching strategies, and their MLC goals (Table II). Both pre- and post-interview questions revealed similar themes addressing the overall research question for this study about the MLC affecting teaching views and practices.

Theme 1: Adjunct faculty desire to learn and improve their teaching practices

When adjunct faculty participants were asked why they chose to participate in the MLC, one theme that emerged was a desire to learn ways to improve their teaching practices. In the pre-interview, both Joe and Bobby expressed a desire to learn about new teaching strategies (TLT psychological dimension) and connected this learning with improved student success.

> I want to improve every day. It sounds like I might be able to benefit and learn some new things from this program, and I am excited to do so. – Joe

> I want to learn from the regular faculty who teach more classes than me. They may have come across some other way to keep the attention of students. I'm just hoping to learn something new. – Bobby

This same sentiment of wanting to learn and improve their teaching was reflected in their post interview regarding why they signed up to participate in the MLC program.

> I want to be a better teacher. Simple as that. Learn from you all. That was the reason I wanted to participate. Just to learn from other people. It was a great opportunity; you don't have that kind of chance while you're working. – Joe

> I just wanted to learn from this course about something to help my teaching. Maybe a new teaching method or way to engage students in class. That was the major motivation for me. - Bobby

A sentiment of wanting to learn and grow as an educator was at the root of adjuncts' desire to participate in the MLC program and was consistent in both pre- and post-interviews.

Theme 2: Adjunct faculty views of teaching were transformed by the MLC

When asked about their experiences during the MLC and how they viewed teaching after participating, they said their views on teaching were different than when they began the MLC. When asked how the MLC helped them, both Bobby and Joe agreed that the program directly impacted their thoughts and perceptions of teaching practices.

> It definitely helped me in terms of getting those ideas, and although I've not implemented much yet, I've been able to implement some, and this [experience] was really helpful. By getting to hear from other people who are participating in this program, both pros and cons, I gained faster knowledge so I can decide whether that is a good or bad thing for me to try and if it might be feasible in my classroom setting. It has definitely increased my ability to instruct in this way and has added to my ability in teaching students in a different way.   – Bobby

The MLC provided an avenue for both adjunct participants to interact, collaborate, and reflect on teaching. This opportunity was something Bobby said he never had available to him before.

> It's good to know there are so many levels I can implement. I have not been able to listen to people who have tried these before, so that was a good experience for me and changed my thoughts on using them in class. – Bobby

Joe went on to say that the MLC had a transforming impact on how he thought about his classroom practices. Both participants expressed that their views of what could be done in the classroom were transformed because of the MLC. Joe stated that the biggest reflection he had from the experience was that "it could be done," meaning that he now believed he could transform the way he taught.

> The most surprising thing for me was that it can be done! You can change. Seeing how other people were doing things surprised the heck out of me. I thought it was too big of an obstacle, but I can see that it works and truly has an impact on the students' learning. – Joe

He admitted that prior to the MLC he did not believe he would change, even though he was interested. He stated that "seeing how his mentor was using various strategies and being able to ask questions" really transformed his way of thinking toward active learning. Both adjunct faculty expressed that their teaching and thoughts about teaching were impacted because of their participation in the MLC program.

Theme 3: Adjunct faculty appreciated collaboration

In the post-interviews, both participants were asked for their feedback regarding the inclusion of both features, mentoring and the learning community, into the MLC design. Bobby stated that being able to experience a variety of perspectives from the participants really influenced his thinking and experiences. He had no prior experience with a learning community or mentor and found both aspects helpful for him.

> The MLC exposed me to various ways people are teaching and learning their problems, their benefits from their experiences. It exposes and widens your thinking in terms of teaching differently. These were things that made this a good way to learn. Coming together with other instructors to discuss various ways they are teaching in their classes. Getting feedback from your mentor on how you implement something in your class. All of these things, I believe, will be for the betterment of my students regarding my teaching. – Bobby

Bobby stated that he and his mentor observed each other, and he found the feedback from his mentor helpful. He also benefited from being able to observe his mentor to learn and observe a different way of teaching. He went on to state that the feedback from his mentor gave them both an opportunity to reflect on their teaching and have a "lively discussion about teaching styles and student learning."

