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Fostering Professional Learning Communities Beyond School Boundaries

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Teacher Development, Teacher Practice and Student Achievement

Much is known about what constitutes successful teaching in mathematics (Anthony & Walshaw, 2009; Australian Association of Mathematics Teachers, 2006; Franke, Kazemi, & Battey, 2007) and the key ingredients of effective professional development programs (D. J. Clarke, 1994; D. J. Clarke & Hollingsworth, 2002; Organisation for Economic Cooperation and Development, 2005; Sowder, 2007). In particular, successful programs are ongoing, and provide opportunities for practice, feedback and follow-up support. They 'involve teachers in learning activities that are similar to ones they will use with their students, and encourage the development of teachers' learning communities' (OECD, 2005, Chapter 4, p. 1). Additionally, for mathematics teacher education, it is critical to develop teachers' pedagogical content knowledge (AAMT, 2006; Malara & Zan, 2008; Sowder, 2007) and to view teachers as decision makers (Malara & Zan, 2008; Muir & Beswick, 2007; Ruthven & Goodchild, 2008).

Knowledge of practice is a type of knowledge generated when teachers investigate learning and teaching in their own classrooms and school sites, which may be a form of school-based teacher development (Ruthven & Goodchild, 2008; Sowder, 2007). Sometimes these school-based studies of practice involve action research and the knowledge created is the result of a dialogic cycle comprising research, scholarly knowledge, teaching, and craft knowledge (Ruthven & Goodchild, 2008). Often teachers value the knowledge that arises from such activities because the outcomes are personally significant and context-specific (Putnam & Borko, 2000).

Amid the array of school-based professional development initiatives reported (Gu & Wang, 2006; Johnson, 2009; Meiers, 2007; Muir & Beswick, 2007; Ruthven & Goodchild, 2008; Seidel, Sturmer, Blomberg, Kobarg, & Schwindt, 2010; Shepherd, 2006; Smith, 2002), there has been increased interest in *Professional Learning Communities* (PLCs) (Coburn & Russell, 2008; Darling-Hammond & Richardson, 2009; Jessie, 2007; Katz & Earl, 2007). Indeed, a school principal, claimed 'this is the most common-sense, cost-effective process for student achievement that I have seen in my more than 30 years in this business' (Jessie, 2007, 1). Similarly, Meiers (2007) described a PLC as a viable means for transforming schools and improving student achievement.

Given the emergence of the approach and the claims made about its efficacy in the United Kingdom (2005) and United States (Coburn & Russell, 2008; Darling-Hammond & Richardson, 2009; Katz & Earl, 2007), and, more recently, in Australia (Johnson, 2009), it seems timely to examine critically the strengths and limitations of PLCs to inform new endeavours. To do this, we commence with a review of literature about PLCs and identify common

elements of successful PLCs. Then we analyse a case that produced collegial relationships focused on mathematics teaching across seven Australian primary schools against the key elements reported in the literature.

Professional Learning Communities (PLCs)

From research in the United States, Darling-Hammond & Richardson (2009, 49) describe PLCs as a new paradigm in which 'teachers work together and engage in continual dialogue to examine their practice and student performance and to develop and implement more effective instruction practices. ...teachers learn about, try out, and reflect on new practices in their specific context, sharing their individual knowledge and expertise'.

According to Vescio, Ross & Adams (2008) a key premise of PLCs is that student learning improves as teaching practice improves. There are two fundamental assumptions behind this principle that relate to teaching practice. The first is that knowledge is situated in the day-to-day lived experience of teachers and best understood through critical reflection with others who share similar experiences. The second is that the active engagement of teachers in a PLC, with a focus on the learning needs of students, raises their levels of professional knowledge about student learning. Darling-Hammond & Richardson (2009, 50) argue that 'group members must make their practice public to colleagues and take an inquiry stance. Change occurs as teachers learn to describe, discuss, and adjust their practices'.

Along similar lines, Johnson (2009) refers to *action learning* to reflect a model of professional development and improvement in student learning that takes place as teachers go about their normal duties. Action learning involves teachers working in professional learning teams on work-based inquiries. In this model, the team has a common inquiry and there are clear indicators of expected outcomes. Effective work-based inquiries typically start with a clear focus that is important to the individual, team and school, and a short timeline grounded in the reality of the school context. Each inquiry includes an action plan, describing how the challenge will be handled, and involves a small team of colleagues committed to action research who are prepared to reflect, exchange knowledge, and support each other. It is necessary for a productive team to maintain a sensitive balance between diversity in action that allows individual ownership, and creativity that draws together and helps team members to align with the goals of the team (Johnson, 2003, 2009).

