Innovating Teaching Practice Through Professional Learning Communities: Determining Knowledge Sharing and Program Value

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Abstract

The Professional Learning Community (PLC) model has been used to help faculty develop innovative teaching practices and diffuse effective strategies and resources throughout K-12 schools. Yet, whether and how PLCs influence research-focused higher education institutions remain unknown. Drawing on existing research on PLCs and the social network theory, this mixed-methods study investigated how participants shared what they learned during their time in the program to build greater capacity and the perceived benefits and weaknesses of the PLC model. We conducted semi-structured interviews ($n = 8$) and a survey ($n = 77$) among current PLC fellows and alumni at a large research university. The results based on social network analysis showed that PLC fellows shared knowledge and resources across departments and offices at the university, and these efforts led to additional collaborative research and grant applications. Results also indicate that PLC fellows valued the diversity of the program, developed skills that they used in their courses, gained confidence in their ability to share knowledge and resources, and appreciated the accountability the program provided. Furthermore, respondents rated the program positively and indicated that they were currently using the knowledge and skills gained to further develop innovative teaching practices as well as planning to continue to do so in the future. These findings suggest that the PLC model can be an effective way for universities to empower faculty to develop innovative teaching practices, and, by sharing what they have learned with others, to build capacity for innovative teaching and research practices across the institution.

Keywords

education, social sciences, knowledge sharing, professional learning community, teaching and learning, faculty development

Introduction

Motivated by the increasingly complex learning environment, the past decades have witnessed a gradual paradigm change in professional development in education (Vescio et al., 2008). Linda Darling-Hammond and others have been writing about faculty development for almost 30 years (Darling-Hammond & McLaughlin, 1995; Darling-Hammond et al., 2017). One salient reason for professional development for faculty is "to support the increasingly complex skills students need to learn in preparation for further education and work in the 21st century" (Darling-Hammond et al., 2017, p. v). Professional development can help faculty develop and refine their skills and foster the innovative approaches needed to effectively help their students succeed.

One faculty development model that has gained much theoretical and empirical attention is Professional Learning Communities (PLCs) (Huijboom et al., 2021; Stoll et al., 2006; Vescio et al., 2008). The term P*rofessional Learning Community*"describes how [participants] engage in professional development in a collaborative, interactive and ongoing way, in contrast to traditional models of professional development which is developed by outside experts and delivered to [participants]" (Cann, 2021). Other descriptions for a PLC include "professional learning group, collaborative

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learning communities, critical friends group, and community of practice" (Cann, 2021).

There is much discussion and evidence on how PLC's foster teachers' professional development in primary and secondary school settings in the existing literature. For example, scholars have found that PLC's contributed to the enhanced knowledgebase, better teaching practices (Andrews & Lewis, 2007; Gore & Rosser, 2022), school reform (Stoll et al., 2006), and enhanced student learning outcomes (Owen, 2015), Yet, given the different professional responsibilities of K-12 school educators and those working in higher education, little is known regarding the effects of PLC's in postsecondary schools, such as universities.

Responding to the call for more empirical studies to examine the PLC's effects in different contexts (Hairon et al., 2017), we conducted an empirical mixed-methods case study to explore the potential benefits brought about by PLC's in the higher education context. PLC's have been used at a large southwestern Research One or R1 university in the U.S. since 2012. R1 universities are classified as having very high level of research activities by the Carnegie Classification of Institutions of Higher Education. This PLC program's original goal was to support faculty and staff's professional development and innovation in their teaching practice through digital technologies and have participants share what was learned with the broader university. This has taken place through colloquiums, brown bag lunches, informal dialog with colleagues, social media, and professional relationships.

In 2017, the PLC program logistically moved under the university's Quality Enhancement Plan (QEP) initiative and the focus changed to helping faculty and staff to enhance and assess student use of teamwork. The program has grown from 11 participants in 2017 to 35 in 2022, representing almost every college and school at the university and other entities such as the library and student success. The focus of the PLC has been on improving and innovating the way that teamwork has been taught in classes across the institution. That focus has remained, but with COVID the focus also shifted to improving the digital learning experience of students.

The model for the program includes interdisciplinary cohorts of new and returning fellows that meet about 10 times (for 2 hr each time) across the academic year to share ideas and content knowledge about teaching and learning. There are currently three groups, one for beginners to the program whose goal is to implement a teamwork strategy in their course and present the results through a poster session at a colloquium; the second group is comprised of newcomers and previous participants and is focused on digital content and strategies related to teamwork with the focus on introducing innovations into their courses and also presenting their results

in a colloquium; the third group is for "veterans" of the program who are engaged in a fully-fledged study of innovative ways to enhance and assess teamwork with the goal of presenting their results at a conference, and later publishing in a journal. As incentives, fellows participating in the program receive lunch, 500 dollars to use toward an intervention in their course, to buy equipment, or to put toward travel. In addition, they receive a subscription to an online workshop of their choice by the Online Learning Consortium.