Joe also found both his mentor and the learning community features of the MLC useful to his views of learning. Joe had mentioned in his pre-interview that he was looking forward to learning from a mentor and getting feedback on his own teaching, so it was no surprise this was reiterated as a benefit in his post interview.

> Having Joy [his mentor] look over my shoulder and sit down with me and say, "I would have done this a little different," and show me in a constructive way. That was very useful. It helped me, it really did. Both the group discussions and having my own mentor. – Joe

Both participants also stated that the face-to-face component of this program was very useful for them to be able to connect and interact with colleagues in similar teaching situations.

Overall, these interview findings suggest that the adjunct faculty participants had a desire to continually learn and improve their teaching methods. Participating in the MLC reframed their thoughts regarding this new teaching style. Both participants stated that their main desire to participate in the MLC was to improve their teaching and learn something new from the MLC. They also stated that the use of a mentor was valuable throughout the program, providing feedback and constructive criticism which they had not previously received. The learning community aspect also provided them faster access to information regarding teaching strategies and allowed them to make decisions regarding the feasibility of using these new strategies in their own classroom by discussing it with another participant in the MLC. Both participants also expressed a transformative shift in their thinking about teaching because of the MLC and the information they learned, and they recognized change was possible. Even though their implementations

were different, both expressed they had plans to utilize the new teaching strategies moving forward.
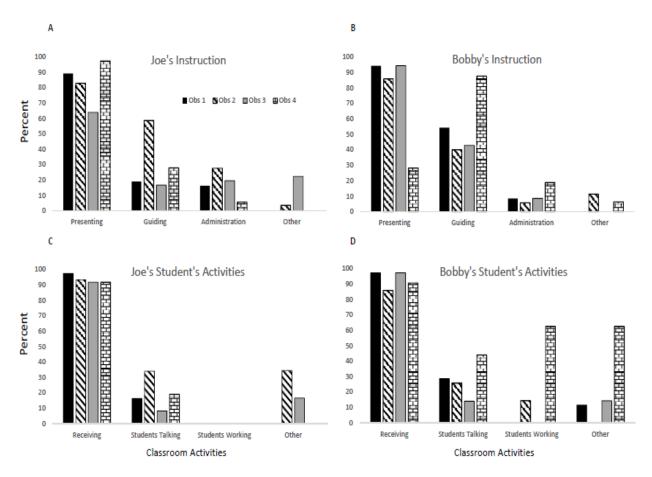
Classroom Observations: Mentoring-Learning Community led to change in teaching practice

The COPUS (Smith et al. 2013, 2014) was utilized to evaluate in-class teaching as the adjunct faculty members participated in the MLC. Several trends were observed from the analyzed data (Figure 1). First, Joe and Bobby presented information in the form of lecturing during most of their class time (Figure 1 A and B), and they were observed consistently throughout the MLC using this teaching method. A difference was noted in the final observation of Bobby's classroom, where a notable decrease in the amount of time presenting was observed by the research team. In that observation, Bobby shifted his presenting to guiding (Figure 1 B) with the incorporation of clicker response questions. By implementing this one activity, Bobby doubled the amount of guiding he typically used during a class period and presented one third as much (Figure 1 B). Using clicker questions also engaged his students, who spent much of the class time working and talking twice as much as a typical class period (Figure 1 D).

Second, guiding was mostly observed as posing questions to the students (Figure 1 A and B), commonly in the form of verbal questions. These questions may or may not stimulate the same student response as clicker or discussion questions, which are also commonly grouped under the guiding category. The data suggests that Bobby guided his students for 40% of his class time by asking questions, whereas Joe averaged only 20%. Although Joe increased his use of guiding to 60% in Observation 2, Bobby increased guiding to 90% with the incorporation of clicker questions in Observation 4. Both increases were after formative assessment discussions in the MLC. Joe's implementation was different than Bobby's, as Joe was observed verbally asking students more questions, and Bobby was observed integrating clicker questions throughout his class. Both adjunct faculty members included the use of more questions, however, resulting in a 40-50% increase in the guiding of students in class, which also corresponded to an increase in their students talking (Figure 1 C and D).

Finally, the increased "other" category (Figure 1 C and D) was commonly observed as students communicating amongst themselves in response to instructor questions or regarding the clicker questions in Observation 4 (Figure 1 D). This observed increase in peer communication is also reflected as an increase in the student talking category. Both Bobby's and Joe's students responded with increased talking when their instructors utilized more guiding teaching styles.

