How Does Lesson Study Work? Toward a Theory of Lesson Study Process and Impact

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Abstract This chapter proposes a theoretical model of the impact of lesson study. Outcomes addressed include teacher outcomes (e.g., knowledge and beliefs), professional learning norms and routines, instructional routines and tools, and student learning outcomes. Four theoretical perspectives are used to examine lesson study impact: knowledge integration environment, self-determination theory, self-efficacy theory, and pedagogies of practice. The chapter also examines all four phases of the lesson study cycle – study, plan, teach, and reflect – and for each phase identifies major goals, challenges, strategies to overcome challenges, and relevant theoretical perspectives. In addition, reflection questions for each phase are proposed, which are designed to support educators and researchers to reflect on the effectiveness of their work during each phase. The chapter is based on 20 years of observations of lesson study and is intended to spark further conversation about the process and impact of lesson study.

Keywords Lesson study · Theory-driven lesson study · Knowledge integration environment · Self-determination theory · Self-efficacy theory · Rehearsals · Pedagogies of practice

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R. Huang et al. (eds.), *Theory and Practice of Lesson Study in Mathematics*,
Advances in Mathematics Education, https://doi.org/10.1007/978-3-030-04031-4_2

1 Introduction

We are often asked "Does Lesson Study work?" – a question that seems a lot like asking "Does teaching work?" (Or, "Does marriage work?"). It all depends on your goals and how you approach them. The goals of lesson study as it is practiced in Japan are much broader than is often appreciated in the West. For example, in Japan, lesson study is expected not only to improve teaching but also to strengthen professional community among teachers (Lewis et al. 2010; Sato 2008), help teachers make sense of changes in national standards (Takahashi and McDougal 2014), build more coherent instruction across classrooms (Matsuzawa Elementary School 2011), and connect individual teachers' daily instruction to the shared long-term vision for students embraced by the school (Takahashi and McDougal 2016).

This chapter lays out a theoretical model of lesson study that encompasses outcomes for teachers (individually and collectively) and students. We draw on theoretical perspectives from knowledge integration environments (Linn et al. 2004), self-determination theory (Deci and Ryan 1985), self-efficacy theory (Bandura 2001), and pedagogies of enactment (Grossman et al. 2009a, b) to build our theoretical model. Our chapter is organized around the phases of the lesson study cycle, and we examine each phase through the lens of theory to understand the key goals and challenges of each phase and to consider strategies to overcome key challenges. We also propose reflection questions specific to each phase, rooted in the theoretical perspectives on each phase and designed to help lesson study researchers and practitioners gauge the progress of their work.

1.1 What We Mean by "Lesson Study"

Lesson study is a translation of the Japanese term "jugyou kenkyuu," and it is a professional inquiry approach practiced in more than 90% of schools in Japan (National Education Policy Research Institute 2011). Although lesson study is sometimes misconstrued as focusing primarily on lesson planning, it consists of four stages of cyclical activity, as shown at the left side of Fig. 1. In Japan, lesson study cycles typically take place in the context of school-wide Collaborative Lesson Research, in which lesson study teams throughout a school build and share knowledge around a research theme that captures long-term goals for students and testable ideas about how to reach those goals (Takahashi and McDougal 2016). Some eminent researchers lay out six phases of lesson study (Fujii 2016; Takahashi and McDougal 2016), in order to emphasize goal-setting at the outset and to separate the post-lesson discussion and subsequent reflection on learning, but we have opted for simplicity.

