

# Learning While Leading Lesson Study



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**Abstract** This chapter presents research on how teacher developers in the United States learn to conduct lesson study. In contexts such as the United States where this form of professional development is relatively novel, few teachers have participated in lesson study, so leaders of lesson study groups do not have that prior experience to draw upon for facilitation. To investigate how facilitators learn to lead a practice that is new to them, two novice teacher developers were followed for a period of 18 months, from their first exposure to the literature on lesson study, through their participation in lesson study conferences, apprenticeship with an experienced lesson study leader, and into their independent conduct of lesson study groups. Data show that the facilitators learned to contend with such issues as teacher resistance, the use of time, and the shifting imperatives of directing teachers' work versus stepping back to give teachers autonomy in determining their collective work. The chapter concludes by suggesting that lesson study functions as a countercultural bulwark in the field of teacher learning by promoting a participant-driven, time-intensive form of

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professional development and that despite its complexity, teacher developers who are new to lesson study become reasonably skillful facilitators in a surprisingly short period of time if they have strong mathematical and pedagogical backgrounds.

**Keywords** Lesson study · Facilitation · Professional development

## 1 Introduction

As the demand for lesson study has expanded across districts and schools across the United States, the need for high-quality facilitators of lesson study has grown apace. In contexts such as the United States where this form of professional development is relatively new, few teacher developers have experienced lesson study as teachers themselves, so many are beginning to lead this complex practice more or less *de novo*. Even experienced professional developers may have little to draw on in leading lesson study, since it is meant to be teacher-driven and therefore unlike other forms of professional development more commonly practiced. Lesson study represents a significant departure from the modal kind of professional development in the United States that positions teachers as receivers of expert knowledge imparted from teacher developers and as such presents challenges for teacher developers who may never have experienced this kind of teacher learning themselves.

This chapter examines how leaders of lesson study learn to lead this complex form of professional development at the same time that they are learning to participate in it.

## 2 Background

Research from the last decade has provided images of lesson study in Asia as a model for the improvement of mathematics teaching and learning (Isoda et al. 2007; Lewis et al. 2006, 2009; Puchner and Taylor 2006; Stigler and Hiebert 1999). Lesson study has been shown to transform mathematics and science instruction in Japan (Lewis and Tsuchida 1998; Stigler and Hiebert 1999) and raise achievement of Japanese students on international assessments. A number of studies have demonstrated its efficacy in the United States (see, e.g., Isoda et al. 2007; Lewis et al. 2006, 2009; 2013; Puchner and Taylor 2006). In fact, lesson study was one of the only two programs of professional development in mathematics (out of 643) that led to statistically significant positive gains for students in the United States, according to the criteria of the US Department of Education Institute of Education Sciences

(Gersten et al. 2014). Accordingly, the need for articulating the work of facilitation is growing as the practice of lesson study expands in the United States and elsewhere.

Lesson study could be thought of as a form of “professional learning community,” or PLC. Professional learning communities are characterized by “shared values and vision; shared and supportive leadership; collective learning and its applications; supportive conditions for the maintenance of the community; and shared personal practice” (Hord and Sommers, 2008, p. 9). PLCs are frequently mandated in school district policies across the United States, although there is little specification about how they are to be conducted and what teachers learn in PLCs. Note that the definition of professional learning community above is somewhat silent about subject matter teaching and learning, so lesson study’s strong focus on children’s thinking and on mathematical content would render lesson study a very particular form of PLC.

Despite its ubiquity in policy documents, it is likely that US teachers and teacher educators have never taken part in the kind of teacher-driven, content-rich professional development that the PLC literature calls for. Contrast this with the experience of Chinese teachers, for example, where lesson study is the norm: “First, [teachers] have experienced the development process as novice teachers, then as experienced teachers, and finally as expert teachers. Thus, they can draw on their own experiences of professional development as teachers to mentor others at a range of professional phases” (Gu and Gu 2016). That makes the launch of lesson study a challenge, with facilitators having to lead a practice that they may have never witnessed or experienced themselves. This article studies the experience of two novice lesson study leaders in the United States to understand some of these challenges.

### 3 Theoretical Framework

#### 3.1 *Linking Theory and Practice*

Lesson study is especially promising as a form of professional development because it links theory and practice in a way that has eluded many efforts in the field. Feiman-Nemser wrote that “when teachers talk about their professional learning they rarely mention formal preservice or inservice courses. Instead, they talk about the experience of teaching itself, and the chance to observe and talk with other teachers” (Feiman-Nemser 1983, p. 151). This underscores the tension between the formal theory that teachers learn in preservice coursework and professional development and the experience of practice that they often find more vivid and compelling. *Practice* in education is often defined in contrast to *theory*: practice is the interactive, experiential dimension of teaching work. To better understand teaching *practice*, we turn to Andrew Pickering (1995), who has written about scientific practice to afford a consideration of practice as a generic construct. One definition Pickering provides is the notion that “‘practice’ is the generic one around which all that follows is

organized—practice as the work of cultural extension and transformation in time” (p. 4). In science, Pickering writes that “‘practice’ relates to specific, repeatable sequences of activities on which scientists rely in their daily work” (p. 4). Pickering’s definitions provide contours for thinking about practice in general and apply to the practice of teaching in specific.