Overall, the COPUS data revealed that instructors began transforming a portion of their teaching during their participation in the MLC. Joe's second observation revealed an increased posing questions to students, and Bobby included a clicker response activity at the end of the semester. The COPUS data showed slight shifts in teaching practices when Bobby and Joe implemented these formative in-class assessments. However, no consistent trends emerged in implementation, indicating that the adjuncts were progressing toward instructional transformation in the classroom.

Figure 1. Percent of a class period that instructors (A and B) and their students (C and D) performed given activities. COPUS (Smith et al. 2013, 2014) was used to systematically record activities during two-minute time intervals throughout a class period and made four observations (Obs 1-4) that spanned the fall 2018 semester at a Southeastern U.S. university whose focus is on teaching undergraduates.

DISCUSSION

This study was guided by the research question, "What impact does a Mentoring-Learning Community have on science adjuncts' views of teaching and their classroom practices?" Through semi-structured interviews and COPUS data, we sought to gain a deeper understanding of how adjunct faculty learn and transform their teaching views and practices while participating in a Mentoring-Learning Community.

When viewing our findings through the Transformative Learning Theory framework (Mezirow 1978), three important ideas emerged that followed the psychological (learning new information), convictional (shifting beliefs), and behavioral (transformative action takes place) process. First, the MLC provided a community for adjunct faculty to collaborate. Participants in the MLC had an opportunity to have a rich engagement among a diverse group of learners with various teaching experiences (Meizrow 1995), which has been known to support transformative learning. The MLC design brought tenured, tenure-track, and adjunct faculty together for two PDP elements, mentoring and a learning community. Adjunct faculty found the collaboration with other faculty beneficial to their learning of new instructional strategies as expressed in the

interviews. By creating a learning environment in which adjunct faculty can learn and share information around teaching, the MLC afforded these adjunct faculty an opportunity to learn, grow professionally, and transform through all three of Meizrow's dimensions (Table III). Other studies have also suggested that participating in a like-minded learning group encourages faculty to try new things (Furco and Moely 2012; Bragg et al. 2022). In the MLC, both participants expressed a reframing of their views on teaching and an increase in their confidence to teach in a new way as a direct result of the MLC program. This reframing was noted in the interview data by both Bobby and Joe (Table III) and in the COPUS data, as Bobby attempted a new strategy in the fourth COPUS observation (Figure 1 B).

Table III. Transformation during the Mentoring-Learning Community (MLC) process. This table represents our two adjunct instructors as they move through Meizrow's transformative dimensions during their participation in the MLC. Both participants started with a desire to learn and ended further on the continuum at varying stages of transformation (implementation). One showed a more developed transformation as his implementation was more planned and reflected on during his interview. This could be due to him being more ready for transformation at the start of the MLC.

Meizrow's Dimensions	Views of thinking	Modes of action	Evidence of views/action
Psychological (learning new information)	-want to learn -want to improve -gaining ideas	-attends PDP -reads literature related to education	Pre-interview 2/2 participants
Convictional (shifting beliefs)	-changed thoughts on using them in class -gained faster knowledge -recognizing change can happen	-reflects on teaching practices -observes other instructors -has mentor observe and provide feedback	Post-interview 2/2 participants
Behavioral (transformative action takes place)	-planning for a new strategy -implementation of a new skill -increased ability to teach	-shifts from presenting to guiding students in their learning	COPUS Observation 4 and post-interview 1/2 participants

Second, data revealed that the adjunct faculty began to reframe their views of teaching regarding the use of active learning strategies. Participants each began the MLC wanting to learn and improve their teaching (TLT psychological dimension), as noted in both interviews and in the act of volunteering to participate. The interview findings reveal that improving teaching was a clear motivator for adjunct faculty participation, which suggests that they had a desire to try something new or had a readiness for learning new approaches. In the convictional dimension of the TLT, learners begin to grapple with their previous views of learning as they engage with new teaching strategies. For example, Bobby became more confident that new approaches could help improve his teaching and the learning of the students. At the end of the MLC, Bobby attempted to implement one of the new strategies (TLT behavioral dimension).