Despite the differences in the labels used to describe the activity, we believe that there is sufficient commonality between PLCs and Johnson's (2009) action learning and work-based inquiries to draw on both without always marking a formal distinction between them. In this paper we refer to PLCs, this being the more familiar term. However, we include Johnson's work

because both action learning and work-based inquiries are integral to the activities of PLCs.

Key Elements of Successful PLCs

Figure 1 presents an overview of the key elements or characteristics of effective PLCs as identified by key researchers in the field.

Figure 1: Overview of elements of effective PLCs from the literature

PLCs promote and operate effectively when members ...	Bolam et al. (2005)	Johnson (2009)	Darling-Hammond & Richardson (2009)	Coburn & Russell (2008)
have shared values and vision	•	•	•	•
have formal and widespread leadership	N/A	•	N/A	×
have collective responsibility for pupils' learning	•	•	•	N/A
attend to school teaching-learning challenges	•	•	•	N/A
focus on student learning	•	•	•	•
take an inquiry stance	•	•	•	•
goal set and design action plans	N/A	•	N/A	N/A
make teaching more public	•	•	•	•
share experiences and expertise	•	•	•	•
are willing to experiment with alternative strategies	•	•	•	•
engage in reflective dialogue	•	•	•	•
engage in high depth interactions (about how students learn content, pedagogical principles, curriculum content, etc)	N/A	N/A	N/A	•
have mutual respect and support for teachers	•	•	•	N/A
have inclusive membership	•	•	•	×

• = explicitly stated; • = implicit; × = questioned practice; N/A = not referred to in this document

The profile of elements from the selected literature referred to in Figure 1 suggests that these researchers from the UK, US, Australia and Canada hold similar views about what constitutes an effective PLC. There is strong consensus about the elements concerning: shared values and vision, a focus on student learning, teachers sharing experiences and expertise, and reflecting on practice. A focus on using an inquiry process, making teaching public and experimenting with alternative strategies is implicit in each of the studies. However, with the absence of examples it is difficult to know how these elements were enacted.

Views varied about aspects of the group composition; for example, the suitability and knowledge-level of the person leading the group. The authors of the study reported later in this paper argue that it is important to draw on relevant expertise when necessary; in some cases, this may necessitate calling on individuals outside the school context.

In western societies, primary school teachers often have comparable experiences and face similar challenges when teaching children. Often

teachers regard the experiences of other practitioners as crucial because their advice is seen to have been derived from authentic school contexts (Carter & Doyle, 1996). They believe they learn vicariously from discussing others' experiences (Bandura, 1986). So, it is understandable that teachers may value and benefit from participating in PLCs as defined by elements such as those in Figure 1. Nevertheless, although there are mostly favourable reports regarding teachers' participation in PLCs, there is relatively little information about what teachers actually do as part of their active involvement in PLCs, and even less evidence detailing the changes in the achievement of students taught by those teachers (Vescio, et al., 2008). Furthermore, most PLCs are composed of teachers working at the same school sites. Not much is known about whether it is possible to foster similar relationships between teachers across schools.

Even though research has led to a growing understanding of the links between professional development, changes in teachers' knowledge and practice, and improved student learning outcomes, further studies are warranted. Several authors stress the need for documented evidence of changes in teachers' practice and changes in student achievement as teachers work in PLCs (Meiers, 2007; Vescio, et al., 2008). In this paper, we explore one of the gaps in the literature by addressing this research question: *What elements of effective professional learning communities, identified in the literature, are evident in the focus group discussions in a particular inter-school context?*