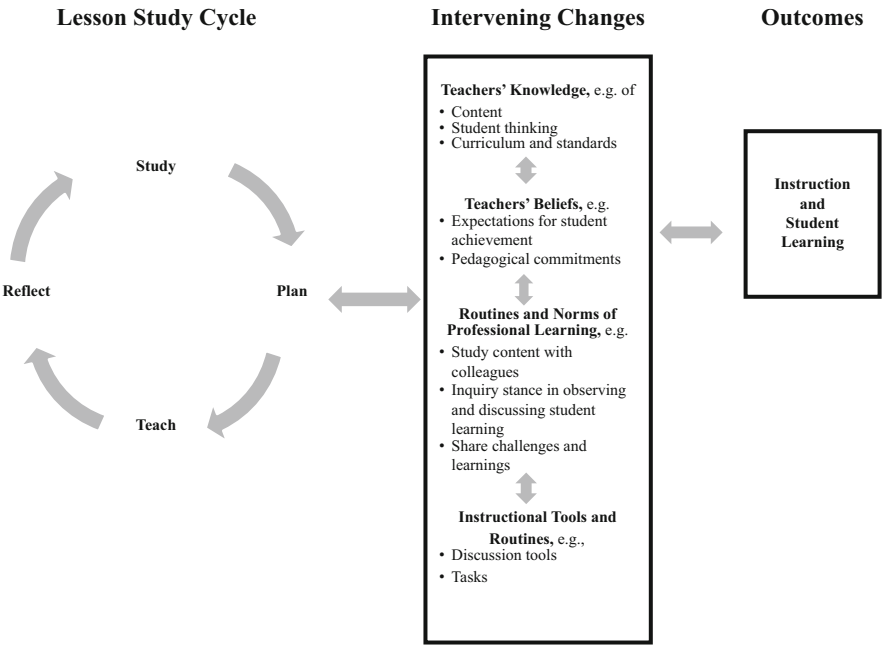

Fig. 1 Theoretical model of lesson study impact

2 Theoretical Model of Lesson Study

Figure 1 posits that lesson study can influence instruction and student learning through intermediate changes in teachers' knowledge and beliefs, professional norms and routines, and instructional materials; in the second part of this section, we provide research-based examples of each type of change. First, we describe four theoretical perspectives that we have found useful in understanding the impact of lesson study. These perspectives focus on four different types of outcomes: knowledge, motivation, self-efficacy, and capacity to enact knowledge (e.g., of content and teaching) in the classroom.

2.1 Knowledge Integration Environment

The knowledge integration environment is a perspective on learning that grew out of Piagetian theory applied to the domain of science learning, and it focuses on the conditions that allow people to develop increasingly sound understandings of complex phenomena. Knowledge integration theory posits that four sequential processes enable development of powerful, integrated knowledge: making one's current ideas visible ("elicit"), encountering new ideas ("add"), developing criteria to

compare and distinguish ideas ("distinguish"), and using reflection to solidify and integrate ideas ("consolidate") (Linn et al. 2004, 2013; Linn and Eylon 2011).

2.2 Self-Determination Theory

Self-determination theory posits that human beings have three basic psychological needs – autonomy, competence, and a sense of belonging – and that intrinsic motivation to learn develops to the extent that these needs are met (Deci and Ryan 1985; Ryan and Deci 2000). By extension, lesson study groups that meet teachers' needs for autonomy, competence, and belonging will be valued by teachers and will elicit teachers' intrinsic motivation to engage in the hard, ongoing work of improving instruction.

2.3 Self-Efficacy Theory

Self-efficacy is a belief in one's ability to succeed, and it influences motivation: "It is partly on the basis of efficacy beliefs that people choose what challenges to undertake, how much effort to expend in the endeavor, how long to persevere in the face of obstacles and failures, and whether failures are motivating or demoralizing" (Bandura 2001). In general, people experiencing higher levels of self-efficacy feel more motivated to take on – rather than shy away from – challenging experiences. Both personal experience and indirect experience (observing others) influence efficacy expectations. To the extent that people increase efficacy beliefs through participation in lesson study, they may also increase motivation to take the risks entailed in trying to improve instruction.

2.4 Pedagogies of Practice

Teaching is a practice: Knowledge for teaching is enacted with other people. In their investigation of "pedagogies of practice," Grossman and colleagues identified three pedagogies common to professional training for the "relational" careers they studied (teaching, clergy, clinical psychology): (1) using representations of practice, (2) decomposing practice into components, and (3) engaging with approximations of practice such as rehearsal or microteaching to peers (Grossman et al. 2009a, b). For educators, they note that "Taking clinical practice seriously will require us to add pedagogies of enactment to our existing repertoire of pedagogies of reflection and investigation" (Grossman et al. 2009a, b, p. 274).

2.5 Evidence of Lesson Study Impact on Pathways in Theoretical Model

While a full literature review is beyond the scope of this paper, we briefly note some of the evidence that exists for the pathways of impact shown in Fig. 1. A number of our examples are drawn from a randomized, controlled trial of lesson study with mathematical resource kits on fractions (hereafter "Fractions Lesson Study RCT") (Lewis and Perry 2015, 2017).

Lesson Study Impact on Student Learning The Fractions Lesson Study RCT found a significant impact on students' mathematical proficiency in fractions (Lewis and Perry 2017). A case study of lesson study in language arts in a turnaround school likewise found a significant impact on standardized test scores in language arts (Collet 2017). A multi-year case study of a school practicing school-wide lesson study in mathematics showed an increase in mathematics achievement nearly three times that of the district as a whole (Perry and Lewis 2010) (Lewis et al. 2006).

Lesson Study Impact on Teachers' Knowledge The Fractions Lesson Study RCT also produced a significant increase in teachers' knowledge of fractions (Lewis and Perry 2017). Research has found an impact of lesson study on other aspects of teachers' knowledge including knowledge about tasks (Krystal 2018) and pedagogical content knowledge of mathematics related to students and teaching (Aoibhinn 2016).

Lesson Study Impact on Teachers' Beliefs The Fractions Lesson Study RCT showed a significant impact on teachers' expectations for student achievement (measured by items such as "By trying a different teaching method, I can significantly affect a student's achievement") (Lewis and Perry 2015). Other research has shown impact of teachers' collaborative, lesson-focused work on their beliefs about the value of using errors (Pernilla and Henrik 2018).