Through end-of-program feedback mechanisms, participants have generally expressed satisfaction with the program over the years, and administrators commend the work being done. However, no systematic investigation has been undertaken to ascertain the quality of the PLC model or the extent to which participants share what they have learned with each other and others at the university or outside campus in other venues. Given the financial commitment by the university, the time investment by the fellows, the role of the PLC as part of the QEP, a major university initiative, and the potential impact on student success, determining the relationships that participants have developed and how knowledge and skills gained in the program have diffused is critical. The purpose of this mixed-methods study is to understand the perceived benefits and weaknesses of the program and how participants have shared what they have learned to provide insights for building PLC's in the higher education setting.

Literature Review

Social networks can be structures of individuals connected by social relationships varying in types and strength. The PLC network tends to be relatively open with many weak ties, which may be more receptive to new ideas and connections to outside networks (Granovetter, 1983). In a similar vein, bridging social capital (i.e., the resources accumulated through loose social relationships) that grow out of weak social ties are more likely to bring new information and perspectives to the network (Ellison et al., 2007).

Professional Learning Communities

Although research into Professional Learning Communities (PLC's) has grown over the last 30 years. PLC's have been used as a vehicle for improving teaching and student learning for much longer (McLaughlin & Talbert, 2010). According to the website *All Things PLC*, "the term *professional learning community (PLC)* first emerged among researchers as early as the 1960s when they offered the concept as an alternative to the isolation endemic to the teaching profession in the United States" (All Things PLC, n.d.).

DuFour (2004) writes that the "professional learning community model flows from the assumption that the core mission of formal education is not simply to ensure that students are taught but to ensure that they learn" (p. 1). Rentfro (2007) outlines the PLC model stating that it offers "a framework to build teacher capacity to work as members of high-performing, collaborative teams that focus on improving student learning" (p. 1). Many institutions in higher education run PLC programs. Portland Community College defines its PLC as "safe and confidential spaces where facilitated conversation supports the exploration of dilemmas relating to our professional practice. We will learn skills, acquire tools, and practice processes that enhance our knowledge of teaching and learning" (Portland Community College, 2019).

In a similar vein, Stanford researcher Joan Tabert describes a PLC as "a group of individuals who share a goal and work together to achieve the goal, assess their progress, make corrections, and hold themselves accountable for achieving their goal" (McLaughlin & Talbert, 2010, p. 35). For DuFour (2004), there are three basic questions that a PLC must address. These questions all revolve around student learning which stems from what the faculty learns in the PLC. The questions are, "What do we want each student to learn? How will we know when each student has learned it? How will we respond when a student experiences difficulty in learning?" (p. 1). These questions speak to some core aspects of a PLC particularly focusing on using assessment to understand what is happening in the classroom. Composition of the group is also important. McLaughlin and Talbert (2010) note that for a PLC to be effective there must be "some sort of critical mass of experienced skilled teachers in the group… with strong instructional skills" (p. 37).

PLC's, as formal organizational networks, play a vital role in increasing self-efficacy, enabling access to information, responding to diverse needs, promoting professional growth, facilitating instructional change, and shaping organizational commitment (e.g., Daly et al., 2010; Fred et al., 2020; Quardokus & Henderson, 2015; Trust et al., 2017).

The communities do not have to be held in a face-to-face setting but can also be virtual as highlighted by Carpenter and Munshower (2019). Their research showed that "educators recognized virtual collaboration as just as valuable a tool for enabling PLC's than face-to-face collaborations while still offering similarities to improved teacher practice" (p. 1).

It is also important to note that in some countries such as China, the model of teachers collaborating together is inherently part of its culture, although the term PLC is not specifically used. For example, Chen (2020) writes, "using collaborative efforts for professional development is not new for teachers in China. The principles of PLCs have been deeply embedded in Chinese teachers' collective work in the form of Teaching Research Groups (jiaoyanzu, TRGs)…which have, for decades, structured teachers' collaborative discussions on teaching and learning" (p. 374).