Bourdieu points out that one essential aspect of practice is its integral location *in time* and that any analysis of practice or distance from it violates this essential feature. He writes:

Practice unfolds in time and it has all the correlative properties, such as irreversibility, that synchronization destroys. Its temporal structure, that is, its rhythm, its tempo, and above all its directionality, is constitutive of its meaning. As with music, any manipulation of this structure, even a simple change in tempo, either acceleration or slowing down, subjects it to a deconstruction that is irreducible to a simple change in an axis of reference. In short, because it is entirely immersed in the current of time, practice is inseparable from temporality, not only because it is played out in time, but also because it plays strategically with time and especially with tempo. (Bourdieu 1990, p. 81)

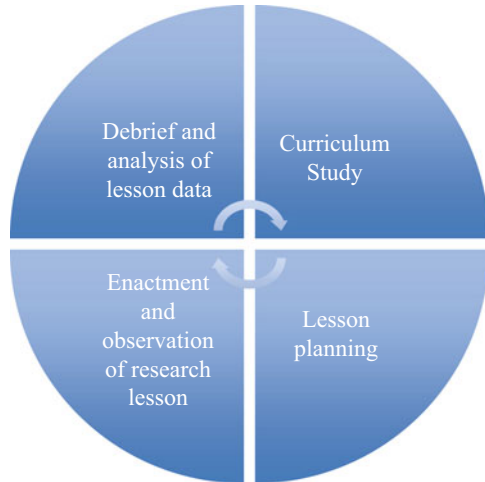
He goes on to describe the aspect of urgency that is integral to practice:

Urgency, which is rightly seen as one of the essential properties of practice, is the product of playing in the game and the presence in the future that it implies. One only has to stand outside the game, as the observer does, in order to sweep away the urgency, the appeals, the threats, the steps to be taken, which make up the real, really lived-in, world. (p. 82)

Nothing better captures one dimension of teaching practice than this description of urgency. Facing a classroom full of expectant, impulse-driven, curious children, one can be overcome by the sense of urgency that demands action in the moment. To be a teacher means to be required to respond to immediate and sometimes conflicting demands *right now*. In contrast, much of teacher education is conducted outside such demands, and this gives it a seeming lack of authenticity. The suspension of time and press for immediate action is what lends teacher education its sense of remove from the “real work” that teachers must do. Videotape, discussions of practice from afar, literature discussions—indeed, most forms of professional development for teachers—fail to include this sense of urgency. That distance from the press of time allows for the kind of deliberative reflection that is difficult to achieve in the presence of a room full of children. If the urgency that is a function of time is indeed what Bourdieu called “an essential property of practice,” then professional development experiences, at least some of them, need to include that sense of urgency.

We use this theoretical framework because lesson study can in some measure provide this sense of time and urgency so lacking in many other forms of professional development.

Figure 1 shows the lesson study cycle. Following what Pickering called the “specific, repeatable sequences of activities” (1995, p. 4) of lesson study shown in this cycle, lesson study’s apex, for the purposes of linking theory and practice, would be the research lesson, the actual teaching with real children in a chosen classroom. This is where the fruits of reflection, deliberation, and practical judgment are reintroduced into the test of real-time work. In this sense, lesson study inquiry is driven by practice and the standards to which its outcomes are judged are practice-

**Fig. 1** Lesson study cycle

based. It serves, potentially, as a bridge between theory and practice: teachers design a lesson based on their theoretical hunches about what will be productive with students, and they then bring that lesson to the test of practice.

### ***3.2 Lesson Study: Framed and Driven by Problems of Practice***

The lesson study process begins with teachers formulating a problem to study drawn from their own practices. Teachers' planning of a lesson is likewise anchored in the specifics of teaching work, blending teachers' knowledge and experience with theory from relevant academic and professional disciplines. Child psychology, research mathematics, philosophy, and other disciplines are drawn upon in the planning of the lesson, but unlike other professional development efforts, these disciplines do not drive the lesson, but rather serve as resources for teaching and learning in the context of a single lesson designed around a real problem of practice. The lesson study group continues its investigation by trying out a lesson with children in the presence of other teachers. The teachers reflect on the outcomes of that lesson using evidence of learning as the criteria of reference. The iterative steps that follow—reflection, redesign, teaching, and reflecting again—are also anchored in the practice of teaching as reference points, not some theoretical framework, policy document, or disciplinary lens, although all these may be woven into the teachers' appraisal and understanding of the lesson. Teacher education often approaches the improvement of teaching piecemeal, where a single dimension of teaching work, or one relevant discipline, is addressed. So, for example, in preservice teacher education, students typically take courses that focus on social science disciplines meant to have applications in teaching generally. Professional development days are often

comprised of single-session workshops treating either a new policy affecting teachers (e.g., suicide prevention, as currently proposed by Michigan legislators) or a new technique (reciprocal teaching) or a new resource (a new mathematics textbook). These workshops are divorced from practice in their presentation and leave it to the teacher to apply to their work. Even long-term, discipline-rich professional development interventions such as that described by Grossman, Wineburg, and Woolworth (2001) do not take practice as a point of departure. In the professional development effort described in this article, teachers gathered to read together in the fields of English and history over a period of years. How teachers were to make use of this experience in practice, however, was left unspecified. Like other teacher education efforts, teachers' translations of such inputs into their practices are left for teachers to figure out on their own.

Lesson study provides opportunities for teachers to make use of educational research in the crucible of teaching practice, but also to generate knowledge about teaching and to share that knowledge through various pathways of dissemination. This constructs a role for teachers to be both consumers and producers of knowledge about teaching and casts different kinds of educational research as relevant and useful.

The very nature of the lesson study process presents challenges for facilitation. The fact that lesson study incorporates live practice means that facilitators cannot script complete sessions in advance. Much of lesson study is driven by teachers, so the preparation for sessions is relatively indeterminate. Since teachers set the agenda based on their own assessments of their students' needs and their own sense of their teaching challenges, facilitators have to follow the lead of teachers in the moment, sometimes as it is being formed. Contrast this with the kinds of professional development that most facilitators experienced themselves: preset stacks of slides, activities designed in advance, and structured discussion topics with a specified end in sight. Thus, because so much of lesson study is entwined in experience, and because teachers' interests and needs drive the process, facilitators and teachers have to co-construct their competencies as their time together unfolds. These competencies for facilitation are unlikely to have been developed in other forms of professional development that novice lesson study facilitators have experienced themselves. Yet the rapid increase in demand for lesson study around the United States has meant that facilitators inexperienced in this form of professional development are being called upon to lead lesson study groups. This study follows two novice lesson study facilitators to better understand what such novice facilitators have to contend with and how best to support them.