Lesson Study Impact on Routines and Norms of Professional Learning The Fractions Lesson Study RCT showed an impact on collegial learning effectiveness (measured by items such as "I have learned a great deal about mathematics teaching from colleagues") (Lewis and Perry 2015). A shift in professional learning routines to consider students' interaction with the content, rather than only the content itself, has also been documented in lesson-focused collaborative professional learning in Sweden (Pernilla and Henrik 2018). Similarly, cross-national lesson study work conducted jointly by Japanese and Iranian educators led the latter to expand their study of curriculum to include consideration of students' interactions with the curriculum (Sarkar Arani 2017).

Lesson Study Impact on Instructional Tools and Routines The Fractions Lesson Study RCT showed an impact on the instructional tasks used to teach fractions, with about half of the participating lesson study teams choosing to adopt a Japanese task they saw in classroom lesson videos; teams that used this task produced an added

benefit in student learning over the experimental group as a whole (Lewis and Perry 2017). A case study of Swedish teachers working to improve decimal instruction documented an expansion of their ideas about assessment to include formative assessment and informal observation during lessons (Pernilla and Henrik 2018). There is some evidence that teachers can share instructional tools across countries (Runesson and Gustafsson 2012).

3 Goals and Indicators of Effectiveness for Each Lesson Study Phase

While the research examples cited in the prior section illustrate the potential of lesson study to influence teachers' knowledge and beliefs, instructional tools and routines, and student learning, lesson study does not always achieve these outcomes, even when they are intended. The remainder of this chapter analyzes each step of the lesson study cycle, using the theoretical perspectives introduced in Sect. 1 to illuminate the goals and challenges of each phase and to identify strategies that may support success at that phase. Our thinking about the goals, challenges, and strategies at each phase is heavily informed by our observation of lesson study groups that took part in two randomized trials of fractions lesson study and our ongoing work with 13 US schools involved in Collaborative Lesson Research (Takahashi and McDougal 2016). Figure 2 summarizes the goals and theoretical connections of each phase of the lesson study cycle, which is discussed in more depth in this section.

3.1 Goals and Key Components of Phase 1 (Study)

Phase 1: Study
The Study Phase focuses on two major goals:

- To establish a lesson study team that is valued by its members and has reasonably efficient processes for learning together
- To establish the topical focus of the lesson study cycle and build team members' knowledge about the topic

3.1.1 Study Phase Goal 1: Build a Valued Team with Efficient Processes for Learning

Teachers are busy. For teachers to experience lesson study as a worthwhile use of their time and begin to value it, a lesson study team needs to build effective processes for learning. The processes for learning established during the Study Phase have