In light of the literature on Professional Learning Communities, and in-line with our own goal of ascertaining the benefits received by PLC members and understanding what factors determine the PLC members' overall attitude toward the program we proposed the following research questions:

> *RQ1: What did past and present PLC fellows perceive as the benefits of their involvement in the PLC program?*
> *RQ2: What factors predict PLC members' overall attitude toward the program?*

Social Networks in Professional Learning Communities

Social network analysis (SNA) is an interdisciplinary method of studying social systems, and it has generated important insights in analyzing PLC networks (Li & Krasny, 2020). It emphasizes the study of relationships (i.e., edges) among the entities that make up the system and those entities' attributes (i.e., nodes, Borgatti et al., 2018). In social network theory, nodes may have various attributes, such as university faculty members' departmental affiliations, while edges specify the types of relationships by connecting the nodes. In studying social systems, communicative relationships are often conceptualized as edges (Kavanaugh et al., 2005). By examining the nodes and their relationships, SNA generates vital insights about an actor's access to communal resources and potential constraints and opportunities he or she may encounter (Borgatti et al., 2018). SNA has been used to study a variety of phenomena in the higher education context. For example, Rawlings and McFarland (2011) found that a faculty member's local network affiliates had a significant influence on his or her research productivity. Additionally, informal structures in academic departments were found to be instrumental in planning change initiatives (Quardokus & Henderson, 2015).

Social capital is the resources, reciprocity, and trustworthiness that arise from human connections in social networks (Leonard, 2004). Putnam (2000) suggests that two types of social capital emerge in social systems. First, strong ties such as family members, friends, and coworkers create bonding social capital. The bonding social capital is considered a type of "exclusive" social capital that can serve as constraints for individuals. Members with bonding social capital may be held back by family and community standards, and they reach their full potential only if they can forge connections in the larger society (Leonard,

2004). Second, weak ties based on indirect and secondary relationships in social networks facilitate "bridging" social capital (Kavanaugh et al., 2005). Weak ties integrate members of different social groups into a larger social setting (Putnam, 2000; Yuan & Gay, 2006). By linking otherwise disconnected social groups, bridging social capital fosters information flow and exchange among socially disconnected groups. Similarly, Burt (2017) suggested that the weak ties among social groups are structural holes in the network. Structural holes in social systems create competitive advantages for those whose social network spans across the holes because structural holes separate non-redundant information from non-cohesive and inequivalent sources (Burt, 2017).

Embedded within the existing social systems of universities, PLC's potentially facilitate the forge of weak ties and the emergence of bridge social capital. Educators, researchers, and school administrators have realized that the social capital existing in faculty and staff networks can be facilitated purposefully and effectively through PLC's (Woodland & Mazur, 2019). Specifically, participating in PLC-sponsored activities involves members sharing ideas and feedback, collaborating, and supporting each other emotionally (Trust et al., 2017). These processes help members establish social relationships that they may not be able to otherwise. Over time, the PLC members may establish weak ties that span across structural holes—those that connect different social groups and facilitate non-redundant information to flow freely across the otherwise disconnected groups. The weak ties that connect structural holes foster bridging social capital.

In fact, PLC's, as formal organizational networks, has been found to play a vital role in increasing self-efficacy, enabling access to information, responding to diverse needs, promoting professional growth, facilitating instructional change, and shaping organizational commitment (e.g., Daly et al., 2010; Fred et al., 2020; Quardokus & Henderson, 2015; Trust et al., 2017). Therefore, adopting the theoretical lens of social network theory, we propose the following research questions to explore the benefits that PLC's bring to the university community:

> RQ3: What was the structure of the UTA PLC member and non-member communicative network?
> RQ4: Do PLC members' positions in the network influence their PLC-related behaviors and attitudes? If so, how?

Methods

Sample

The sample of this study includes all the current PLC fellows and alumni at a large public research tier-one university in the Southwest U.S. We used a mixed-methods approach to collect qualitative and quantitative data in this study through semi-structured interviews with current and former PLC members, and surveys of the target population of professional learning community fellows ($n = 77$) over the duration of the program to that point in time (2012–2019).

In terms of both our epistemological motivation for conducting the study, a mixed-methods approach was deemed most suitable because we wanted to understand the perceived benefits of the PLC program from an individual perspective, gathering rich data through interviews and hearing from participants in their own voices. However, we also wanted to look at the larger perspective and see what participants in totality were doing with the knowledge they gained. Finally, we also wanted to see if the themes derived qualitatively were manifest quantitatively. Saldaña and Omasta (2022) uses the term "paradigmatic corroboration" (p. 145) to describe the harmony between both methods, and "the consensus between number and words" (p. 145).

To invite current and past fellows to participate in the study, we sent an invitation email that included a link to our questionnaire hosted on Qualtrics and an invitation to sign up for an interview.

Interview Procedures

Eight participants (six females and two males) were selected for interviews from a pool of volunteers. Selection was based on their availability, variation of project, and length of time in the program. Researchers were particularly looking for interviewees who had participated in early, later, and both early and later cohorts in order to better understand experiences over time (Creswell & Poth, 2017). Researchers were also purposeful in selecting interviewees representing tenure-track faculty, non-tenure track faculty, and staff to ensure that people from each group were given a voice (Saldaña & Omasta, 2022).

