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Learning communities promote pedagogical metacognition in higher education faculty

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Abstract

Pedagogical metacognition, or the reflective and reflexive actions associated with teaching practice, strengthens the planning, monitoring, evaluation, and adjustment of teaching in higher education faculty. Learning communities are optimal environments to foster this active teaching reflection. This study incorporated pedagogical metacognition into a faculty learning community curriculum and explored its impacts on higher education instructors' reflective and reflexive practices. Faculty participants completed monthly metacognitive reflections for one academic year, each corresponding to a research-based principle of learning. Qualitative analysis indicated that faculty learning community participants recognized their lack of pedagogical training, successfully reflected on their teaching strategies, identified areas for improvement, and set goals to incorporate research-based strategies into their instruction. To maximize student learning, pedagogical metacognition should be included in higher education professional development to encourage reflection on and action upon one's teaching.

Keywords: Pedagogical metacognition, higher education, learning communities, faculty, professional development

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Pedagogical metacognition, or reflective and reflexive action associated with teaching practice, is pivotal to the planning, monitoring, and adjustment of teaching in higher education. The instruction of higher educators who employ pedagogical metacognition can improve, though this reflection is not always an explicit component of pedagogical training (Moncrieff & Coria-Navia, 2018). Professional development settings such as learning communities (LCs) are environments in which reflective and reflexive practices can be stimulated (Tocco et al., 2021). In this article, we argue that participation in an LC focused on promoting pedagogical metacognition influences faculty to plan, monitor, and adjust their teaching using research-based principles of learning to maximize student achievement.

Metacognition involves planning, monitoring, and adjusting thought processes (Flavell, 1979) and has been widely researched among K–12 and higher education students. Higher metacognitive skills are related to increased academic achievement (Vrugt & Oort, 2008) in part because learners who possess more sophisticated metacognitive skills can more efficiently adjust their learning strategies (Ross et al., 2006). Promoting metacognitive strategies in the classroom leads to increased depth of cognitive processing (Ross et al., 2006), deeper awareness of thinking and reasoning errors (Poorman & Mastorovich, 2016), and increased self-efficacy (Cera et al., 2013). Higham and Gerrard (2005) found that teaching metacognitive skills to students and providing opportunities for practicing them encourages students to adopt these skills and results in more effective learners. Classroom tools such as metacognitive study guides (Agarwal & Bain, 2019) and metacognitive journals (Kuiper, 2004) are powerful strategies to help students engage in the processes of planning, monitoring, and adjusting their learning.

Since promoting metacognition leads to increased learning outcomes, it is imperative that educators teach their students how to think about their own thinking and encourage the use of metacognitive practices. Key factors in promoting students' metacognition are

understanding metacognitive processes and reflecting on one's teaching. This reflective and reflexive practice (Ryan, 2015) in relation to one's teaching is also called pedagogical metacognition (Kramarski & Kohen, 2017) and includes planning, monitoring, and adjusting teaching (Tocco et al., 2021). Within pedagogical metacognition, reflective thought about instruction is followed by deliberate action. Ryan (2015) argues that critical reflection is achieved only when one is reflective and acts on those reflections to affect change in teaching methods and resultant student learning. Therefore, it is necessary for higher education instructors to understand the difference between reflective and reflexive practice and how they can infuse their instruction with pedagogical metacognition.

Kohen and Kramarski's (2018) pedagogical metacognition framework was developed for preservice math instructors and includes three parts: (1) cognition/metacognition strategies and considerations, (2) teaching instruction strategies and engagement activities, and (3) strategies for teaching in a web-based learning environment. In this model, each component involves the teachers planning, monitoring, and adjusting their teaching practices. Kramarski and Kohen's (2017) research in this area in K–12 teacher training shows that promoting planning, monitoring, and adjusting teaching increases teachers' use of these metacognitive strategies on their own. Furthermore, teachers are more likely to incorporate explicit research-based instructional strategies to promote student knowledge construction, stimulate interest, and increase motivation and engagement after exposure to this metacognitive framework. Because engaging in pedagogical metacognition is an important activity for effective teaching in K–12, it is likely also important in higher education, though little research has explicitly explored this construct in higher education teaching professionals.