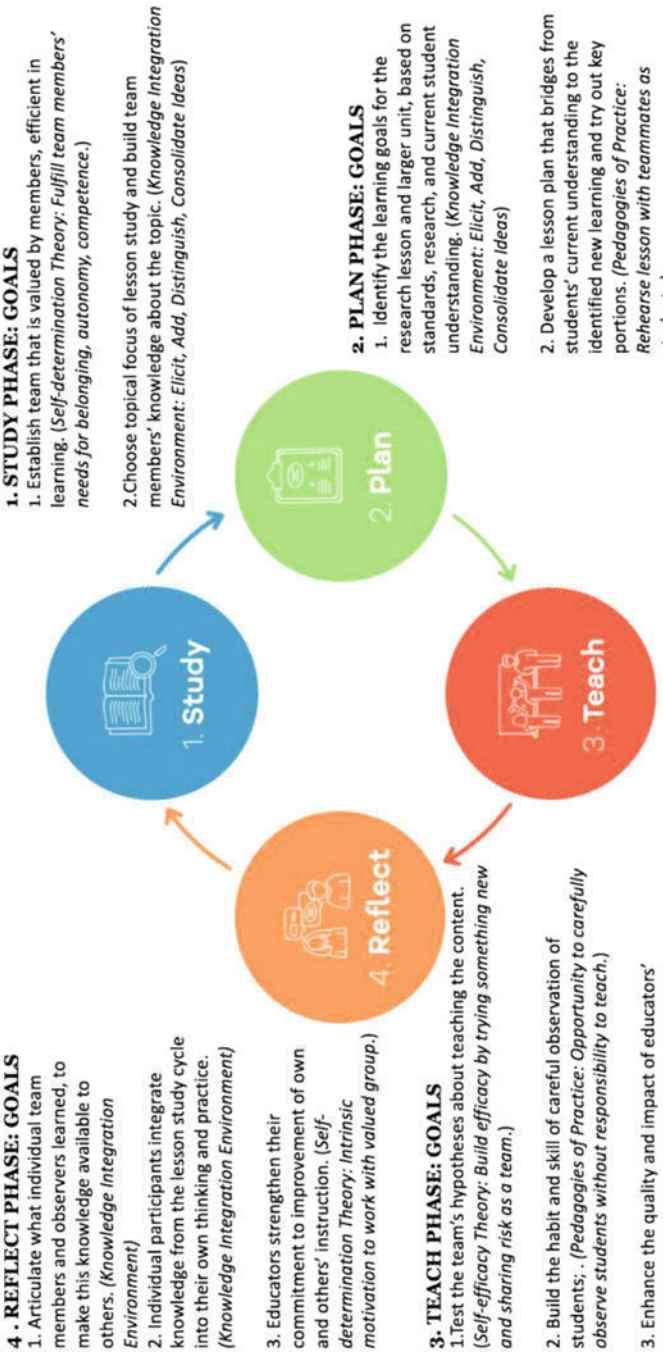

Fig. 2 Goals at each lesson study phase, connection to theory

both short-term and long-term implications. In the short term, these processes allow a lesson study team to work efficiently – for example, to keep track of what they learn and decide at each meeting and to quickly access this information at future meetings, in order to build upon it.

In the long term, the team needs to become a group that is valued by teachers, thus eliciting their commitment to continued learning. Self-determination theory suggests that teams that meet members' fundamental human needs for autonomy, competence, and belonging are best positioned to elicit members' commitment and motivation to do the hard work of improving instruction. Team members who feel supported by the team and committed to its goals will be able to do the hard work of learning – such as admitting gaps in their knowledge and revealing challenges they are facing in the classroom.

In our experience, some key challenges in building valued, efficient teams are:

- Managing time – for example, allocating sufficient time to important conversations and avoiding time-consuming sidetracks
- Managing participation – for example, making sure that all team members feel included and no voice habitually dominates
- Managing learning – for example, making sure that ideas from prior meetings are carried forward and built upon

Some key strategies often used to build valued, efficient teams include the following.

1. *Develop norms and revisit them at each meeting*, to reflect on how the teamwork is going and what you might need to change. Your school or district may already have an established process to do this. If not, you can find processes to do this at http://lessonresearch.net/prepare-step/build-and-practice-norms/.
2. *Adopt meeting tools*, *such as an agenda and meeting notes*, and agreements on how to use these. You may already have systems in place that enable your team to develop an agenda for each meeting in advance, keep and carry forward notes, and update the Teaching-Learning Plan that will inform your research lesson. If not, you can find templates for agendas and notes at http://lessonresearch.net/prepare-step/adopt-an-agenda/ and a Teaching-Learning Plan template at http://lessonresearch.net/study-step/access-tlp/.
3. *Establish roles (*e.g., *notetaker, facilitator) and rotate them each meeting*, so that all team members experience what it's like to manage that facet of the team's work. Many teams start out with a designated facilitator – perhaps someone who brings particular content knowledge or is experienced with the lesson study process. Over time, it may be optimal for teams to rotate responsibility for facilitation, so that all team members gain leadership experience. (Accessing content knowledge does not necessarily need to be joined with the facilitation role – e.g., it can be one standing item on the agenda.) If your team is not familiar with establishing and rotating roles, you can find examples here at https://lessonresearch.net/prepare-step/agree-roles-expectations/.

4. *Develop a shared research theme* that articulates your long-term vision for students. Teachers create it – often as a whole school faculty – by considering the qualities they want their students to have at graduation (or several years down the road), the qualities of their students today, and a gap between those two sets of qualities that they really want to work on as educators. The research theme – whether developed by the whole school or just one lesson study team – helps reconnect educators with the goals that are really vital to them. You can find a suggested process for developing the research theme here at http://lessonresearch.net/study-step/develop-research-theme/.

The research theme provides an agreed-upon long-term vision for the lesson study team's work, and also a starting point for the second goal of the Study Phase, discussed next.

3.1.2 Study Phase Goal 2: Establish a Focus of Study and Build Team Members' Knowledge About It

The research theme establishes a broad, long-term goal, such as building students' perseverance and capacity as problem-solvers. The lesson study team also needs to identify the specific discipline (e.g., mathematics) and topic (e.g., fractions) where they will situate their investigation of the research theme and to study this topic in some depth. This learning is often called "kyouzai kenkyuu" in Japanese – literally, study of teaching materials (Yoshida and Jackson 2011; Watanabe et al. 2008; Takahashi et al. 2005; DosAlmas and Lewis 2017). But, since Japanese curriculum guides provide more information on student thinking and on the content trajectory than counterpart US materials (Lewis et al. 2011), it is probably better to translate this term as "study of curriculum and content." In addition, some important knowledge for this phase (and for the Plan Phase) will come from the educators on the team as they solve tasks themselves, anticipate student thinking, and share solution methods that illuminate different ways of thinking about the mathematics (or other subject matter).