The participants were primarily interviewed face-to-face using the same basic questions. Two who had left the university and were living out-of-state were interviewed via Zoom. The interviews were conducted by two faculty members involved with leadership in the PLC program and trained in qualitative research. The interviews were recorded and then transcribed using Temi.com. Following transcription of the interviews, the transcripts were read through and compared to the audio interview. Any errors in the transcription were corrected.

We were open to conducting more interviews, but it became apparent through some initial coding of the interviews that we had reached saturation in terms of the answers we were receiving from the interviewees. That is, although each interviewee had some personal stories or

experiences that were unique to them and their experience in the program, as Saldaña & Omasta (2022) notes in describing saturation, similar themes were recurring in each interview, and each new interviewee continued to "affirm the already salient findings".

Coding

We began with initial, or open, coding where we read through the interviewer notes, listened to audio recordings, and read the transcription, The purpose of initial coding is to break the material into manageable chunks and to start to get a handle on the qualitative data. Through this process initial themes and topics of interest began to emerge from the data. The coders then conducted a thematic analysis of the transcripts using the In Vivo Coding method (Saldaña, 2016). In Vivo coding develops codes that are "participant-inspired rather than researcher-generated…" codes that "prioritizes and honors the participant's voice" (pp. 106, 107). Saldaña (2016) notes that In Vivo coding has been labeled in other terms such as "literal coding, verbatim coding, inductive coding" and other terms (p. 105). He also writes that "the code refers to a word or short phrase from the actual language found in the qualitative data record" (p. 105). "In Vivo Coding is also quite applicable to the action and practitioner research…since one of the genre's primary goals is the verbatim principle using terms and concepts drawn from the words of the participants themselves. By doing so, researchers are more likely to capture the meanings inherent in people's experience" (Stringer, 2014 p. 140).

Coders followed Saldaña's (2016) guidelines by looking for "words and phrases that seem to call for bolding, underlining, italicizing, highlighting, or vocal emphasis if spoken aloud" (p. 107). Their salience may be attributed to such features as impacting nouns, action-oriented verbs, evocative vocabulary, clever or ironic phrases, similes, and metaphors, etc.' (p. 107). Some of these words or phrases had become apparent during initial coding, while others began to become more solidified as the coders dug deeper into the data. Following the establishing of initial codes, the researchers engaged in reflective analysis through analytic memo writing, followed by a second round of codes in order to condense the number of In Vivo codes and provide a reanalysis of the initial codes. Following the establishment of the main codes, the two interviewers reviewed the interviews again and then discussed their thoughts and findings with each other to come to an agreement on the main themes.

Quantitative Methods

After doing a preliminary analysis of the qualitative answers, we used the qualitative data to refine our preliminary survey and then distributed it to all available cohort members. The study's quantitative part enabled us to examine the knowledge diffusion processes in the social networks formed by the PLC members and non-members and explore the significant predictors for sentiment toward the program.

Additionally, a Qualtrics online survey was distributed to faculty and staff who had been members of the PLC program by sending the invitation letter and survey link to their university email addresses. After sending three rounds of reminders, 45 out of the 77 PLC alumni responded to our questionnaire. The response rate of 58.44% is on par with other studies conducted in similar organizations (Baruch & Holtom, 2008). Missing data were deleted case wise. The sample included 12 tenured or tenure-track faculty, 21 professional-track faculty, and 12 staff, whose work tenures ranged from 1 to 37 ($M = 11.27$, $SD = 7.39$). Furthermore, respondents were from six out of the eight colleges and other units within the university, including the Library and the Office of the Provost. Our sample was representative of the PLC member population in terms of their appointment type, work tenure, and departmental affiliations.

Measurements. Besides asking about their departmental affiliations and work tenures, we also included Likert-type items (i.e., ratings from 1 = strongly disagree to 7 = strongly agree) that measured participants' overall attitude toward the PLC program, whether they were or planned to use the skills and resources gained from participating in the program, whether they shared the skills and resources to other people, and to what extent they felt their participation informed their teaching and research. For example, we asked participants to what extent they agreed with the following statement *I plan to continue using the skills/resources that I obtained in the PLC program.* Additionally, we also requested the respondents to list up to 10 names of the people they "have discussed the knowledge, skills, and/or experience" that they gained being a part of the PLC program and indicate the nature of the discussion. Specifically, we asked if the discussions were one-time or multiple-time, the contexts of the discussions (one-on-one vs. one-to-many), and the end products of those discussions (e.g., new teaching strategies, new grant proposals, new research projects).