Methodology

Background Context and Participants

It is important to note that the present study was undertaken within a larger context - a professional learning program, *Contemporary Teaching and Learning Mathematics* (CTLM) (D. Clarke, et al., 2010; D. Clarke, et al., 2009). The main aim of CTLM was to enhance the pedagogical content knowledge of teachers as an integral component for increasing students' mathematical learning. The eleven Catholic primary schools in and around Melbourne that participated in the first round of CTLM were endeavouring to raise their lower than expected test results in mathematics. The teachers participated in twelve full days of professional learning over two years led by teacher educators from Australian Catholic University (ACU) and mathematics education staff from the Catholic Education Office Melbourne (CEOM). Between these days, teachers undertook a range of teaching and assessment activities related to the program. The input and activities shared on and between these days served to increase teachers' pedagogical and mathematical content knowledge. They were supported in classrooms, in school professional learning team meetings, and at the professional learning days by a variety of people including fellow teachers, CEOM staff, ACU teacher educators and final year ACU pre-service teachers. This study set out

to evaluate the effectiveness of CTLM, and part of the process involved creating the PLC.

During the first professional learning day of CTLM, teachers were invited to join a smaller group as co-researchers interested in reflecting on their teaching of mathematics by creating a digital portfolio of classroom practice. This group of teachers together with the authors of this paper formed the PLC.

In 2008, the first year of the CTLM, nine teachers representing four schools joined the PLC. In 2009, two of the teachers from 2008 were joined by five more teachers. Some teachers from 2008 did not continue their participation because they either changed schools and were no longer involved in CTLM, took on new positions of responsibility, and/or had only intended to participate for one year. Each year, the authors worked alongside the teachers as both co-researchers and supportive critical friends. We met as a group on two occasions in the first year and three in the second year to discuss the protocols we had developed and to share insights we had gained with one another. However, the decisions about when, where and what data were collected for an individual teacher's digital portfolios, and what would be analysed and shared remained the responsibility of each teacher / co-researchers (for more detail see Scott, Clarkson & McDonough, under review). In all, fifteen teachers, from seven Catholic primary schools, participated voluntarily in the PLC study. Six taught lower primary classes (students aged between 5 and 8 years); two job-shared a Year 3 class (students aged between 9 and 10); and, seven taught upper primary classes (students aged between 11 and 12 years).

Data Sources

Fifteen sets of data were collected over the life of the study and included five written questionnaires with open- and closed-items; audio-recorded discussions with teachers individually and as focus groups; researchers' notes on lesson observations; archived records of email communications between participants; digital portfolios; and, summary analysis charts from each teacher. However, in this paper, although we refer incidentally to the teachers' individual digital portfolios which focused on their teaching of and reflections on their mathematics lessons, our main aim is to report our analysis of the audio-recorded data from focus groups that were attended by members of the PLC. In the first year of the study two focus group sessions were run; one at the beginning of the year, and a second at the end. All members of the PLC attended these. In the second year, three focus group meetings were conducted; at the beginning, middle and end. The middle focus group meeting was included because members of the PLC who continued on into the second year thought that this mid-year meeting would provide useful added support for teachers who had joined in that year. This proved to be the case. In the second year all members of the PLC met on each occasion except for the two teachers who had participated in the previous year. Given their experience

with the protocols (see later), it was felt they did not need to attend the first meeting. They attended the mid-year meeting, and had every intention of participating in the final meeting, but at the last minute their school changed the times of meetings they could not miss. In response to this predicament, one of the authors conducted semi-structured audio-recorded interviews with the two teachers who missed the meeting. These transcriptions were used in combination with those from the focus groups.

Digital Portfolio

When teachers joined the PLC, they were each given the set of digital portfolio 'SAPP' (Self Analysis Professional Portfolio) protocols electronically as files on a portable memory stick. The digital portfolio comprised four folders. A file in each folder had protocols and suggestions to give the teachers ideas on how to start the task. Three folders represented three sets of data collection taken in March, July and October. Teachers were asked to include at least one 60-second video clip of their classroom practice, digital copies of students' work, and a reflective commentary on the video clip(s) in each folder. The fourth folder completed in November contained a graphic organiser referred to as a *Before and After Chart*, which encouraged teachers to review their video clips and then identify what changes had occurred over time. The full description of the set of protocols developed is reported in Scott, Clarkson & McDonough (2010). The files within the digital portfolio provided insights into the teachers' professional learning journeys and involved a specific aspect of their teaching of mathematics at the conclusion of their involvement in the PLC.