Although formalized practice of pedagogical metacognition is relatively new, it is important to acknowledge findings of those who paved the way for understanding reflective and metacognitive practices in higher education. For instance, Beeler et al. (1985) describe

the reflective teaching (RT) framework, including the sequential steps of advanced planning, design and management of a learning group, and assessment of teaching outcomes, all of which foster reduced teaching anxiety and increased teaching reflection. Although this research focused on promoting reflective practices among student discussion leaders, the ideas could be, and have been, used in faculty development. To this end, Brookfield (2002) argues that group critical teaching reflection is essential to community college instructors' professional competence. Furthermore, promoting the notion of reflection-in-action through reflective teaching journals, contemplative practice, and monthly meetings emphasizes how new insight gained from reflection can be integrated back into the classroom (Norton et al., 2011). Research suggests the instruction of higher educators who employ reflective and reflexive practices can improve, though this reflection is not always formalized (Moncrieff & Coria-Navia, 2018), nor is it common to undergo formalized training in practicing pedagogy using reflective and reflexive practices.

Because most higher education teachers have not received explicit training in pedagogy, they likely are unaware of specific personal and environmental factors (e.g., teaching self-efficacy, pedagogical content knowledge, assessment-driven instruction) that influence teaching and learning effectiveness. However, developing faculty in these constructs and how they impact teaching and learning can positively impact teaching-related attitudes and behaviors such as teaching self-efficacy, self-concept, pedagogical content knowledge, conceptions of teaching and learning, teacher identity, and student-centered learning strategies (Fabriz et al., 2021; Favre et al., 2021; Postareff et al., 2008; Postareff & Nevgi, 2015).

LCs are ideal environments to encourage pedagogical metacognition, as they promote reflection on and action upon one's teaching (Tocco et al., 2021). LCs are groups of individuals brought together to pursue shared learning goals (Brower et al., 2007), and when the community is composed of educators, the long-term goals are

increased pedagogical knowledge of the complexity, design, and assessment of teaching and learning (Cox, 2001). Research on LCs in both K–12 and higher education shows a benefit of participation to teachers' pedagogy through their pedagogical content knowledge in Universal Design for Learning (Ward & Selvester, 2012) and effective use of technology as a pedagogical tool (Engin & Atkinson, 2015), for instance. LC participants report enjoying the sense of community (Alzayed & Alabdulkareem, 2021; Meyer, 2002) and opportunity for discussion (Ward & Selvester, 2012) that are incorporated in LCs, providing the environment for a community of teacher-scholars. LCs have clear benefits to pedagogical practice, but little research has studied the impact of incorporating pedagogical metacognition into LCs and its subsequent impacts on teaching.

Tocco et al. (2021) recently explained the benefits of promoting pedagogical metacognition in a pilot of a university-wide LC program. The learning outcomes of the LC included building community with other instructors, learning research-based instructional strategies to improve student learning and enhance pedagogy, and engaging in reflective and reflexive practice. Results of their work demonstrate that LCs are environments in which planning, monitoring, and adjusting teaching can be fostered. The current article reports on a follow-up study of pedagogical metacognition in higher education LCs. We argue that promoting pedagogical metacognition through reflective and reflexive practices influences faculty to adjust their teaching using research-based principles of learning to maximize student learning outcomes. The research questions that guided this project were as follows:

Research Question 1: How does LC membership influence faculty members' knowledge of teaching and learning?

Research Question 2: How does encouraging pedagogical metacognition in an LC influence faculty participants' reflective and reflexive practice?

Methods

Participants

All members of one cohort ($n = 27$) of a yearlong LC were invited to participate in this research. Participation in the research was not a requirement of participation in the LC. Thirteen participants in total, including tenured/tenure-track faculty ($n = 11$) and lecturers ($n = 2$), completed the majority of the research materials and were included in subsequent analyses. Most study participants were white women ($n = 11$), one identified as a white man, and one identified as an Asian woman. Participants' previous teaching experience in higher education ranged from 3.5 years to 25 years. The academic disciplines represented were varied and included health sciences, education, humanities, natural and physical sciences, languages, and performing arts.

Materials and Procedure

This study was conducted by staff members of a center for the enhancement of teaching and learning (CETL), including a doctoral field experience student, the coordinator of faculty development, and the CETL director. The LC was developed by the coordinator of faculty development and the CETL director using principles of effective curriculum design, educational psychology, and research on successful LC programs. The LC was facilitated by a faculty member who had previously participated in the program and had consequently received a year of training in learning theory. During facilitator training, the LC facilitator met with CETL staff to review and master the curriculum, plan meeting agendas, create thought-provoking questions to ask participants, and organize program logistics. This training took place during the spring and summer semesters prior to the start of the LC.