Quantitative Analytical Strategies. We used SPSS 26.0 to conduct statistical analyses. Additionally, we performed a social network analysis to reveal the relationships among the PLC participants and the people with whom they had discussions or how knowledge and skills diffused within and beyond the PLC program. To visualize

the social network formed by PLC members and non-members, we used Social Network Visualizer, which helped us determine the appropriate graph. To calculate structural hole-related statistics in the social network, we used UCINET 6 (Borgatti et al., 2002).

Results

Qualitative Themes

An analysis of the semi-structured interviews with past and current PLC participants, and the process of coding the answers into themes, as detailed previously, helped answer RQ 1: *What did past and present PLC fellows perceive as the benefits of their involvement in the PLC program?* The coding process revealed the following themes: *diversity, learning, accountability, and confidence.* The interviewees highlighted an appreciation for the *diversity* of membership of the PLC groups that they were a part of, and how that diversity facilitated their learning. *Learning* was a theme that was mentioned in several ways; learning through interaction with colleagues outside of their own discipline and in terms of learning new pedagogical approaches that they were able to apply to their courses. The themes of *confidence* and *accountability* were also evident in the interviews. Confidence was noted in terms of participants feeling empowered to share knowledge that was gained from the PLC, and accountability was noted in terms of follow-through with the projects they were involved in and the expectation that they would have a product (poster) to present at the end of the program.

Diversity. Faculty and staff that were interviewed appreciated the opportunity being in the PLC gave them to meet with and learn from a diverse group of faculty and staff from across the university. As one member noted:

> [all] Makes and models. So young, old tenure track or non-tenure track, male, female, um, black, white, brown, lots of diversity. Um, and especially at [this university] where our student body is so diverse, I thought that was very important.

What is reflected in that statement is also a feeling of equality in that tenure track faculty were not given priority over non-tenure-track faculty or staff or treated differently as is sometimes the case in higher education, but everyone was treated equally.

Faculty and staff benefited from getting out of their own departments and/or colleges and finding common ground with other PLC members. In doing so, not only did they learn from each other, but stereotypes were broken down. An engineering faculty member hadn't

expected to find colleagues in diverse areas to be as interested in teamwork as those faculty in engineering:

> So I didn't know for sure what to expect. Um, but at our very first meeting we introduced ourselves and I found that there were faculty in many different disciplines and different colleges who were also interested in students doing teamwork, which had, it kind of, it seemed to me like, well teamwork, that's a thing that engineers have to do because all engineers work on teams. But it turns out that even if you're doing a play, you still have to do teamwork. So, um, the experience of working with faculty from many different disciplines was, was very helpful for me. And, um, [a] professional growth experience.

This benefit of having diverse disciplines collaborating together was mentioned consistently:

> So I found that the resources that the participant brought, especially, you know, I'm in public affairs and then there were people from nursing, people from social work, from education. And so there was this mix of perspectives and disciplinary perspectives that really helped. Uh, I thought that was the best, um, the biggest strength of the program, learning from our peers.

Learning. Another faculty member who joined the PLC program in his first semester at the university talked about the learning that took place through the diversity of the PLC membership and how it was also beneficial in acclimating him to the university community as a whole:

> You know, focusing a bunch of different people with different skill-sets from different disciplines in the university. Um, made for interesting conversations and you know, ideas that would not have come to pass without people from different perspectives. Bouncing them off of one another for me as a new person at [the university]. Uh, it was also invaluable in just getting my feet wet in the [campus] community and understanding [the university's] commitment to, um, better ways of teaching and learning.

A staff member who works closely with faculty also talked about the learning that took place through interaction with others in the PLC program:

> …[T]hat's to me the number one strength you'll, you learn so much. You meet people who are trying to tackle similar problems and then you find ways you've learned so much from what they've explored, and they learn from what you've explored and you can kind of start putting pieces together and coming up with a better model.

Confidence. The theme of confidence was intertwined with learning in many of the interviews and was evident in several ways. Faculty reported gaining confidence through the PLC to be able to implement changes into

their course content and changes in their pedagogical approach based on what they themselves had learned through discussion with other members, and through their own research conducted as part of the PLC. It was not just anecdotal reports of benefits in their courses, but there was tangible evidence seen in such artifacts as end-of-semester evaluations from students. The focus of the most recent PLC's has been on enhancing and assessing teamwork. One faculty member talked about what she had learned about teamwork from the PLC, and how she had seen improvement in student feedback over time:

> I think that I learned a lot about how to deal with students in team situations. Um, I learned a lot about how to arrange students in teams and to do it purposefully, um, in a way that is really beneficial. Uh, and I believe that student feedback survey, if you track from the year before I was in the PLC to the year I was in it, to the year after, the complaints about the teamwork aspect decreased over the course of those three years. So, I feel that I, I really learned a lot about how to properly institute teamwork and how to properly engage students in teamwork from the purposefully putting them together to um, you know, giving them more time to develop relationships.