Focus Group Sessions

During the period in which the teachers were involved with the PLC, two group face-to-face sessions were held for teacher co-researchers and the university team in 2008 and three were held in 2009. The first session was an introductory meeting, with an emphasis on getting to know each other and exploring the SAPP protocols. The second and third sessions concentrated on exploring data that had been recorded and reflecting on them. Each teacher co-researcher presented a synopsis of their project to that date which resulted in free-flowing conversations based on the video clips the group had viewed. These conversations were recorded and used as a data source to enhance our understanding of the teachers' journeys. Each of the five sessions reported here were two and a half hours in duration.

Data Analysis and Processes

Several steps were taken to organise the audio data from the focus groups for analysis (Miles & Huberman, 1984). The process commenced with preparation of the digital audio-recordings of each focus group session. While the university team was listening to and transcribing the tapes, additional

researcher files that outlined the purpose of each session and the sequence of the activities were also on hand. These notes included key questions used to guide the discussions and indicated planned time-frames for different activities in each session such as input from the university researchers, free-flowing discussion and dedicated 'air time' for each teacher co-researcher to present their findings to the group. These notes helped to locate key aspects of each session.

The data set was inspected for each of the 14 elements of effective PLCs identified in the literature and presented earlier in Figure 1, using a process of content analysis (Cohen, Manion, & Morrison, 2007). These data were read several times and segments of text specifically concerning the elements were tabulated. These coded segments of text were reread against the specific elements for accuracy and, where necessary, mismatched segments of texts were either recoded or deleted. One researcher performed the initial data analysis. Later the other two researchers examined the data individually for consistency.

Limitations

We comment below on three key limitations of this study: the number of participants, the possibility that the participants' engagement levels were due to a Hawthorne effect, and the self-report nature of the data. Nevertheless, we argue that our results are robust enough to give new insights into a rarely acknowledged context for a professional learning community, teachers from across different schools.

The number of the teachers involved in the PLC was not large and therefore we do not seek to suggest that the results can be accepted as generalisations without further work being undertaken. However, the size of this study did allow us to gain a clear insight into the functioning of the group, which may well have been difficult with larger numbers. We have no doubt that, to some extent, there was a Hawthorne effect working in this study. However, it was operating to the advantage of the participants. To try out new ideas teachers need to have a certain feeling of confidence and excitement to override their normal apprehension at moving beyond their comfort zone. The more important question is whether, when the feelings of being part of something new and the Hawthorne effect dissipates, as it inevitably must, will there still be evidence of change in what the teachers do. We have detailed elsewhere some results that suggest that this study did elicit long term change (Scott et al., under review). Finally, self-reported data have been questioned in the literature. One criticism is that, without other types of supporting data, by themselves self-reported data can be unreliable. We agree to this to some extent, although we also note that the reliability of self-reported data, when they are carefully handled, may be more robust than has been traditionally acknowledged (see Desimone, 2009).

Results and discussion

In this section, we address the research question: *What elements of effective professional learning communities, identified in the literature, are evident in the focus group discussions in this interschool context?* Each of the fourteen elements of effective PLCs was considered in turn and, where there were multiple sections of coded text classified for the element, an example was provided representing the typical nature and quality of the focus group discussions. Figure 2 indicates the degree of evidence of each of the fourteen elements noted in one or more focus group sessions.

Figure 2: Evidence of fourteen elements of effective PLCs in focus group sessions

PLCs promote and operate effectively when members ...	Elements of PLCs demonstrated during focus group session/s
have shared values and vision	•
have formal and widespread leadership	•
have collective responsibility for pupils' learning	×
attend to school teaching-learning challenges	•
focus on student learning	•
take an inquiry stance	•
goal set and design action plans	•
make teaching more public	•
share experiences and expertise	•
are willing to experiment with alternative strategies	•
engage in reflective dialogue	•
engage in high depth interactions (about how students learn content, pedagogical principles, curriculum content, etc)	•
have mutual respect and support for teachers	•
have inclusive membership	•

• = explicitly stated; × = not evident;

In some cases described below, the selected excerpts provided evidence of more than one element and were used in preference to other entries to avoid repetition and present results concisely. Pseudonyms used to represent teacher co-researchers were the same as those used in related publications (Scott, Clarkson, & McDonough, under review).