General announcements and communications directed to department chairs were sent to recruit participants to an annual cohort of LC members. The cohort was open to any instructor (part- or full-time) who

was the instructor of record for at least one course at the university that semester. Interested individuals were provided an **interest survey** link asking an open-ended question about their reason for participation in the LC, including what they hoped to gain from participation. Only data from participants who later completed informed consent were used in subsequent analyses. Everyone who completed the interest survey and was available during the meeting times was sent a presurvey that included informed consent and qualitative items. The qualitative items were two open-ended questions on **knowledge of teaching and learning**, specifically (1) the members' perspectives on effective student learning and (2) how their pedagogy is influenced by their perspectives of learning.

Members then participated in the LC, which focused monthly on one of the seven principles of student learning and effective teaching from Ambrose et al. (2010). The seven principles of learning are (1) students' prior knowledge can help or hinder learning; (2) how students organize knowledge influences how they learn and apply what they know; (3) students' motivation determines, directs, and sustains what they do to learn; (4) to develop mastery, students must acquire component skills, practice integrating them, and know when to apply them; (5) goal-directed practice coupled with targeted feedback enhances the quality of students' learning; (6) students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning; and (7) to become self-directed learners, students must learn to monitor and adjust their approaches to learning (Ambrose et al., 2010).

The framework of the LC used the Think-Pair-Share method (Lyman, 1981) with members reading one chapter from Ambrose et al. (2010) each month and completing **pedagogical metacognition prompts**. These prompts were designed to facilitate planning, monitoring, and adjustment of LC members' teaching strategies in relation to each month's topic, such as, What are some ways that you already help your students organize their knowledge in your course(s)? What are some ways that you could better assist your students with organizing their knowledge? Members completed these prompts as the Think activity (Appendix A), answered guided questions with another LC member for

the Pair activity (Appendix B), and participated in a monthly 90-minute facilitated LC meeting that comprised the Share activity of whole group discussion around the month's topic.

At the conclusion of the LC, a postsurvey was distributed to all participants. The postsurvey was identical to the presurvey with the inclusion of questions for program evaluation and improvement purposes (e.g., program satisfaction). The structure of the learning community is represented in Figure 1.

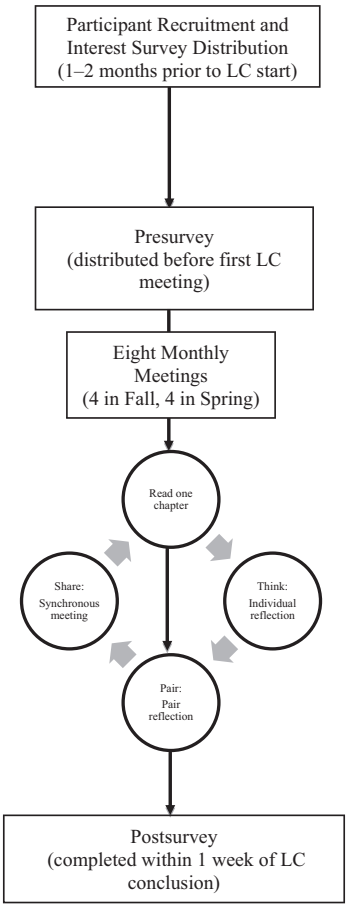

Figure 1. Diagram of Learning Community Structure

Note. The eight monthly meetings each followed the same cycle depicted in the figure.

Analysis

An in-depth thematic analysis was conducted to reduce data from the LC interest survey, pre- and postsurvey knowledge of teaching responses, and individual metacognitive reflections into codes. Open coding was used to identify broad categories in the data from all sources by reading and rereading the data and organizing it into groups that shared commonalities. Using Microsoft Word, groups were arranged in a table and quotations that represented each group were entered into corresponding columns of the table. Then, axial coding was used to narrow these groups into codes by highlighting each code with a different color (Creswell & Poth, 2018; Merriam & Tisdell, 2016). To promote interrater reliability and validity within the analysis, three of the researchers worked together to identify codes. Each researcher coded the data individually. Then the researchers met to discuss their codes. Any codes that did not match were discussed until researchers came to an agreement.

The following results include themes organized by research question and detail our findings regarding the influence of this LC on faculty knowledge of teaching and learning and their use of pedagogical metacognition. Findings from the pre- and postsurveys related to faculty members' knowledge of teaching and learning are discussed first. Next, three themes corresponding to the components of pedagogical metacognition (planning, monitoring, and adjusting teaching) are described and supported with quotations from individual reflections.