Finally, in the course of one semester, adjunct faculty participants began to implement behavioral actions leading to a transformation of their teaching practice during the MLC. This finding is consistent with previous findings suggesting the transfer of learning into action takes time to implement and observe (Gess-Newsome et al. 2003), often one year or more (Bragg et al. 2022). For example, COPUS observations during the second and third year of Wheeler's (2021) PDP showed it was common for faculty at that point of the program to start transitioning to student-centered teaching but not fully change their teaching practices; using clicker questions was considered transitional (Wheeler 2021) and matches behavioral changes we observed during one semester of our MLC PDP. Although participants in our study showed some progress in transformation, the transformations were inconsistent. Mezirow (1997) showed that transformation is unique to the individual. Not all faculty will transform in the same way or at the same speed. While transformation began to occur during our study, it was observed differently in both adjunct faculty participants. Toward the end of the one semester MLC program, both participants attempted a new teaching strategy, revealing that transformation takes time and is unique to the individual.

This study provides insights for university administrators as they consider ways to engage adjunct faculty in PDPs. In the sciences, these findings help to shed light on ways adjunct faculty can learn about science teaching practices from the calls for reformed instruction (AAAS 2011). The most recent report from the *Vision and Change* group acknowledges adjunct faculty as a stakeholder in biology education reform (AAAS 2018). As such, this study provides insight as to how science adjunct faculty can improve and transform while participating in a PDP and provides a framework for implementing adjunct faculty support programs in higher education.

This study builds on what is known about adjunct faculty transformation of teaching practices. Previous reports suggest that faculty members who participated in a learning community were able to adopt new teaching strategies and transform their teaching (Bragg et al. 2022; Elliott et al. 2016; Wheeler 2021); our study, specifically on biology adjunct faculty learning, adds another example, which is supported by qualitative and quantitative measures and provides deeper insight into faculty views and actions. Because transformation takes time, understanding the reflection and thought process is valuable when actions are not readily seen. Many studies measure transformation using quantitative measurements such as classroom observations (Bragg et al. 2022; Elliot et al. 2016; Furco and Moley 2012; Smith et al. 2014; Wheeler 2021). Measuring qualitative gains such as views of thinking provides another potential way to monitor the progress of transformation. Utilizing qualitative feedback from participants of a PDP program may

provide greater insight as to the design, duration, and benefits gained from participation that may not be reflected in quantitative measures such as classroom observations.

Utilizing the TLT to develop indicators, this study evaluated where faculty were in the transformation process as expressed by their views and actions (Table III). Developing and monitoring indicators to use as a guide for evaluating the transformation process during a PDP could help researchers and faculty evaluate their progress toward transformation. A transformation indicator checklist could also inform administrators in higher education of a PDP's potential impact in spite of all participants not reaching behavioral transformation. As adjunct faculty are usually a temporary part of a university, a transformation checklist could be a valuable way to see the influence a PDP has on adjunct faculty in a short amount of time. Since the transformation process takes time, learning where faculty are is one way to measure the outcome of a PDP, as opposed to measuring only the ending behavioral transformation.

Limitations and Future Work

As with any research study, our study was not without limitations. Our institution had only two participating adjunct faculty, which is a small sample size, and was implemented over just one semester. Although an exploratory study, our data suggests that the MLC design had an impact on the views of the participating adjunct faculty, which led to changes in their practices. Additionally, the data from this study provided some insights into the instructional learning of adjuncts, such as appreciating collaboration and feedback from mentors, that should be beneficial for not only biology but other disciplines as well.

For future research, comparing student success (e.g., earning a C or higher) before and after the PDP (Bragg et al. 2022) would help determine MLC effectiveness and provide insight about modifying the PDP. Sharing classroom observation results with the participants (Bragg et al. 2022) may inspire faculty to continue implementing student-centered and active learning teaching practices in the classroom. Examining how transformation continues post-MLC would also be helpful. Post-MLC data would further inform decisions regarding the impact PDP has for adjunct faculty teaching practices and provide insights to higher education administration on the importance of ensuring all faculty have access to PDP regarding teaching practices. The Mentoring-Learning Community PDP provides a framework for understanding how to better support adjunct faculty and help participants learn "it can be done!" (Joe).

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