Shared Values and Vision

During the recruitment phase, information letters about the PLC study that outlined our intentions were distributed to all teachers attending the CTLM professional learning program. This information seems to have been understood. For example, Tammy said:

My understanding of the project is that this is inbuilt into what we're doing with the [CTLM] program so it's not extra work it's more of a reflection on

the things that we're doing: A recording of what we are doing for personal reasons, or for your level, or even to inform your school.

Researcher 2: and to inform us too ... the original idea for the whole PD project [was] that there would be an evaluation component built into the program and this is, that the evaluation bit.

(Focus group meeting 1, April 2008)

Formal and Widespread Leadership; An Inquiry Stance; Goal Set and Design Action Plan

The overall aim of this research PLC study was to evaluate the impact of the CTLM project on teachers' practice in mathematics. One way in which we chose to do this involved supporting teachers in collecting and analysing data embedded in their practice. Hence, we provided some leadership and direction for teachers to undertake their own inquiries and action research by providing purposefully designed protocols, and interacting with the teachers.

The purpose of the first focus group meeting each year was to explain how to make sense of the protocols and how to collect and analyse data. In both years, one of the authors of this paper presented an example from her own teaching. She used this to explain possible ways in which the example could be annotated to show her reflections on each artefact embedded in the example. In the real operation of the study such reflections would be saved to memory sticks by the teacher / co-researchers. The following excerpt is an example of the nature of the discussions that took place to brainstorm goals and action plans.

Julie: I want to focus on my planning this year. So, will I record the process of my planning or the actual teaching?

Researcher 2: You might include both: for example, you might scan a copy of your planning then reflect on [it] after the lesson and record a voice over reflection about your planning and make some annotations on it, for example: 'next time I'll do this' Or, you might get a five- or ten-second video snippet of children who've actually got it but instead of recording their voices you might be speaking and saying these two kids have got the point.

Sharing Experiences and Expertise; Making Teaching More Public

During the second and third focus group meetings each year the teacher co-researchers shared some of their own data including video-recorded footage of their practice that had been collected as per the guidelines in the protocols. These elements were conditions for participation in this study and were made known to potential participants during the recruitment phase.

Inclusive Membership

As discussed earlier, all focus group meetings followed a similar format. There was designated 'air time' for each teacher co-researcher to share their work in progress and their data. This meant quite focused opportunities for free-flowing discussions.

Collective Responsibility for Pupils' Learning

In most cases there were two teachers from each of the schools. Yet although teachers shared experiences about what happened at "their" schools, the responses did not articulate a distinct collective responsibility for pupils' learning during any focus group sessions. This was the case even for the two teachers who shared the responsibility for teaching the same Year 3 class. Nevertheless, it would be unreasonable to make a judgment on the collective responsibility of these teachers sharing the class, given the limited discussions we had about this issue during our group sessions.

Common Teaching-Learning Challenges

Several teachers had taken a similar aspect of teaching as the focus for their action plans. These included using effective questioning techniques to facilitate discussion and to assist students to articulate their mathematical thinking. When Emma presented her achievements in November 2008 during group meeting 2 in the first year of the study, she read one of her reflective entries from her digital portfolio.

She had written:

*My foci for the SAPP research project were **effective questioning techniques** and **classroom discourse** and **reflective practice** [emphasis added]. I felt, and continue to feel, that these things go hand in hand. Effective questioning helps children to be more explicitly aware of what the teacher's focus for the lesson is and also helps them to see purpose in what they are learning. If they are being prompted by 'good' questions, the children are more likely to speak confidently about their learning and reflect on it in a number of ways including pictorial representations, written reflections, comparison charts, videotaped and audio taped oral reflections.*

A Focus on Student Learning

Each teacher had a focus on student learning; it was an expectation of the participation in their study. The protocols provided were designed to guide teachers through a process of identifying a specific issue or problem and developing an action plan to address it. However, we anticipated that, in some

cases, the teacher would modify the original focus and adapt their plans because of their self-reflection. This was the case for several teachers.

Karlee explained:

At first my focus was about giving children feedback about how well they [were] doing and in areas of improvement. But by the second one I found that I wasn't focusing on that I was focusing on different assessment types and using different ways to assess them. So I was filming/recording my conversation with children about their work samples. [One day] I realised that if I had just looked at [this girl's work sample about a division task] I would have thought that 'she doesn't know about division'. But [after my conversation with her] I learnt that she really did know how to split up those leftovers. So my focus did change. I'm realising that now I do use different ways to assist children rather than just looking at the work samples.