## **4 Data and Methods**

This chapter presents a case study of two facilitators learning to conduct lesson study, which was, for them and for the teacher participants, a novel form of professional development. For the purposes of this investigation, a multiple-case

case study (Yin 2009) was preferred. Studying how novice facilitators conceptualize and carry out the work of lesson study involved close readings of mostly qualitative data collected over time. Two facilitators were followed over a period of a year for this study.

The two facilitators who are the objects of this multiple-case case study are experienced teachers and both new to lesson study. Both have a solid background in mathematics. Karl<sup>1</sup> is a lecturer in a college mathematics department and coordinates the mathematics education classes for teachers. He has worked for 18 years in a summer math program for middle school and high school students. Karl has a BA and an MA in mathematics. Louis was a high school mathematics teacher for 12 years and taught middle school mathematics for 1 year. He currently works as the mathematics coordinator in a student resource center at a public university. Both began their studies interested in other fields but gravitated toward mathematics. Both first learned about lesson study as doctoral students in a course on teacher learning; Karl attended a national lesson study conference where he observed a very established lesson study team's research lessons followed by post-observation panels that included commentary from renowned lesson study scholars from around the world. Both were apprentices to an experienced lesson study leader, attending several days of lesson study with the groups of teachers that they would eventually lead themselves. Those lesson study days focused primarily on curriculum study (*kyozai kenkyu* in Japanese); only Louis was able to attend the research lesson for a middle school group. Both Karl and Louis were novice facilitators in lesson study although both had some experience working with teachers in professional development forms of different kinds. Louis had served as the mathematics department chair at his high school and in this capacity led teacher learning in different formats. Karl leads a cohort of instructors in an intensive summer math program for adolescents and in that role is responsible for ongoing informal professional development during the summer program. Both work in a university where the student population is 36% minority and academically underprepared relative to undergraduates in peer institutions across the state.

Data for this study were collected in three waves. The first wave of data collection occurred as facilitators were apprenticing with an experienced lesson study facilitator. This was for a middle school mathematics department's first exposure to lesson study, and they completed a full cycle. The facilitators' observation notes, transcriptions from meetings, and annotations from readings about lesson study were collected during this phase.

The second wave of data collection occurred as facilitators were together leading middle school and high school lesson study groups through a cycle of lesson study, the second one for the middle school teachers. Facilitators' session plans, transcriptions from meetings, photographic records of inscriptions during sessions, participants' evaluations, and interviews with the facilitators were collected. The third wave of data collection occurred during the facilitators' third cycle of lesson study.

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<sup>1</sup>All names in this article are pseudonyms.

By “cycle,” we mean a complete round of curriculum study, lesson planning, research lesson, and debriefing phases of lesson study, as shown in Fig. 1 earlier.

It is important to note that the middle school and high school teams of teachers were composed of entire mathematics departments in a single school district, and these teachers were new to lesson study as well. Teachers on these teams did not choose to participate in lesson study; they were mandated by their administrators to attend as part of their required professional development.<sup>2</sup>

Data sources included verbatim transcriptions of interviews, photographs of inscriptions during lesson study sessions, scanned feedback forms from teacher participants following lesson study sessions, verbatim transcriptions of facilitator meetings, and audiotaped recordings of meetings. Multiple perspectives on individual lesson study sessions were solicited from participating teachers, from observers of lesson study sessions, and from the facilitators themselves as a way to triangulate the data. All data were uploaded into atlas.ti, a software program for qualitative data analysis. These data were coded in atlas.ti using a cross-case synthesis method (Yin 2009) where trends and patterns were noted and labels assigned to clusters of teacher developer actions and thoughts. The first coding was done using open coding in an iterative process (Corbin and Strauss 2008); as patterns emerged, codes were combined and subsumed into thematic codes. Focused coding was then conducted, re-examining the data using these thematic codes.

Below in Table 1 is an excerpt from an observer’s field notes recording a conversation of apprentice facilitators’ observation of a lesson study session. Alongside those notes, the original open codes are recorded.

Analytic memos were written as the data were coded. Following this process, the themes of facilitator learning were identified, and these are shared in the Results section below. To better understand how novice facilitators of lesson study learn to conduct this form of professional development, we report their experiences in their own words to preserve their standpoint as much as possible. These excerpts of facilitators’ thoughts are offered against the backdrop of records of practice (lesson plans, teachers’ comments) to provide another angle on facilitator learning.

## 5 Results

A number of themes emerged as issues to contend with as these two leaders learned to lead lesson study. We group these themes into three broad categories: teachers as learners, facilitators as learners, and the nature of the lesson study process itself. For the most part, we report these findings in the voices of the facilitators themselves, so that we can understand how they learned to conduct lesson study through their eyes.

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<sup>2</sup>Some lesson study advocates recommend that participants volunteer to take part to ensure buy-in; in Asian countries it is common that an entire faculty or department participate in a lesson study group.



**Table 1** Excerpt of data with open codes

Apprentice facilitators' discussion, transcribed	Open codes
Experienced facilitator: What did you see teachers working on during this session?	
Sharon: I don't understand the issue that they're finding their students talking. Is that an issue with the students or an issue with the teachers? My question here at the [facilitators'] table, Could an obstacle be the kind of lesson plans they have to turn in? We were persistent about getting them to interject open questions. Tina needs a clearer idea as to what her focus should be. Because what they're faced with is simple targets and not these deeper questions. That seems to be where they are. In order for us to understand to help them see, we need to understand what their obstacles are	Teacher buy-in Immediate- vs long-term External conflicts
Principal: Targets are investigative approach and vocabulary	District support Mismatch
Sharon: They saw content as interfering with practice	Mismatch Teacher buy-in Math content
Karl: Teachers kept hammering away at dependent and independent variable	Math content Aims
Mira: Joanie asked them about that. Corey said this is a foundational concept. [We need to] speak to aims and targets	Math content Aims Teachers' struggles
Sharon: Why is it important? It allows for the same picture	Math content
Mira: It is important to know that the number of customers on the price	Math content
Sharon: I was upset that I didn't suggest to Corey to give a piece of the lesson as a "do now"	Withholding/ stepping back
Mira: Should we have spent more time at the front identifying the content and the practice goals in a more careful way? One, it's a good practice. It might have helped us guide them a little more. What is it we want to get out of this lesson?	Math content Aims