Results

Research Question 1

Impact on Knowledge of Teaching and Learning

Two questions were asked regarding participants' knowledge of teaching and learning before and after the LC program: (1) What

is your view about how students best learn key concepts in your discipline? and (2) How is your view about how students learn reflected in how you plan and teach your courses? Participant responses to the first question of the presurvey were detailed, mentioning research-based learning strategies and tools, including hands-on experience, application, scaffolding, lecture, Bloom's taxonomy, and constructivism. Open-ended answers to the postsurvey included many of the same learning techniques and did not demonstrate an increase in depth or specificity of teaching practices. Interestingly, the postsurvey responses did not explicitly reference any of the principles of learning discussed during the LC.

When asked how faculty plan and teach their courses, presurvey responses were extensive and each LC participant described their own approach to teaching. Many of the teaching practices discussed were connected to how faculty believed students learn. For example, LC participants who mentioned that students learn best through active hands-on experience and application included case studies and real-world examples as key components in their course materials. A theme running through many of the Question 2 responses was that faculty like to provide a variety of options for students to learn and demonstrate their learning, such as podcasts, videos, articles, textbooks, classroom response systems, discussions, online learning components, and case studies. Postsurvey responses were similar to presurvey answers. Additionally, there was no explicit mention of research-based principles of learning or teaching strategies discussed during the LC. Participants did not demonstrate noticeable growth in knowledge of teaching and learning after the LC. Overall, analyses of pre- and postsurvey knowledge of teaching and learning questions did not illustrate differences in depth of knowledge, although faculty displayed a variety of approaches to teaching and several research-based teaching strategies.

Research Question 2

Planning Teaching

The first component of pedagogical metacognition is planning. Planning teaching was evident in many participants' hopes for the learning community and is illustrated through their desire to gain more knowledge of research-based teaching practices. Due to the shift to remote and hybrid format during the COVID-19 pandemic, faculty members expressed the need to learn more about online teaching and learning. One instructor mentioned, "I hope to learn how others are teaching during this pandemic and apply this information directly to my teaching." The global pandemic brought with it the challenge of teaching online, a task that many faculty had limited experience with. Another faculty member was appreciative of the opportunity to participate in the LC for a similar reason, stating:

> I am thankful for the timing of this offering as I have had to move my courses completely online, something very new to me. As this course has a lab component and is one of the more difficult courses in our curriculum, I want to provide the best experience for my students.

Faculty participants cared deeply about their students' learning and viewed the LC as an avenue to help them plan and restructure their courses to online and hybrid formats. Some faculty members hoped the LC would provide them with new tools and strategies to assist in the planning of their instruction in a changing higher education landscape. One participant was worried their teaching style was outdated and was interested in learning new teaching techniques to enhance it:

> As an older faculty member of the [university] teaching community, I am looking for discussions of pedagogy—best practices, engagement,

> the shifting landscape of higher education in general. I have been passionate about education for about as long as I can remember and I come from a long line [of] teachers. I know that many of us (myself included at times) teach the way we were taught, and my questions center on—is that still the best way? Are there better, more engaging ways?

This faculty member identified as someone who had been teaching for quite a few years, using the same strategies that were used when they were in college. By joining the LC, they were interested in finding new, engaging research-based teaching strategies to fit the evolving demands of teaching in higher education.

Another reason faculty chose to join the LC was to increase their knowledge of teaching and learning processes. One faculty member wanted to be better educated in student learning processes to make sure students could be successful in her class, saying, "It is critical to have knowledge about the learning process to ensure the types of activities, assignments, exams, etc. I give align with the science of learning so students are set up to be successful in my classroom." This instructor realized the importance of understanding how learning works and joined the LC to increase her knowledge of the learning process.

Some LC members expressed the desire to hear various perspectives on teaching strategies from faculty across the university. One said, "I . . . would also like to learn with a community of faculty with various backgrounds and specialties." Another faculty member shared this feeling of community learning by saying:

> I am interested in the Faculty LC because learning is a social activity and learning can be enhanced through learning with others. One of the aspects of the LC I desire is the opportunity to collaborate with other faculty across the university and to learn more about how teaching and learning at the college-level compares to my experiences [teaching] in K–12 education.