Faculty also gained confidence to be able to do research and present it to others. This was particularly important for those faculty who were instructors (non-tenure-track) and who were expected to focus more on teaching than research. Consequently, they lacked the opportunities to conduct and present research. One such faculty member stated:

> So skills and content knowledge that I've gained, um, the ability to, um, create a project and see it through to the ending and the ending, not just being the students' grades, but also being able to take that to the next level, write up the project and present it to my peers with confidence. Because…I still get nervous when I know that [PLC coordinator] is reading something I just do. Um, and, but then taking it beyond that level even and presenting at a conference…So that is in my, in my previous career in business, I did those kinds of things all the time, but it's different in academia and um, I've really been able to, I don't want to say broaden my skill set, but, um, I've been able to develop that particular trajectory…

Accountability. One requirement for the PLC program is that faculty are to present their ideas/research/innovations in a poster presentation at a culminating end-of-year PLC-sponsored colloquium. Some faculty had never presented a poster before and appreciated the opportunity to do so. Presenting at the colloquium gave them the confidence to realize that they could do it at a conference if the opportunity arose. However, it was not just about the opportunity, but about being held accountable to produce and present the research. One instructor talked about the accountability that came with having to create the poster, and the benefits that lasted after the colloquium:

> I think the colloquium is an important piece, um, because it, uh, feels like the wrong word to say, but forced us to collect our thoughts and to put our project on a poster and present it. So now my poster is up in [my] department. Wow. And now everybody that comes [to my department], students, faculty, visitors, everybody walks right past that poster. So I think that's really, really more important than just that one afternoon because only a few people actually come to that.

Being able to display the poster in the department was a big boost for that faculty member who is an instructor with a heavy teaching load and who felt second-best to the tenured faculty who were publishing. The poster being on display was an important demonstration of accomplishment and ability to create research.

Another faculty member talked about accountability in terms of "deliverables" and how having deadlines was important.

> I think that, um, maybe the, uh, forcing faculty to have deliverables I think is a great idea because…I think it forces, so, so when I talk about deliverables, I'm talking about the poster fair and the ending report… but by doing that, it creates tangible, um, deadlines. And I think if faculty didn't have those, I don't think that we would recognize the true value of what it is because if it was just a workshop type thing where we came to the session and we learned and that was it. I think the deliverables that you have scheduled …really add value, um, of forcing faculty to recognize and reflect on their work.

In sum, faculty interviewed benefited from the various forms of diversity and opportunities within the PLC groups. They also benefited from the ability to learn from a diverse group of people and gained the confidence to apply and integrate what they learned into their courses and present this knowledge in a variety of venues. This would not have been possible without the accountability that came through the structure and goals of the PLC program.

Quantitative Analyses Results

Overall, the respondents felt extremely positive about the program ($M = 6.64$, $SD = 0.61$). Respondents reported using the knowledge and skills obtained ($M = 6.38$, $SD = 1.07$) and planned to continue using the knowledge and skills obtained through the PLC ($M = 6.51$, $SD = 0.90$). To answer RQ2, *What factors predict PLC members' overall attitude toward the program?*, two

Table 1. Summary Statistics, Correlations and Results From the Regression Analysis.

| Variables	M	SD	Correlation with attitude	b	SE
Model 1					
Current use	6.38	1.00	.63***	0.13	0.19
Continue use	6.51	0.90	.59***	0.10	0.20
Connection	6.40	1.03	.63***	0.20*	0.10
Share	6.20	0.97	.55***	0.06	0.10
Model 2					
Inform teaching	6.40	1.01	.61***	0.25**;	0.08
Inform research	5.58	1.50	.60***	0.17**	0.05

Note. DV = attitude toward the program.
*$p < .05$. **$p < .01$. ***$p < .001$.

multiple linear regression analyses were run to explore the significant predictors of PLC members' overall attitudes toward the program. First, we found a significant multiple regression model when using the following four predictors: whether they were using the knowledge and skills from the PLC, whether they planned to continue using them, whether they made useful connections by participating in the PLC, and whether they shared knowledge and skills they obtained through the PLC (R squared = .49***, $F(4, 40) = 9.57$, $p < .001$). As shown in Model 1 presented in Table 1, whether PLC members felt they made useful connections by participating was a significant predictor of the overall attitude toward the PLC. We also found a significant multiple regression model when using whether members felt their participation informed their teaching and research to predict overall attitude (R squared = .50***, $F(2, 42) = 20.71$, $p < .001$). As can be seen in Model 2 presented in Table 1, whether members felt their participation informed their teaching and research were both significant predictors of their overall attitude.