## 5.1 Teachers as Learners

### 5.1.1 An Overview of the Lesson Study Cycles

In the three cycles of lesson study conducted by these novice facilitators, teachers chose to work in grade level and topic teams. They spent almost a full day determining the mathematical topics that they wanted to pursue and ended up dividing into three teams to pursue different mathematical topics for study; these included exponential growth and decay, systems of equations, and properties of similar triangles. All three teams chose to work the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers 2010), Standard for Mathematical Practice #1: "Make sense of

8:00 AM	<ul style="list-style-type: none"> <li>• Introduction and gather</li> <li>• Review the process of Lesson Study</li> <li>• Determine two objectives               <ul style="list-style-type: none"> <li>○ Overarching math practice to study (student discussions)</li> <li>○ Mathematical concept (exponential growth)</li> </ul> </li> </ul>
8:30 AM	<ul style="list-style-type: none"> <li>• Gather resources on mathematical concept</li> <li>• Explore other textbooks on approaches of presenting mathematical concept</li> <li>• Determine positives and negatives of different approaches</li> <li>• Break</li> </ul>
9:00 AM	
9:30 AM	<ul style="list-style-type: none"> <li>• Begin creating lesson plan               <ul style="list-style-type: none"> <li>○ What is the focus of the lesson?</li> <li>○ What do you want students to gain from the lesson?</li> </ul> </li> <li>• Focus on the Launch               <ul style="list-style-type: none"> <li>○ How will you engage students?</li> <li>○ What materials will you use?</li> </ul> </li> </ul>
10:00 AM	
10:30 AM	
11:00 AM	
11:30 AM	Lunch Break
12:00 PM	
12:30 PM	<ul style="list-style-type: none"> <li>• Continue working on lesson plan               <ul style="list-style-type: none"> <li>○ Write three questions that will provoke student thinking.                   <ul style="list-style-type: none"> <li>▪ Come up with ways students will answer each question</li> <li>▪ How will you respond to their answers?</li> </ul> </li> </ul> </li> <li>• How will you assess if the students achieved the expectations of the mathematical concept?</li> <li>• How will you determine if the lesson achieved the overarching objective of the study?</li> </ul>
1:00 PM	
1:30 PM	
2:00 PM	
2:30 PM	
PM	

**Fig. 2** Facilitator's plan for a lesson study session

problems and persevere in solving them,” and studied methods for developing students’ capacity to hold rich mathematical discussions as a way of working on this practice. The middle school team was additionally interested in developing real-life contexts to support the textbook lessons they were using.

Half-day and full-day sessions were then spent studying the mathematical topics by examining textbook and supplementary curriculum materials on the topics chosen; often the teachers did the mathematics problems themselves and talked through how they completed them or what they anticipated would be difficult for students. Lesson plans were constructed based on adaptations of existing textbook materials, and these adaptations were especially aimed at supporting rich mathematical discussions of the textbook lessons chosen. Research lessons were taught when each team determined their plans were finished enough to be enacted; the number of days for planning varied by team. Figure 2 shows a facilitator’s schedule for one lesson study day.

In Fig. 2, we can see how the facilitator tried to lead by structuring the day and the function of different time segments of the lesson study day while at the same time leaving substantive mathematical and pedagogical questions to teachers to determine. For example, at 1:00, the facilitator directs teachers this way: “Write three questions that will provoke student thinking. Come up with ways students will answer each question. How will you respond to their answers?”

### 5.1.2 Teacher Resistance

The facilitators frequently reference the issue of teacher “buy-in” versus resistance. Little of value can be done with participants who do not perceive the time spent in lesson study as worthwhile; because lesson study departs in significant ways from teachers’ other experiences in professional development, resistance is a common concern and not easily managed or dismissed:

Buy-in is a huge issue. I feel like I should meet [the teachers] where they are instead of trying to persuade them. I’m feeling better about managing that and breaking down some resistance that was there in the fall. I backed off a lot then because I could tell they weren’t welcoming. (Karl, Wave 3)

The novice facilitators had few tools to manage resistance. As Grossman et al. (2007) have documented, teachers have a surprisingly thin understanding of resistance and a correspondingly paltry skillset for working with resistant students. This is in contrast with therapists who, during their training, rehearse a carefully defined set of strategies for handling client resistance.

### 5.1.3 Comfort and Discomfort

Related to resistance, these novice facilitators identified areas where teachers exhibited “comfort” and “discomfort.” For the high school lesson study group, doing mathematics together was a comfortable exercise where teachers felt confident and authoritative. As a group, the teachers found doing mathematics for themselves to be enjoyable and non-threatening.

For the middle school teachers group, doing mathematics problems together was not uniformly comfortable for all participants. The middle school teachers include two special education teachers who work closely with the mathematics teachers, embedded in certain classes and providing external support for other classes. For this group, doing math was positive for some and off-putting for others:

This session went a lot better, it went well. The teachers liked the math problem a lot. A couple of the special education teachers seemed less engaged by it but one new one was really into it in small groups. The “How many dots?” problem generated a lot of discussion. It was simple enough but you couldn’t just count it easily. Finding different ways to count the number of dots—the problem was good, not sure what appealed to them: math, comfort zone. Maybe what I was taking as them not into it in the last session was actually their discomfort. (Louis, Wave 2)

Exactly what we did this last cycle, especially the high school teachers, they see the value in it and willing to push it, new mathematics, into changing their teaching to look for ways to improve their teaching. The middle [school team], it was better than it was, but I'd be kind of surprised if they wanted to do it again. The bulk of the discomfort I mentioned early came from their lack of knowledge came from the mathematics. A lot of the reform ideas are very difficult for the special education kids. (Karl, Interview)

This last quote touches on a number of issues that appear frequently for these facilitators. Teachers' content knowledge in mathematics varies across grade levels, individuals, and certification areas. The middle school lesson study team for this school is comprised of mathematics and special education teachers, so the special education teachers' background in mathematics is sometimes less than that of their subject area counterparts. But in his comments above, Karl is also pointing to the fact that special education teachers in his team often lobbied for more skills-based goals for their students and were less committed to working on mathematical practices for complex, abstract, nonroutine problem-solving that drives much of the agenda in lesson study. The facilitators did not challenge this notion directly. This remains a delicate issue for facilitators and teachers alike to navigate and one that the field of mathematics education has perhaps not addressed sufficiently.