These educators felt that learning about teaching and learning was best achieved through discussions with others and looked forward to engaging in collaborations with multiple interdisciplinary perspectives to help them better plan their instruction. The desire to increase their knowledge of student learning and research-based teaching strategies is strong evidence of planning—the first step in pedagogical metacognition.

Monitoring Teaching

The second step of successful reflective and reflexive practice is monitoring teaching. LC members monitored their teaching by recognizing their weaknesses in teaching, noting changes in the landscape of higher education, reflecting on teaching strategies they had previously used, and asking questions about the quality of their pedagogical training.

Participation in the LC helped instructors identify their own target areas for improvement in teaching and in understanding the needs of their students. Many instructors reflected on their own perception of their teaching in comparison to student performance and understanding. Two instructors described a disconnect between their expectations of students and student performance:

> Despite being (what I consider) very explicit in how things connect, and that what we're learning now will be applied to the next assignment, I don't see students transferring that knowledge as much as I want them to. They're missing the connections, or I'm failing to give them.

> I think that sometimes I underestimate how much time it will take the students to learn and be able to perform a skill and judge how many times it will take for them to practice the skill before they can know when to apply it.

By monitoring their teaching and students' learning, these instructors noticed a gap between their expectations and what their students were

able to achieve. The first instructor described their students not being able to transfer knowledge between topics and reflected on their own influence in the learning process. The next instructor was able to reflect on their expectations of the time it takes for students to learn and apply a skill. Both instructors were able to recognize specific weaknesses in their teaching through the pedagogical metacognitive skills. One instructor reflected on her weaknesses in understanding the learning process:

> I have routinely used strategies to support students in accessing prior knowledge, but I haven't thought much about the ways that prior knowledge hinders learning. I think I have not spent enough time understanding some of the misconceptions that students have.

This instructor found a new perspective on how students' prior knowledge of leadership could hinder their current learning. Monitoring is demonstrated through this instructor's recognition of weaknesses in her teaching and knowledge of the learning process.

In addition to recognizing weaknesses in their teaching, some educators identified how the landscape of higher education is evolving and the implications of these changes for their teaching. One faculty member viewed the LC as a way to make their classroom more inclusive, saying, "We are now faced with the challenge of teaching a greater diversity of students as compared to previous decades. I want to learn teaching strategies that can help these students learn." Another instructor mentioned needing fresh perspectives on how to teach the incoming generations of students, explaining:

> I have found that during the last 5 years or so, I've struggled a bit with connecting with Generation Z/iGeneration students. I'm not sure how to motivate these students; these are not the students I had 10 years ago. I need new approaches and ideas from others.

These LC participants understood that they lacked knowledge and experience with diversity, a topic that has come to the forefront of

education recently, and they joined the LC to learn strategies to make their teaching more equitable.

Perhaps the most poignant demonstration of monitoring instruction was illustrated through faculty acknowledging their lack of training in teaching. One faculty member discussed their experience in a teaching workshop and mentioned their realization that, although they were currently teaching, they had not received formal training in education. They stated, "[The workshop] made me realize that even though I am a professor, I have not had much training in education and would love more training on learning theory for student success." They hoped the LC would provide them with the requisite training in teaching and learning that would help improve their students' learning. Another faculty member described their experiences in graduate school, characterized by a lack of pedagogical training:

> Although I earned my PhD and have had a variety of teaching opportunities since then (including some teaching assistant/graduate assistant roles during my degree preparation), I found that like many other terminal degree programs, the emphasis was not on actual teaching-learning skill development. I believe that I will benefit from the LC because I have come to humbly recognize that although I am clinically proficient and well-grounded in various research methodologies, what benefits my students the most is an instructor who also excels in the learning environment.

Another professor acknowledged their prior knowledge of learning theory but lack of expertise incorporating learning theories into their instruction: "While I did have some coursework in educational learning theory in my doctoral program, I would like to learn more about how to apply these theories more effectively in my teaching."

The LC may have assisted these instructors in monitoring their educational training by exposing them to new research-based teaching strategies and helping them realize that they did not receive enough pedagogical training during their graduate and early career years. It

is evident they hoped the LC would provide them with the necessary skills to effectively facilitate student learning as well as supplementing the minimal instructional training they had received.