In our experience, challenges that arise as teams identify their focus and study it during the Study Phase may include:

- Premature focus on a single lesson, rather than on the larger unit and trajectory of which it is part
- Failure to go beyond the team's current knowledge
- Study of low-quality resources that do not illuminate the content or what is known about its teaching and learning (e.g., attention-grabbing activities found online that may be side trips from the key mathematical trajectory)
- Choice of a focus that is not of interest to (some) team members

Several strategies may enhance the team's likelihood of success with Goal 2 (establish a focus of study and build knowledge around it).

1. *Provide access to high-quality content resources and frameworks*. High-quality content resources can enable a team to go beyond what team members currently know. For example, the TRU Framework (**t**eaching for **r**obust **u**nderstanding) and TRU Conversation Guide (see chapter "Teaching for Robust Understanding with Lesson Study" this volume for details) can provide important resources as teachers develop their research theme and focus their lesson study work, because they support broad thinking about the multiple determinants of students' mathematical development (Schoenfeld et al. under review). (As discussed below, the TRU materials can also provide important reflection tools during lesson planning and post-lesson discussion.) High-quality resources on the specific topic to be studied (e.g., fractions) and the teaching-learning strategies to support the team's long-term goals (e.g., what is known about building agency) are also essential. Frameworks that illuminate the trajectory of the content over time (e.g., Clements and Sarama 2004), concise summaries of research (e.g., Shifter et al. 2010; Van de Walle et al. 2009), and research-based curriculum materials are all likely to be useful.
2. *Create the environment for knowledge integration*. The knowledge integration perspective reminds us that learning is not just a matter of adding ideas: it also depends on eliciting team members' existing ideas and sparking a need to reexamine and refine ideas. Supportive team dynamics (see Goal 1) will be essential to eliciting ideas, since team members need to feel comfortable revealing their thinking, speaking up when they don't understand or agree, and so forth. Likewise, the right activities are essential to elicit team members' thinking – for example, a mathematics task that teachers can solve and discuss that illuminates new perspectives on the content.
3. *Ask each team member to identify something they would like to learn*. Even if the topic of the lesson (e.g., multiplication of fractions) is not a topic every team member expects to teach, every team member can and should feel a stake in the team's learning. A focus on some dimension of the larger research theme – e.g., examining a strategy to support student agency – will help all team members take an authentic interest in the work. Some lesson study teams ask each team member to develop an inquiry question related to the team's work. For example, a team member may ask how to use reflective mathematics journals to support student agency and integrate this question into the lesson study cycle.

Reflection Questions

1. Did our team develop efficient processes for learning together? For example, were we able to use our time in a worthwhile fashion and carry forward knowledge effectively from one meeting to the next?
2. Did our team develop inclusive processes that value the thinking and learning of all team members?
3. Did we arrive at a research theme and content focus that we are genuinely curious about? Does every team member have something they want to learn?
4. Did we access major research and standards/frameworks to learn about this content and its teaching-learning? Specifically, what did we learn?

5. Did we access knowledge from our own experience, teammates, and students to learn about this content and its teaching-learning? Specifically, what did we learn?

3.2 Goals and Key Components of Phase 2 (Plan)

Phase 2: Plan
The major goals of the Plan Phase are:

- Identify the learning goals for the research lesson and larger unit, based on standards, research, and students' current understanding.
- Develop a lesson plan that bridges from students' current understanding to the identified new learning and think through or try out key portions.

During the Plan Phase, teams continue to investigate the content by studying research, standards, curriculum, student thinking, and tasks (e.g., solving and discussing tasks as adults). This work culminates in a Teaching-Learning Plan (TLP) for a research lesson (explicitly situated within a larger unit and trajectory of learning). The TLP differs from many everyday lesson plans in its focus on providing a rationale for the lesson design and anticipating student responses and how they will be used to build the new learning of the lesson. The Teaching-Learning Plan also specifies the data that will be collected during the research lesson to investigate the students' learning and the team's hypotheses about lesson design. Ideally, the team also conducts a mock-up lesson in which the instructor teaches the lesson to the other team members (who take the role of students). The mock-up lesson allows the team to experience the lesson from the student point of view and the instructor to "rehearse" by trying out the specific teacher questions and moves the team has planned (Lampert et al. 2013). Of all the activities in the Plan Phase, the mock-up lesson most closely approximates the experience of actually teaching the research lesson; it provides an opportunity to fine-tune plans, based on the team's simulation of the lesson they have planned. Mock-up lessons are common in Japan and have recently been encouraged in the US by Akihiko Takahashi, to help teachers specify and test their instructional moves more carefully before the lesson.

3.2.1 Challenges of the Plan Phase

Key challenges of the Plan Phase include:

- Jumping into lesson planning, without first considering the unit design and long-term content trajectory, and clearly identifying the lesson's role within the larger unit and trajectory.