(Focus group meeting 2, November 2008)

Experimentations with Alternative Strategies

There were many examples of teachers experimenting with different tasks, activities and strategies that had been modelled in their classrooms or demonstrated to them during CTLM workshops. Clearly, they enjoyed the experimentations and their confidence in this area was high. Gary said:

I now feel more confident to put mathematics into our integrated topic, and I'm deepening children's understandings even in share-time. I ask the children to turn the mathematical understandings into raps to make it more interesting. Another time I got them to present what they knew as a radio interview.

(Focus group meeting 3, November 2009)

Reflective Dialogue

Most of the conversations between teachers indicated their abilities to reflect critically on practice. Many had thought about their focus repeatedly: individually, with colleagues at work and during our focus group meetings.

David said:

Over time, it dawned on me that I could be doing more [with the way I used the interactive whiteboard]. I asked the children, 'what are some of things that we've learnt about in this unit?' I handed out the pens and children were excited to come up and put something on the board that they had learnt. At the end, we had this page full of stuff and I thought I should save this. This is great. So I saved it and created a new folder. I realised that I was recording

data; this was assessment. From there I realised that when we revisited this topic, rather than me doing an introduction, I just pulled up the saved file. I said, 'remember when we did this? What can you remember about this?' The visual enabled a lot of them to recall their learning because they had enjoyed themselves when they were doing it. I think that too helps solidify it in their minds.

(Focus group meeting 3, November 2009)

High-Depth Interactions about Teaching and Learning; Mutual Respect and Support For Others

Following on from the last point, these teachers were not only self-reflective about their own particular foci, but they were supportive and genuinely interested in the experiences and insights offered by others. Here is an excerpt that shows the nature of the interactions between group members:

Tammy: In the beginning, I was asking questions with just one right or wrong answer so kids had that whole pressure of failure. Now with effective questioning I am [saying]: 'Show me what you did' and 'what do you think another way could be?' Or, 'what do you think?' and 'what are others' thinking?' Well, with the whole thinking, kids think 'thinking can't be wrong, so I'll share mine because that was what I was thinking' but if I said, 'how did you do it?' They might ask, 'what's the right way to do it?'

Kerri-anne: I've noticed the more able students have taken on asking questions themselves. I have them in mixed ability groupings. I partnered them with specific children and a lot of them will lead and ask questions of their partner, 'how do you know that?' They were going through one stage saying, 'Do I have to prove it to you?' 'Yes, you do!' But now, they're getting used to that and as you say, [referring to a comment by another participant, Emma], they're not thinking about just giving you a number. They know they have to explain how to do it and they are leading the way with other children as well.

Researcher 2: *Are you suggesting that they are actually copying what you do?*

Kerri-anne: *Yes, some of them! Yes, I am.*

Researcher 2: *Because you've got the effective questioning going yourself they are going to do it too. But if you're asking questions with a yes or no answer, that's what they'll do.*

It seemed that the viewing of the video clips enabled many rich and varied discussions.

Concluding Comments

In this paper we first identified important elements of effective PLCs common to studies conducted in the UK, US, Australia and Canada. We then analysed focus group discussions from a PLC study that we had conducted to see whether these elements were present. All but one of the fourteen elements were identified.

More particularly, findings indicated that participants were able to engage in high-depth interactions (Coburn & Russell, 2008) about student learning and pedagogical knowledge despite working in different schools, at different grade levels, and only meeting face-to-face on two or three occasions. Several factors, none of which was incidental, led to this success. It seems that in having teachers engage in a work-based inquiry whilst undertaking the professional development program initiated a cycle in which researching and teaching became more coordinated. We experienced the reality that others had theorised about (Feiman-Nemser, 2001; Grossman, 1995; Johnson, 2003; Malara & Zan, 2008; Meiers, 2007; Ruthven & Goodchild, 2008). The sharing of short video clips of classroom practice at these focus group meetings was central to the cycle and promoted rich and varied discussions.

Overall in this cycle, participants experimented with a variety of pedagogical strategies, deepened their content knowledge, reflected on their practice in multiple modes and on several occasions, both individually and collaboratively. As a result, we all established new collegial relationships and gained rich professional insights about teaching and teachers' professional learning journeys.

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