In addition to monitoring teaching, some LC participants demonstrated evidence of monitoring their own (or lack of) metacognitive skills, specifically when discussing the research-based learning principles around self-directed learning. One of the metacognitive reflection prompts asked LC members to think about how they gained their metacognitive skills. A faculty member responded:

> I have no idea how I gained these skills; this is perhaps a "blind spot" referred to in previous chapters we have discussed in the LC. . . . In regards to the first step of metacognition, assessment, my instinct as a student was to assume that the instructor was both an expert and is giving me explicit instructions for a reason, so I tried not to make assumptions about the task. This is a level of deference that I feel is sometimes missing among my own students, but it may also be related to not knowing how to assess and not being given opportunities to practice this skill, which are areas I can address as an instructor.

In thinking about how this instructor gained the skills necessary for metacognition, they realized that they did not have any explicit training in the use of these cognitive processes during their education. This led to reflection on their students' learning processes and how they might address the various components of metacognition in the classroom to help their students assess learning tasks more effectively. This LC member's thoughts about teaching and monitoring of their own metacognition is a strong example of pedagogical metacognition.

Another LC member recognized their efforts to promote metacognition in their students but noted that their pedagogical metacognition was lacking, saying, "I make an effort to encourage my students to think about their thinking and studying process, but I am less sure that I think about my own thinking." It became apparent to this instructor that they did not have an awareness of how they think about their own

teaching, or how to plan, monitor, and adjust their teaching strategies. Their point offers evidence of the effectiveness of the LC in promoting active reflection on teaching and recognizes the lack of metacognitive training that educators receive.

It was clear the LC was beneficial to higher educators' teaching, as evidenced by a LC member's thoughts on a required reading: "I'm not sure how to instill good metacognitive practices in my students and I really appreciate this chapter for that reason." This faculty member acknowledged their lack of expertise in promoting metacognition in the classroom and appreciated the LC meeting and corresponding chapter for providing direction in this area. It was evident that reflection on one's teaching, as promoted by the LC, encouraged participants to think deeply about their current pedagogy and make changes to their instruction.

Adjusting Teaching

Adjusting teaching is the key to effective reflective and reflexive practice. LC participants engaged in planning and monitoring through their reflections on their own teaching and pedagogical training. This reflection was extended to reflexive practice when faculty suggested adjustments to their teaching as a result of LC readings and discussions.

LC participants brought attention to their lack of training in metacognition while they monitored their teaching. Furthermore, findings suggest that the LC was effective in promoting pedagogical metacognition through structuring instructors' reflexive practices. In a response to a metacognitive reflection, one LC member described their thoughts on helping students become self-directed learners by making specific changes:

> I also want to reflect and learn more about what it means to help students become self- directed learners. We discuss the idea of life-long learning but I get frustrated when students finish our program and are not transferring the skills learned throughout the program into their

> comprehensive exams. I wonder how increasing strategies to support students monitoring and adjusting their own approaches to learning could support them improving their effectiveness as learners.

This instructor reflected on their students' self-directed learning and the challenges that come along with promoting transfer of learning to outside contexts. Using pedagogical metacognition, they suggested an adjustment to their teaching to improve their students' learning. This reflection on teaching and subsequent action to promote student learning is a robust example of reflective and reflexive practice.

Another faculty member similarly engaged in reflective and reflexive practice through a comparison of their discipline to metacognition:

> I knew a fair amount about metacognition prior to reading this chapter, but not a lot because I don't come from a psych, neuro, or education background. I come from the health sciences. . . . We teach (and I practiced) the discipline process which entails assessment, diagnosis, planning, implementation, and evaluation. I can see significant similarities between the discipline process and metacognition, but I have not seen the terms used interchangeably before, which is interesting to note. The major difference is that we ask our students to apply this cognitive process to the discipline practice but not to their own learning. This makes me think that perhaps we should do just that—if they were more in tune with their own learning needs, perhaps they would be better clinicians down the road.

This excerpt demonstrates an LC member's reflection about teaching the process of their discipline (assessment, diagnosis, planning, implementation, and evaluation) and how it closely parallels the process of metacognition (planning, monitoring, evaluating, and adjusting). Reflecting on the readings and participating in the LC activities allowed this instructor to compare the two learning strategies and observe that their students are not actually applying the process to their learning. After reflecting, the LC member proposed that teaching their students

to think about their own learning needs might help them become better practitioners and students. Adjusting teaching is evident in this LC member's notes.

Through reflection on their own teaching styles, instructors were able to consider improvements based on the information they learned in the LC. One instructor explained the importance of metacognition and how they would like to incorporate it:

> Based on the readings, the one thing I want to focus on is metacognition. In several assignments, we have students reflect on the content of the assignment by asking what did you learn or how are you thinking about this topic differently. Rarely have I asked, what did you learn about learning or what worked to support your learning or what will you remember and do for next time. I want to add this into a few assignments.