To answer RQ3, *What was the structure of the UTA PLC member and non-member communicative network?*, we visualized the PLC social network among PLC members and non-members (see Figure 1). The network analyses corroborated the qualitative results and generated important insights for how knowledge was diffused, and how relationships were built within the university community. In Figure 1, each node represented a PLC member (i.e., a circle) or a non-member (i.e., a square) who one or more members had mentioned as someone who they had had conversations with regarding knowledge and skills obtained through PLC (i.e., edges were formed). Nodes with the same color indicate their same departmental or office affiliations.

The visualization highlighted several important descriptive insights. First, the scope of knowledge diffusion was expansive. The *size* of the network was 157 (i.e., the number of nodes in a network). Specifically, the 45
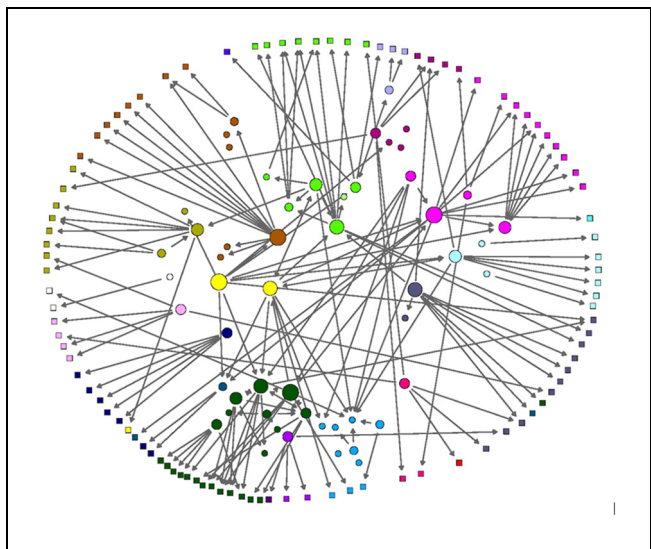
Figure 1. The network formed among PLC members and non-members.

participants identified 112 people who they've discussed the PLC-gained knowledge, skills, and/or experience with, whose affiliations span almost all the colleges and university administration offices and whose roles range from tenured, tenure-track, and non-tenure track faculty members to university staff, administrators, and graduate students. The total number of edges identified was 182.

Second, the PLC fostered knowledge diffusion and relationship building within and across university departments and offices, which resonates with what interviewees shared in the interviews. We also examined the nature of those communicative relationships and found that the discussions are likely to happen multiple times (i.e., 124 for multiple-time vs. 24 for one-time discussions) in one-on-one settings (i.e., 123 for one-on-one and 74 for one-to-many). The content of the knowledge diffused varied, including teaching-related ideas (81

times), potential research collaborations (35 times), and grant application discussions (14 times).

Among all the edges, more than one-third crossed departmental boundaries, which are weak ties that span across structural holes to facilitate sharing non-redundant information. To answer RQ4, *Do PLC members' positions in the network influence their PLC-related behaviors and attitudes? If so, how?*, we ran the structural hole analysis in UCINET. A series of bivariate correlation analyses revealed interesting results about the relationship between one's position in the PLC network and their PLC-related attitudes and behaviors.

Burt's (1992) measure of effective size refers to the network's non-redundant elements (i.e., the number of people someone is connected to, minus the redundancy in the network). We found that the larger the effect size, the more positive attitude one has ($r = .41**$), the more one thought he or she had made useful connections in the PLC ($r = .51**$), the more one though the PLC participating had informed his or her teaching ($r = .48**$) and research ($r = .39**$). Furthermore, constraint refers to how much room someone has to exploit potential structural holes in their network (Burt, 1992). Interestingly, compared to staff members, faculty members had significantly higher levels of constraint ($F = 4.93$, $p < .05$), indicating a higher possibility to take advantage of social capital generated by structural holes.

Conclusion and Implications

The results of this mixed-methods study suggest that the PLC model used at the institution is effective for building capacity for innovating teaching practice. For example, PLC fellows share what they have learned primarily through one-to-one contacts and identified that camaraderie in the groups is a key benefit, highlighting the importance of relationships for building capacity for a culture of innovation. Given the difficulties of having impactful innovation in higher education (Barshay, 2018), determining ways to improve mechanisms that evaluate what works and what does not work is essential for improving student outcomes in a changing learning ecosystem.