- Failing to identify the new learning that will occur during the lesson – for example, describing the lesson goal as "doing ———," rather than identifying what students will *learn* from the activity.
- Planning the lesson around what the *teacher* will do, rather than around what the students will think, do, feel, and learn.
- Neglecting to incorporate learning from the Study Phase into the Teaching-Learning Plan – for example, neglecting to incorporate what is known about building agency or about learning fractions multiplication.
- Failing to grasp students' current knowledge and to design the lesson based on that knowledge.
- Anticipating student thinking in enough depth, accuracy, and breadth to write a plan that is likely to promote learning.
- Lopsided planning, focused on one element of the lesson (often the launch).
- Focus on logistical elements of the lesson, rather than on the key student experiences that will produce tension or contradiction and drama of breakthrough.
- Team members divide responsibility for writing the Teaching-Learning Plan in a way that fails to build all team members' learning.
- The data collection plan is not well-connected to the lesson goals.
- Gaps in the model of teaching-learning underlying the plan – for example, the plan may anticipate certain important student responses but not plan the teacher questions and moves that will allow other students to grasp these ideas.

Theories of knowledge integration environment and pedagogies of enactment (such as rehearsals) are both important to understanding the Plan Phase. Unit and lesson planning should repeatedly surface team members' knowledge and beliefs about pedagogy and help team members' ideas bump up against each other and against ideas from research. The need to negotiate a joint research lesson plan should spark refinement and reflection on ideas. Enactment of ideas during a mock-up lesson should provide more authentic and "proximate" engagement with core elements of teaching than simply talking about teaching; the mock-up lesson should therefore help team members to elicit, compare, and refine ideas about classroom practices such as teacher questioning, board organization, etc.

3.2.2 Strategies to Support the Plan Phase

1. *Use a template to write the Teaching-Learning Plan*. A well-designed template will remind your team to discuss important elements such as the role of this lesson in the larger unit, the experiences that will lead to "aha's" for students, the connection to the standards and larger trajectory of learning, and so forth. You can access one such template here: http://lessonresearch.net/study-step/access-tlp/.
2. *Investigate your students' thinking*. In addition to learning what researchers know about the topic, it's important to know what your own students know coming into

the lesson and what misconceptions they are likely to struggle with. Interviews of current students (or students who studied the material last year), exploration of student work that you bring to the lesson study group for examination, examination of existing learning studies (see other chapters in this volume), and attention to students' thinking as they experience the prior lessons in the unit can all be valuable sources of information in your lesson planning.

3. *Predict the responses of the specific students who will take part in the lesson.* Our colleague Tad Watanabe notes that if we don't make predictions, we won't be surprised. Predicting how the specific students in the class will each respond to the lesson task gives us the opportunity to check out how well we know individual learners. It also enables us to address, in the Teaching-Learning Plan, how each student will move from their initial response and grasp the key ideas of the lesson.
4. *Revisit the TRU Framework.* The TRU framework provides a useful tool to think about whether the Teaching-Learning Plan has covered important bases – for example, whether the lesson design builds in access for every learner, nurtures student ownership and identity, and allows the teacher to understand and use student thinking.
5. *Ask a knowledgeable outsider to review the Teaching-Learning Plan*. By sharing the Teaching-Learning Plan with a knowledgeable outsider when the lesson task has been chosen – but there is still time to revise the plan – the team creates a valuable opportunity to expand its knowledge. (The team might consult the same knowledgeable other consulted during the Study Phase, just after the topic is selected.) An outsider who has expertise related to the content and its teaching can often pose questions that will help the team sharpen thinking about the lesson goals or suggest small changes that may make big changes in student learning – for example, changes in the choice of number or the presentation of the task or clarification of how and why students are expected to change their thinking.
6. *Conduct a mock-up lesson.* The mock-up lesson, with team members taking the role of students, allows the team to notice things that might only be noticed in a setting that closely approximates classroom practice. For example, the instructor might notice that a question needs to be posed differently, or team members might notice that the organization of ideas on the board is confusing.

Reflection Questions

1. Does the Teaching-Learning Plan consolidate knowledge from the Study Phase – for example, knowledge about the content, student thinking, standards, and what is known about teaching-learning? Does it address the long-term research theme as well as the specific goals of the lesson and unit?
2. Does the Teaching-Learning Plan propose a plausible bridge from students' current knowledge to the desired new learning? Can a reader understand how varied students will respond, and how they will grow during the lesson?
3. Does the Teaching-Learning Plan identify what our team hopes to learn from the research lesson and what data will be collected to inform our learning?

4. Did we try the task ourselves and then discuss our approaches, in order to anticipate student thinking?
5. Did we try a "close approximation to practice," such as a mock-up lesson, to help us think through lesson elements that might not come out in team discussion – for example, specific teacher questions, visual arrangement of the board, time allocation to each phase of the lesson, and lesson summary that will come from students?
6. Did writing the Teaching-Learning Plan help team members develop their thinking about the subject matter and pedagogy? What insights were gained by individual team members? What might we do differently next time in our planning and writing to increase every team member's opportunity to learn something useful to them?