Doing mathematics together affords teachers the opportunity to enhance their own content knowledge, and it also can provide a shared experience of teaching and learning that the group can refer to in their ongoing work. Facilitators also used these opportunities to model mathematical teaching practices that they thought were relevant for the teachers in these groups. Doing mathematics together can also occlude the focus on student learning, and invite a retreat from work on teaching, especially for teachers who can easily get absorbed in the pleasure of doing mathematics for themselves without necessarily linking that mathematical work to what students need. Facilitators vacillate between those conflicting goals.

#### **5.1.4 Teachers' Content Knowledge**

Related to the doing of mathematics together as one of the lesson study activities, facilitators gave attention to teachers' content knowledge in a number of different ways. One approach was to bolster content knowledge for some teachers through the doing of math problems together; conversely the facilitators struggled with how much time to devote to this aspect of their sessions:

Session 4 felt short in terms of their time expectations; discussion of dot figure [math problem] took up too much time, should have used time more towards the lesson planning. (Louis, Cycle 2)

#### **5.1.5 Teachers' Goals**

The novice facilitators frequently mention teachers' aims, both for the immediate lesson study lesson plans and in mathematics instruction in general:

[I'd like] for teachers to think more about what they're doing in their lesson plans that will help their students to do better, rather than just doing problems to get through them. (Louis, Wave 3)

Facilitators expressed their desire for teachers to set their sights on student learning beyond immediate activities and textbook pages. Because so much of the lesson study sessions were spent in lesson planning, this issue was a constant for the facilitators:

A big problem is the product versus the process. A lot of teachers feel like they just want the product—the lesson plan—and that the process is only to achieve that perfect lesson plan versus what is that lesson plan doing in their classroom? How is that affecting the students within the classroom? There's still that challenge—the more that we do that, the more the teachers see that it is about what we're doing with the lesson plan, not the lesson plan itself. (Louis, Interview)

## 5.2 *Facilitators as Learners*

### 5.2.1 Time

Facilitators address the number of issues related to time: time management, time shortage, scheduling, and use of time across all the academic year. It is evident that time is a primary issue for teachers and facilitators in many different contexts. In the quote below, we see a facilitator wrestling with time at the intersection of logistics and teacher engagement: is a whole day of lesson study work more productive or a half-day when students are released for the afternoon?

In the first cycle I felt there was a lot of teacher pushback, then that was gone by the second cycle.

Interviewer: What was that about?

Some logistical stuff that we didn't have any control of or knowledge about. The second time around they were more willing. Timing issue was very big— after a full day they were not in great shape. Teachers are getting comfortable with us, trusting us. (Louis, Wave 3)

Teachers feel like the bigger block of time lets them be more productive instead of start-stop. They like working a full day instead of half day when they've been teaching in the morning. Compared to their old [professional learning community format] it's better to have a longer block of time to work. A whole day keeps us focused. (Karl, Wave 3)

Scheduling time for teachers to work together in lesson study is not a trivial issue. US teachers spend more time with students than their international counterparts (Organisation for Economic Co-operation and Development 2014); this leaves scheduling time for professional development a challenge. Louis and Karl were working in a district that was unusually generous in granting time for professional development, but the schedule was not established in advance or a norm for the entire district; thus, for Louis and Karl, carving time out for teachers to attend lesson study sessions was an ongoing concern.

Time plays out in a number of different ways in lesson study. Facilitators noticed that teachers are, in earlier cycles, dismayed at the idea of spending hours planning a single lesson and then later on disappointed that they don't have more time to plan:

Teachers felt the process was rushed, in their prebriefs they felt they didn't have enough time to plan so didn't want to be judged. (Louis, Wave 2)

### 5.2.2 Teachers Noticing the Use of Time

Facilitators found that teachers often noticed how time was used during the lessons they designed. These excerpts from a meeting with both facilitators following a lesson study cycle include multiple mentions of teachers' noticing of time use:

The teachers didn't get through an ambitious worksheet and the creation of the manipulatives took a very long time and that took a long time, that took 13 minutes.

Good stuff came from using the manipulatives. That chunk dominated the instructional time.

The discussion of similarities took only 5 minutes. This led to interesting questions about how to handle this.

The other group also ran out of time in their lesson. We should have seen this as a two-day activity.

The algebra group planned something if they had too much time and if they didn't have enough time!

They only got to the first exit ticket, and they didn't feel they had enough time for student discussion. (Karl and Louis, Wave 3)

### 5.2.3 Progress Over Time

As must be clear from the quotes across this article, the facilitators sense improvement from cycle to cycle: teachers seem increasingly engaged; the facilitators find their footing and trust themselves more. By the third cycle of lesson study, facilitators felt more comfortable presenting less, expressed more confidence in their ability to respond to teachers in the moment, and received positive evaluations from teachers and administrators:

In the beginning I didn't, I was treating it like a direct instruction situation. In that first cycle with [the high school team] I found myself talking much more, I felt like I had to describe the process, going through this and seeing that it wasn't a zero in terms of what they learned but it wasn't where they needed to be. In the next cycle that first general info was out there already but by them doing it and me being in those smaller groups and just facilitate instead I thought that they learned more and they did as well. It was weird, because I haven't done those professional development things I just went to a place where it was more traditional and then later it became a bit more social, learning by doing, taking myself out of it, monitoring it. (Karl, Interview)

I feel more confident.