Among the many benefits of PLC's articulated by the faculty members in both the interviews and surveys are an increased sense of community among the participants and an appreciation of the diversity of the groups specifically in terms of the different disciplines, and the way it facilitated learning. Faculty appreciate the development of innovative approaches to teaching through collaboration with others, opportunities to learn and grow as a teacher, and new opportunities for engaging in research. Diversity and learning were themes that emerged in our interviews. Making connections and getting non-redundant information from the network were found to be significant predictors of positive attitudes toward PLC in our quantitative analysis.

The results of the interview themes confirm what is seen in the research literature. For example, McLaughlin and Talbert (2010) discuss the importance of faculty learning and also the notion of accountability. Both of these themes were evident in our interviews. Consistent with what Fred et al. (2020) proposed, collegial support and social cohesion appeared to be key characteristics of the PLC. What was surprising was the theme of confidence. It was interesting that faculty seemed almost hesitant to engage in innovations in their courses. It was almost as if trying something new in a classroom was taboo. However, membership in the PLC and encouragement they received from other fellows gave them the impetus they needed to try something new. They also gained confidence to be able to share what they had learned with others outside the PLC whether it was through a poster presentation, or informal conversations. For staff and Non-Tenure Track faculty (NTT) who did not have research obligations, or a lot of research experience, the PLC gave them the opportunity to engage in meaningful research, and the confidence to continue to develop a research agenda and share what they had done with others in their network. This is particularly important if NTT faculty go up for promotion. Although teaching is what they are primarily evaluated on, research is still an evaluative component and research on teaching innovations is a natural fit.

The results from the multiple regressions and SNA revealed important insights about the benefits of establishing PLC's as formal organizational networks. First, the communication and collaboration network of the PLC illustrated that participating in PLC-related activities facilitated the forge of weak ties. In other words, the PLC became a catalyst for establishing weak ties that spanned across structural holes in the naturally occurring social groups in the university (i.e., academic departments and offices). The weak ties contributed to the cross-pollination of new teaching strategies from various academic disciplines and interdisciplinary research projects and grants applications (van Rijnsoever & Hessels, 2011). Second, the PLC facilitated knowledge diffusion within the university. For example, the 45 participants identified more than double the number of contacts with whom they had shared knowledge and skills. Due to the diversity of departmental affiliations among the members, the influence of the knowledge diffusion was expansive. Third, the PLC members realized that they had made useful connections in the community, contributing to their overall attitude toward the program. The result resonates with the qualitative theme of diversity found in the interviews. The weak ties connected PLC members

and non-members with diverse backgrounds, and they found the connections made to be an important asset.

There are strengths and weaknesses to any program. Aside from logistical issues that come with organizing a two-semester program for faculty and staff, one issue is getting participant buy-in from the beginning and keeping the fellows engaged throughout. Ideally, everyone would show up for every meeting, but the reality is that there are always those who are going to miss meetings, and those who start off with good intentions, but fade off. One participant noted,

> I think that things trailed off in the second semester. So, there was a lot of interaction that first semester in the fall. Uh, and then as we got into our own research, that interaction trailed off a little bit. Uh, participation seem to trail off a little bit. So, we wound up with a smaller core of people participating in the second semester. But I think the interaction that we did have…remained good, remained high quality throughout the semester even though, you know, some of the, some of the participation did fall away.

Another potential weakness has to do with process versus results. To use a common metaphor, "Is it okay to stop along the way and smell the roses (i.e., enjoy the process of learning), even if it means that one is delayed in reaching their destination, or maybe not even reaching their destination at all?" There is no simple answer; it is important to have facilitators who are able to encourage the participants and guide them along the way, and who also know when to push people along and when to stay out of the way.

The results of our study provided a few practical implications. First, when facilitating PLC's as formal organizational networks in a university context, it is important to encourage people of diverse backgrounds to become members. Weak ties that span across diverse expertise and experiences should contribute meaningfully to the usefulness of PLC's. Second, the benefits of participating in PLC's should be emphasized. Members of PLC's should be held accountable in terms of the implementation of the knowledge and skills they obtained through PLC. PLC members in our experience appreciate the accountability that comes with structure, and it serves as a means to encourage the creation and development of meaningful research, particularly in the area of teaching and learning. It is also important that administrators such as Deans and Chairs, are aware of their faculty's involvement in the program. Faculty who voluntarily participate in development programs such as the PLC deserve to be recognized for their efforts to better themselves and by extension provide a more meaningful experience for their students. At a minimum this recognition should come in their annual evaluations as evidence of their efforts to improve their teaching.

PLC's are an important tool for faculty development, although in our experience staff who work in various capacities with students such as in the library makerspace, distance education, or student success, have also benefited as well. By giving the PLC fellows the incentive and opportunity to learn from each other, institutional silos are broken down, innovative and creative approaches to teaching and assessment is encouraged, and the classroom experience for both the student and the faculty improve contributing to the overall goal of enhancing student success.

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