3.3 Goals and Key Components of Phase 3 (Teach)

Phase 3: Teach
The major goals of the Teach Phase are:

- To test the team's hypotheses about teaching the content
- To build the habit and skill of careful observation of students
- To enhance the quality and impact of educators' conversations by grounding them in a shared classroom experience

During Phase 3, the research lesson is taught by one team member to their students, with other team members observing students and collecting data agreed upon by the team. If observers outside the team attend, the research lesson may be immediately preceded by a pre-lesson discussion in which team members present the Teaching-Learning Plan, have observers try out the lesson task, and review observation guidelines. Some teams choose to have two different team members teach the lesson, with sufficient time in between (at least a day) for revision of the lesson based on what was learned during the first teaching.

Though brief, the "teach" phase is the crux of the lesson study cycle, when the team's hypotheses about teaching the particular content are brought to life in the research lesson. Lesson enactment reveals the instructor's and team's theories of learning. For example, is it assumed that students will be able to persevere in solving a challenging, open-ended problem or that they need the problem in small installments? How are individual work, group work, and whole class discussion assumed to contribute to student learning? What models and visual information are hypothesized to be useful, and how are they sequenced and presented? When one student voices an important idea, is it assumed that other students have also grasped that idea? The research lesson also reveals the team's knowledge of the students: How

close is the fit between the plan designed by the team and the knowledge, interests, and dispositions students actually bring to the task?

3.3.1 Challenges of the Teach Phase

Akihiko Takahashi notes that "Teaching is easy to talk about but hard to do." The Teach Phase is important (and hard) for precisely that reason – that talking about the lesson and planning for it may not adequately prepare for teaching it. Yet the place where the team's study and planning bump up against reality is a rich site for knowledge integration; a great deal can be learned from unsuccessful, as well as successful, lessons. For example, team members may learn that students did not display key knowledge or dispositions needed to grapple successfully with the task. Team members may discover that the students "successfully" solved the problem but did not learn anything from solving it (Mills College Lesson Study Group 2005). Team members may find that the planned lesson supported learning by several students, but not the vast majority of the class. Observations may also reveal variations in student responses that provide hints for improvement of the lesson in the future; for example, one student's way of seeing and counting a geometric pattern may provide insights that could help classmates solve the problem in a future lesson (Lewis et al. 2009), and the questions posed by a student in one group might constitute valuable prompts for other groups in a future lesson.

Key challenges of the phase include:

1. *Student thinking is not made visible by the research lesson*. During a research lesson, it is typical for at least some of the observers to follow particular students from the beginning to the end of the lesson and to understand how these particular students changed their thinking over the course of the lesson and what catalyzed change (or what acted as a barrier). But what if the student's thinking is never made visible – for example, through their writing, actions, or speech? Ideally, the lesson should be designed to allow a careful observer to discern much about a student's experience; some lesson study groups also allow observers to briefly question students after the lesson is concluded.
2. *The data collection plan misses key elements of teaching-learning.* The data collection points laid out by the lesson study team may miss certain data that is important to understanding the lesson – particularly if the lesson does not unfold as expected.
3. *Observers interfere in student learning*. Observers may forget that they are not supposed to help students or may unwittingly interfere with learning – for example, by blocking a student's view of the board or of a resource such as an anchor chart.
4. *Observers do not collect data on student learning.* Data collection on students is a new experience for many teachers, and they may be reluctant to lean in to hear students' conversations and record the content of their work. In large public research lessons, the venue may be too crowded to permit close observation of

students. In either case, teachers who watch from the periphery will not gain a good understanding of students' experiences of the lesson.

5. *The taught lesson diverges greatly from the planned lesson*. Team members may experience great disappointment when the instructor of the research lesson departs greatly from what the team collaboratively planned. This disappointment, and the conflict it often engenders, is a problem. However, diverging from the lesson plan is not necessarily a problem. Akihiko Takahashi encourages research lesson instructors to study, plan, and collaborate as carefully as possible in order to internalize the ideas behind the lesson plan but to "throw out the lesson plan and teach while watching the students' eyes" once the research lesson commences. If the carefully developed lesson plan does not feel right within the classroom, this provides important feedback to the instructor and team. Perhaps the team had a poor grasp of the students' prior knowledge, in which case the instructor's responsibility is now to teach a lesson that will best support students' learning. Or perhaps the team developed a sound plan but did not adequately support the instructor to understand and practice the specific moves that would enable the lesson to unfold successfully. In either case, these are important learnings for the team.