Interviewer: What's changed?

Going through another cycle, seeing that it gets better. It felt like a real cycle instead of showing them what a cycle looks like. Being more comfortable with the cycle itself, with the pieces of the cycle, the teachers have been through the cycle at least once. It's like teaching a class for the second time, you don't know where the trouble spots are going to be but then you start seeing that. I knew where important spots were in the process for me. Part of the discussion in the algebra group was about the script and they didn't have set questions that they wanted to pose. The second time around I had more of that script and I had questions I wanted to use to get them thinking. You know what will be trouble for them and you know how to direct them there. (Karl, Wave 3)

## 5.2.4 Supporting Teachers' Disclosive Acts

The facilitators noted particular turning points in the lesson study process that seemed to portend increased teacher engagement and positive disposition toward the work together. These included teachers' disclosive acts, especially around issues that are socially risky. Karl reported that one of the most respected high school teachers shared that he learned something new in the mathematics of the lesson plan; another high school teacher said that she had never fully understood the concept of geometric mean until the research lesson:

Pam said, "I never knew what geometric mean meant." The algebra team was working on exponential growth and decay. They created a worksheet for the students to have. Laura had never thought through how the formula came from doubling repeatedly. (Karl, Wave 3)

These disclosures signal a new level of safety, engagement, and potential for authentic community (Grossman et al. 2001), and they arose consistently during the post-lesson debriefing sessions. Teachers are traditionally supposed to be experts in subject matter knowledge, so sharing what one doesn't know as opposed to trumpeting what one does know is a delicate act. Teachers talked about the mathematics they didn't know well, and the pedagogical skills they needed to develop, and these admissions clear the way for serious work on instructional improvement. This demands an unusual form of expertise from facilitators. At times, facilitators have to themselves convey a sense of humility to make a safe space for teachers to express doubts and their lack of knowledge; at other times facilitators have to demonstrate deep knowledge of mathematics and of pedagogy to be credible leaders. Miller and Stiver (2015) have described how disclosure fosters a feeling of connectedness; in the context of teacher learning, it also opens possibilities for teachers to work on aspects of practice that need improvement. Perhaps because lesson study includes real-time co-located teaching experiences, disclosive acts are more likely to surface than in other forms of professional development.

This is related to our next category, withholding or stepping back.

### 5.2.5 Withholding or Stepping Back

A central question for facilitators surrounds how much to direct teachers in lesson study:

I found it hard to find the balance between observing and interjecting. I thought it was extremely difficult, I really felt tension, didn't feel comfortable suggesting things. I have to work on that for myself. (Louis, Wave 1)

As they led subsequent cycles of lesson study, the facilitators continued to be concerned about when to be directive and when to allow teachers to set the direction more, but they found ways of managing this tension more productively over time. For example, Karl explains that he grew in this with time, and he developed analytic categories for determining when to steer the conversation:

Once we were in smaller groups then it felt like I could contribute more naturally. I put as much as I could into it. I didn't totally take myself out and do their thing. I really felt like I put myself in the team as one of them, that felt much better and much more natural. They responded to that with much more enthusiasm than I'm telling you in this process. In terms of the mathematics I didn't hold anything back, that was pretty clear to hold out and correct, but in terms of how to do something mathematically I would let them go with it. (Karl, Interview)

In lesson study, it is taking a step back—letting the teachers do the talking, letting the teachers figure things out on their own. With the professional developments that I've gone through, they don't really let us figure it out. They let us work through the worksheets and all that and then they would say "This is what you thought," and it wasn't really letting the teachers/us figure it out for themselves. For the lesson study, we lead the teachers but let them go where they need to go and it was always hard when you see that the teachers are going into the wrong direction, to tell them that they're doing that—you kind of let them go to where they want/need to. We try to refocus them but having to tell them "We need to do it this way. . ." is difficult. (Louis, Interview)

This challenge is directly related to the fact that lesson study positions teachers as leading the agenda and driving much of the content. Facilitators struggle to define for themselves a form of leadership that is, on the one hand, credible and valued, and on the other, respectful of teachers' choices in directing the process.

### 5.2.6 Sources of Learning About Facilitation

When asked how they learned to conduct lesson study, the facilitators mentioned books and online resources about lesson study specifically; they did not originally volunteer the observation or apprenticeship experiences as sources to draw from nor did they mention anything at first about their own participation in professional development experiences prior to this. During the first cycle, Karl asked if there was a manual he could follow for conducting lesson study. By the third cycle, he noted that teachers had developed foci for observing research lessons, something that he wished to learn from a manual in the first cycle:



I did read on how to facilitate, there were some good texts on how this should be done. Catherine Lewis' book, another one was a math facilitators' guide for lesson study. Those texts as well were suggesting that the real value is going to come from them, taking ownership, leading it. Learning from their mistakes, seeing what didn't work, was much more powerful. (Karl, Interview)

### 5.2.7 Learning from Experience

The quote above underscores the extent to which these facilitators learned from experience as much as they learned from manuals, observation, etc. For example, in planning for the second cycle of lesson study, the experienced facilitator suggested that Karl and Louis have to do less talking and frontal presentation of video than they had originally planned, but they were reluctant to leave their planned presentations. Their post-hoc analyses of those presentations, however, convinced both Louis and Karl that it was more productive to work with teachers in curriculum study and lesson planning, rather than talking about those things to them:

How closely we worked with the two groups this time made me learn more, in it the whole time. As opposed to the first time where I was just telling people about it, not getting a chance to get my hands in. Doing more observation in the first cycle, it was a lot more of lecture, do it, lecture, do it, lecture, do it. This one we just got down to it, being hands on. (Louis, Wave 3)

[The teachers] were better when they were doing the work and not just hearing about it. (Karl, Wave 2)

The notion of learning from facilitation experiences, then, operates here on two levels: the facilitators are convinced that teachers learn more from their hands-on, experiential work in lesson study, and we also see that the facilitators themselves draw conclusions from their own experiences in conducting lesson study sessions as opposed to being told by a more veteran facilitator.