This instructor realized how student metacognition could improve the learning process and by using reflective and reflexive practice to analyze their own teaching. They understood how they could have students engage in the same process.

Two instructor responses showed a theme of using reflective and reflexive practice in considering the content and type of engagement with students:

> The 7th principle I haven't thought about much, though I do a bit of "how to learn" in the beginning of the semester, I don't do check-ins with students. I think this semester especially since most of us are online I will do a discussion board after the first exams so students can share what works or doesn't work with learning. I find that asking them to be collaborative and helpful to each other is often good motivation to engage.

> After reading the chapters, I see many different ways that I can change things to improve learning. The example of the syllabus wording is

> one—I can change how I bold things and have a more encouraging tone. I think there are definitely places that I can emphasize the meaning of the material more so that the students can add value to the knowledge. I am terrible at names and tell the students this so I do not make an effort to know the students' names. I need to find a way that works for me to learn the names of my students.

These instructors reflected on how their engagement with students could improve through checking in with students and creating a more welcoming environment. The last instructor engaged in reflective and reflexive process by realizing specific ways to connect with their students to make their students feel valued and appreciated with encouraging tones in the syllabus and learning every student's name. These responses show the importance of the reflexive process and brainstorming ways to incorporate what they have learned in the LC into their teaching.

Another instructor explored how adding scaffolding assignments into their teaching could be helpful but can result in more assignments, concluding that "I would like to explore more examples of how to do this effectively with different objectives and assessments in my classes." By understanding that they haven't incorporated scaffolding assignments because it creates more assignments, this instructor concluded that they could plan ways to personalize this strategy to fit with their own teaching style. Overall, the LC encouraged reflective and reflexive practices by having instructors learn about effective teaching strategies, student engagement, and finding specific ways to integrate the strategies to improve their own teaching.

Discussion

The qualitative data analyzed across the interest survey, pre- and post-survey knowledge of teaching and learning, and metacognitive reflections provide substantial evidence that the LC program was effective

in promoting pedagogical metacognition and encouraging instructors' reflective and reflexive practice. This learning was demonstrated mainly through LC participants' independent reflections, which were written to elicit components of pedagogical metacognition (planning, monitoring, and adjusting teaching) (Appendix A). Meeting discussions likely influenced how participants expressed their learning when reflecting. Pedagogical metacognition is key to faculty reflecting on and changing their practice as it encourages them to critically reflect on their pedagogy and, using research-based strategies discussed in the LC, make changes to benefit student learning.

Previous faculty development literature posits that LCs can be influential in increasing knowledge of teaching and learning and change teachers' conceptions of teaching (Postareff & Nevgi, 2015). This study's pre- and postsurvey questions that asked about knowledge of teaching and learning were aimed at identifying these adaptations after a learning community intervention. In contrast to previous research (Favre et al., 2021; Postareff & Nevgi, 2015), LC participants in this study did not demonstrate noticeable increases in pedagogical content knowledge or knowledge of student learning processes. This limited growth could have occurred because of the length of the program (one academic year), frequency of meetings (monthly), or fatigue during the global pandemic. It is also possible that our questions about participants' knowledge of teaching and learning needed to explicitly target participants' use of principles of learning addressed in the LC. Although faculty did not demonstrate growth in knowledge of teaching and learning, they displayed evidence of growth in metacognition.

This study provides insight into why faculty would be interested in joining an LC and their hopes to improve planning instruction through LC readings, discussions, and reflections. One of the reasons participants in this LC program were interested is because they wanted to learn more about online teaching during the pandemic. Online and distance education is not new (Kentnor, 2015), but the sudden shift to completely remote learning during the COVID-19 pandemic influenced faculty to seek out different perspectives and new teaching

practices to provide the best learning experience for their students. Instructors also mentioned the shifting landscape of higher education in their reasons for participating. College students now are more proficient in the use of technology (McCoy, 2010), bring more diversity to the university environment (Pope et al., 2009), and positively view authentic learning experiences (Nicaise et al., 2000). LC participants acknowledge these trends in their students and wanted to learn how to accommodate these changes. Gaining multidisciplinary perspectives from educators across campus has been a benefit of LCs in the past (Cox, 2004), so it is not a surprise that faculty in this LC were searching for the same enrichment.