### 5.2.8 Need for Resources

Facilitators voiced the need for locating appropriate resources for team members to study as part of the collaborative curriculum study work with their teams. Louis notes that this is especially true in attempting to move from facilitator-driven modes of delivery to more teacher-driven work, where the collaborative work in lesson planning depends on the presence of rich materials to consider:

We didn't do a lot of the front-end lecturing. What I did start with was taking a look at those other textbooks. We need a lot more curriculum resources to share, draw from, compare. (Louis, Cycle 3)

These facilitators are currently based at a university; this means that they teach and are immersed in mathematics content—but it also means that they are somewhat removed from school resources, practices, and policy. On the other hand, both of

these facilitators have extensive recent experience teaching middle and high school mathematics classes. Textbooks, standards, accountability structures, and the like are the currencies teachers trade in, and these two facilitators have to search out such resources and be familiar with them:

We then showed a lesson plan from the Chicago lesson study group. It'd be great to have a lesson plan with a video of it. They were intimidated by it, it's pretty top-heavy with lots of rationale. Rationale was important though because they need to step back from getting through activities and looking instead at learning goals. They were a little taken aback, but that's what's we were trying for. The Rubicon Atlas lessons from Oakland County [provide materials for] lesson planning. (Karl, Cycle 2)

Similarly, Karl mentioned that he is now on the lookout for “good math problems” to use with the teachers in his lesson study group.

### ***5.3 The Nature of the Lesson Study Process***

#### **5.3.1 Collaboration**

Above we noted that the facilitators devoted the bulk of their time to collaborative lesson planning and found that the more they talked, the less the teachers were engaged. Both Karl and Louis said that time and again they learned to have teachers “doing” rather than “talking about” lesson study:

Out of both sessions what stands out the most is what teachers seems to value most is collaborating with each other rather than us leading it and us spoon-feeding it. (Louis, Wave 2)

Despite the fact that teachers originally could not imagine spending days planning a single lesson, they came to value this part of lesson study a great deal. Many teachers commented in their post-session evaluations that creating lesson plans together and analyzing the research lesson together were the most valuable aspects of lesson study.

This collaborative planning also became a significant site for facilitator learning. To give one example, we look to the lesson plan created by a high school team working on systems of equations. The team chose to adapt an existing lesson, and make explicit some of the moves for expanding rich mathematical discussions, one of their stated goals as a team. To do so, the team showed a video to the class about the prices of tacos and drinks as planned in the original curriculum materials, but the team then spelled out some of the supports for sustaining mathematical discourse in the lesson:

Teacher will direct students to brainstorm answers as to what they think one taco and one drink costs. Teachers will then write the data on the board about the possible answers the students come up with. Each group is required to get at least three answers and to share one of them. Students will graph the points on the board. (From High School Systems of Equations Research Lesson Plan, Wave 3)

The lesson continues, with students considering a second scenario with different prices of tacos and drinks. Again, the team designed this to mirror the above plan: watch a video, talk about it, and then have students share possible prices for combinations of tacos and drinks.

The team then designed questions for students to talk about in small groups:

What do you notice about the data?

What do you notice about the graphs? Compare and contrast. Points of intersection?

How much does one taco and one drink cost? (From High School Systems of Equations Research Lesson Plan, Wave 3)

These were simple additions and edits to the lesson, but significant for the group of teachers who were beginning to work on incorporating more student-driven discussion in their mathematics lessons. Although Karl, the facilitator, had some concerns about the plan, he left it for teachers to discover those concerns for themselves during the research lesson and post-lesson analysis.

### 5.3.2 Centrality of the Research Lesson

Karl felt that he had not fully apprenticed to lesson study without having observed the research lesson that grew from the team's planning. He also felt that the research lesson experience propelled the rigor of lesson study for the high school teachers in a way that other phases of the lesson study cycle had not:

Those debriefs felt really good, their observations were dead on, what was lacking [in the lesson plan] came out with the discussion. (Karl, Wave 3)

In their lesson on systems of equations, high school teachers saw in the research lesson, and talked about in the post-lesson analysis session, the fact that students struggled to give words to describe the visual representations they had generated; that students had few tools for justifying mathematical assertions; that visualization might have helped students in advance of graphing and describing their thinking. (From Karl's notes, High School Lesson on Systems of Equations, Wave 3)

These were all concerns that Karl anticipated, but teachers saw them with their own eyes through the experience of the research lesson.

### 5.3.3 Administrator Support

Louis and Karl found that administrators were supportive of the lesson study work. Principals, an assistant superintendent, and the curriculum specialist attended sessions, sometimes for long periods, and often contributed substantive comments. The structure of lesson study makes this kind of cross-occupational participation possible, allowing for all to collaborate around the specifics of instruction:

[The assistant superintendent] and [principal] came for parts of the research lesson. [The principal] was active with the high school group, added to their lesson plan. He also came for the hybrid group and did the same thing, gave suggestions, more management things than math-specific. [The assistant superintendent] participated too, has been to every session, participated in video discussions. (Karl, Wave 2)

[The curriculum specialist] has been a support person there, very helpful. Her goals mesh with ours. . . . That lesson didn't have an explicit learning goal, and people then started to ask, What were we going for? She kept hammering away at that. She was hammering on a single immediate learning goal of the day/lesson. (Karl, Wave 3)

## 6 Discussion

This chapter began with the proposition that lesson study might provide a bridge between theory and practice in a way that could support teacher learning. Here we return to this question, examining the findings to see whether and how facilitators and teachers wove together theory and practice in the context of lesson study.

In an article by Arthur Bolster (1983), he noted that “most research, especially that emanating from top-ranked schools of education, construes teaching from a theoretical perspective that is incompatible with the perspective teachers must employ in thinking about their work” (p. 295). This same idea has been voiced repeatedly and over the decades, not only by researchers and journalists but by teachers as well. Lesson study has the potential to draw upon theory to infuse practice, but in a way that seems relevant to practice in the moment.

In the three cycles of lesson study analyzed in this study, teachers and facilitators explored a number of mathematical and pedagogical themes in great depth, and these explorations were in service of the research lessons that were being planned and eventually taught to students. One of the high school groups developed a lesson on comparing the altitudes of similar triangles, and in the planning phases of the lesson study cycle, the group worked on how students could use physical models to develop the ideas in the lesson, what questions the teacher would pose to elicit high-level conversation among students, and how the notion of geometric mean could come up in discussion. These are the kind of “theoretical” tropes that, in another professional development context, may feel forced or stunted or simply irrelevant for what teachers feel they need. Instead, the team observed the research lesson and saw, immediately, how their plans pan out. This constitutes, perhaps, the kind of linkages between theory and practice that for so long have evaded teacher education: teachers planned a lesson based on theories about the use of manipulatives, student discourse, and co-construction of mathematical ideas and then saw how they fared in practice. Lampert and Clark (1990) claim that “the way in which teachers acquire and use knowledge is contextual, interactive, and speculative” (1990, p. 21), and they suggest that knowledge about teaching is best acquired situated in practice. Lesson study can step into this breach, but through the kind of facilitation that allows teachers to shape the work, to choose the topics to research and design. Thus, understanding how this kind of facilitation can be cultivated is important.

A significant number of the recurring themes for the facilitators in learning to lead lesson study arise in the interstices of theory and practice: the use of time, emotional comfort and discomfort, stepping back to allow teachers to lead, addressing teachers' buy-in, and disclosure. The interactive, real-time nature of lesson study brings these

issues to the fore; these issues may be less salient in forms of professional development that remain more in the realm of theoretical explorations of teaching.

Data from this study point to the various types of knowledge, skills, and dispositions that facilitators of lesson study must possess to implement this structure successfully. The facilitators have to be comfortable and conversant in many facets of school life, which is a world unto itself. They have to be familiar with the curriculum and understand the demands and affordances of classroom teaching. The facilitators had to interact with teachers in ways that led to growth, but also work with administrators and content specialists who are instrumental in scheduling and supporting the work of lesson study. The facilitators must have deep mathematical knowledge and wide-ranging pedagogical know-how, both for teaching teachers and teaching students; that is, they have to know how to work with adult learners but also know a great deal about how children learn. Unlike forms of professional development that are more didactic in nature, lesson study facilitators cannot predict and plan in advance for multiple aspects of the sessions, since teachers drive the agenda and co-design the learning opportunities in real time. Yet facilitators must come to sessions prepared on a number of levels: they bring resources such as textbooks, readings, math problems, and videos to stimulate and extend teachers' thinking and to respond to expressed interests in previous sessions. Facilitators in lesson study follow a kind of "emergent curriculum" (Edwards 1993), an idea well-known in early childhood education, for example, but less so in higher levels of education. "Emergent curriculum" is an approach to education where the curriculum planning grows from children's interests. In this way of teaching, teachers pay close attention to children's interests expressed in play and work and build lessons based on what they see children care about. Teachers may guide children toward materials and topics that they know are important, but the core idea is that the curriculum follows children's concerns. Lesson study is the analog in teacher learning. To be able to conduct this kind of professional development entails a kind of agility that is rare.

The list of attributes needed by a lesson study facilitator seems daunting when viewed this way. But both Louis and Karl were able to get up to speed as facilitators in very short order. By their third cycle of lesson study, their confidence as leaders had increased and teachers rated the sessions highly. We are currently investigating whether external measures of teacher learning correlate with teachers' and facilitators' self-reports regarding these lesson study sessions.

One is struck by the challenges and pushbacks that dogged the facilitators and teachers in learning to enact the lesson study process, and this is revealed in analyzing novices' articulation of what they are learning to contend with. These challenges speak to how profoundly countercultural lesson study is in the US context. Take, for example, the use of time in lesson study. Teacher learning in lesson study is incremental, ongoing, and unfolds over the span of one's career. This stands in stark contrast to the professional development model dominant in the United States, where the expectation is that teachers will learn a complex pedagogical skill in a session or two. Teaching for deep understanding involves endemic challenges that are not easily put to rest in short bursts of professional development,

and lesson study gives form to the abstract notion that serious headway can be made on these challenges by working on them together over many years. In this sense, the instances of resistance in lesson study reveal flashpoints where lesson study actually constitutes a countercultural bulwark to existing modal practices for teacher learning in the United States. Lesson study includes the close reading of student activity during classroom lessons, methodical study of multiple curriculum materials, the joint construction of highly detailed lesson plans, and evidence-based reflections on research lessons that are observed in person. All these aspects of lesson study diverge from current forms of professional development in the United States that feature direct instruction dissemination of information from expert presenters, “professional learning community” meetings that take the form of data inspection (usually aggregate scores on students’ standardized tests), and discussion of instruction that is distant from shared experiences in classrooms. Lesson study emphasizes incremental improvement of complex practice over time, fed by a focus on observed student learning in shared classroom experiences. Modal professional development emphasizes information transfer; in contrast, “lesson study focuses on the direct improvement of teaching in context” (Stigler and Hiebert 1999, p. 122).

This analysis of facilitation in this article is relevant for settings such as the United States where lesson study is not commonly practiced and where leaders have to jump-start a process that in other contexts is self-perpetuating. Still, the categories of novice facilitator efforts documented in this study point to areas that likely occupy the minds of many lesson study facilitators. As lesson study expands in the United States, these categories provide a useful road map for developing the thoughtful practice of this form of professional development for novices and veterans alike.

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