Discussing and evaluating teaching and learning with colleagues from other departments is beneficial to teaching and learning practices (O'Keefe et al., 2009). The last two reasons faculty expressed the desire to improve their pedagogical planning go hand in hand: having a desire to learn more about teaching and learning processes and acknowledging their lack of training in education. Historically, faculty at universities are heavily trained to be productive researchers and perceive their role as disseminators of knowledge (Altbach et al., 2009). Their pedagogical content knowledge is becoming increasingly important to effective teaching and student learning (Major & Palmer, 2002). LCs can bridge this gap by providing an environment for faculty to converse about teaching and learning and to foster new and innovative ideas to bring into the classroom. The motives that LC participants described for joining the LC can be used by faculty developers as they are planning professional development programming.

LC participants demonstrated pedagogical metacognition throughout the LC. Faculty explicitly described how they were planning, monitoring, and adjusting their teaching based on what was discussed in the LC. Some participants identified their lack of knowledge and training in metacognition and self-directed learning but acknowledged their desire to improve to benefit their students' learning. The majority of reflections exhibited retrospective thoughts on past and current pedagogy and future goals for incorporating research-based

teaching strategies into their courses—key features of reflective and reflexive practice.

Learning communities have previously been identified as environments that promote pedagogical metacognition and reflective and reflexive practice (Tocco et al., 2021). This study provides evidence of the capacity for LCs to encourage planning, monitoring, and adjustment of teaching through structured discussions and metacognitive reflections. As faculty progressed through this LC, they demonstrated frequent and detailed reflective and reflexive practice by reflecting on their teaching and suggesting ways to implement new research-based strategies into their courses.

Limitations and Future Directions

Participant attrition throughout the duration of the study limited the authors' ability to conduct statistically significant quantitative analyses of pre- and postsurveys. "Pair" data were also limited due to attrition of community members over the year and thus the reduced availability of partners. Additionally, a quantitative measure of pedagogical metacognition was left out of the presurvey. This resulted in no evidence of quantitative changes in pedagogical metacognition. In the future, the authors will include a measure of pedagogical metacognition in the pre- and post-measures in order to observe changes in reflective and reflexive practice of faculty participants. To motivate LC members to complete pre- and postsurveys, the authors are discussing ways to incentivize completion of the LC requirements. Also, this study revealed that participants did not explicitly mention any of the principles of learning discussed during the LC in their knowledge of teaching and learning responses. Although this finding was not explored in this study, the reasons for this result are an avenue for future research.

This study shed light on the impact of an LC on faculty members' metacognition. However, it did not explore the effect of instructor metacognition on student academic achievement or how instructors implemented the adjustments they proposed. The researchers plan

to continue these LC cohorts and encourage pedagogical metacognition in each of them. The next step is to study the effects of promoting pedagogical metacognition in LCs on student learning outcomes. This will be accomplished by designing and implementing a longitudinal, multimethod project that seeks to explore the effects of pedagogical faculty development through LCs emphasizing pedagogical metacognition on student and instructor outcomes. The project will include classroom observations and measures of teaching practices, pedagogical metacognition, teaching efficacy, student interest, and student performance before, during, and after the LC.

Conclusion

This study provides substantial evidence that an LC can encourage the use of pedagogical metacognition in higher education instructors. Through small and large group discussions, monthly meetings, and metacognitive reflections, participants of the LC planned, monitored, and adjusted their teaching strategies to improve student learning—hallmarks of reflective and reflexive practice. LC programs have the potential to stimulate and increase the prevalence of pedagogical metacognition, in turn enhancing the effectiveness of higher education instruction.

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Appendix A

Individual Metacognition Reflection Prompt Example

After having read the Introduction, consider the following questions (and any others that come to mind for you):

- Which of the 7 Principles of Learning do you recognize?
- Which principles have been explicitly addressed in your courses? How did you address them?
- Which principles are new to you?
- Which principles are familiar, but perhaps you recognize that they can be addressed more effectively in your courses?

Appendix B

Example of Pair Reflection

After you've completed the Think assignment for this month's activities, arrange to meet with your faculty learning community (FLC) partner. You can meet virtually or in person. Together, discuss the following questions:

1. Compare and contrast your responses to the question about how experts and novices organize knowledge, especially regarding the implications to learning. Do you agree with your FLC partner on everything? If not, what are the areas where you have disagreements?
2. Does the type of knowledge or what you're trying to do with it matter?
3. What are some of the similarities and differences in how you help students organize their knowledge? Do you have similar ideas for how you could do more?