3.3.2 Strategies to Support the Teach Phase

Several of the strategies below relate closely to the pedagogies of practice framework, since they represent ways to look at the component parts of practice (such as the lesson plan) outside of classroom practice and to rehearse elements of classroom practice (e.g., particular teacher moves or questions) in a mock-up lesson. Other strategies relate to creation of a knowledge integration environment by creating opportunities to study the lesson plan and relate it to the observed lesson and to bring in knowledge from an outside commentator.

1. *Final review of the Teaching-Learning Plan, with a focus on data collection.* At the end of the Plan Phase, as team members finalize the Teaching-Learning Plan, it is important to review it from the perspective of the data to be collected and ask whether the collected data will adequately capture the story of students' learning during the lesson. If not, lesson elements can be adjusted. For example, the team may add a writing prompt or application problem to the end of the lesson that reveals student thinking, add a poll or partner chat that prompts students to share their current thinking at key points in the lesson, or build in a few minutes for observer-student interviews after the close of the lesson.
2. *Mock-up lesson or other "approximation of practice."* The opportunity to try out the lesson plan with team members serving as "students" can support the lesson instructor to try out specific questions and moves that may be unfamiliar but important to making the team's plan work.
3. *Preparation of students.* Students should know in advance that they will be observed and should understand that the observations are intended to help

make lessons better, by carefully studying how the lesson works for students. Students thus enlisted usually enjoy being allies in improving lessons!

4. *Pre-lesson discussion with public review of observation guidelines*. Even if the observers are experienced in lesson study, they should be reminded of the observation guidelines, such as refraining from side conversations and from helping students. During the pre-lesson discussion, the specific data to be collected by the team should also be reviewed.
5. *Monitoring and encouragement of observers during research lesson*. It may be necessary for a designated facilitator to encourage careful observation by participants who are hanging back away from students, to intervene if an observer starts to teach students, or to quiet side conversations. These challenges may also be raised as a general issue at the post-lesson discussion.
6. *Inclusion of an experienced final commentator*. An experienced final commentator typically provides a good model of data collection and knows how to collect data that reveal student learning broadly across the class – even if the team's data collection plan is not fully adequate. Likewise, experienced observers can show by the example of their observation what it means to closely study students.

Reflection Questions

- Did the Teaching-Learning Plan provide good guidance about data collection? Did data collection focus on the key elements our team wants to learn about, as well as a broad picture of student learning during the lesson?
- Did observers understand and take up their role? For example, were they able to closely observe students without interfering with student learning?
- Did observers have a chance to read the Teaching-Learning Plan and understand the team's goals?

3.4 Goals and Key Components of Phase 4 (Reflect)

Phase 4: Reflect

The major goals of the Reflect Phase are:

- To articulate what individual team members and observers learned from the lesson study cycle, so that this knowledge becomes available to others within and outside the team
- For individual participants to integrate knowledge from the lesson study cycle into their own thinking and practice
- For educators to strengthen their commitment to improvement of their own knowledge and practice and that of colleagues

The final phase of the lesson study cycle includes the post-lesson discussion and often an additional meeting to reflect on the entire lesson study cycle. Ideally, the

post-lesson discussion occurs just following the research lesson, with a short break between lesson and discussion to allow observers to review the data they collected and make decisions about what to present. The Reflect Phase often creates the most palpable tension between two different theoretical perspectives/goals: lesson study as a place for knowledge integration and lesson study as a place for building community and individual motivation. Participants need to navigate between the extremes of, on the one hand, severe critique that will undermine team members' interest in continued professional learning and, on the other hand, "happy talk" that ignores what needs to be learned from the research lesson and leaves participants feeling they learned very little. Use of a discussion protocol (see below) should support teams to avoid both extremes.

Knowledge integration, self-determination, and self-efficacy theories all provide important theoretical perspectives on the Reflect Phase. From the perspective of knowledge integration, the post-lesson discussion often provides the first in-depth opportunity for the last two stages of knowledge integration: distinguishing and consolidating ideas. During the post-lesson discussion, team members for the first time have data from the classroom that enables them to compare and distinguish ideas that may previously been held independently. To take an example from our Fractions Lesson Study trial, during the Study Phase a teacher argued that pizza is a good model for fractions because it is relevant to students, but also commented favorably on research evidence suggesting that a linear measurement model of fractions helps students see fractions as numbers. These two ideas seemed to be held separately from each other until the negotiation of the lesson plan required one to be chosen. (The team chose to use a linear measure model of fractions.) During the post-lesson discussion, teachers explicitly compared the two models (pizza versus linear measure), evaluating, connecting, and "developing criteria to distinguish" between these two ideas about what constitutes a good model for introducing fractions. They noticed, for example, that students in the research lesson, compared to prior students, had a better understanding of fraction composition (e.g., seeing two-thirds as two one-thirds), and they posited that students might more easily transfer understanding of fraction composition from linear measurement to pizzas than vice versa. The hallmarks of the third stage of knowledge integration – distinguishing – is that criteria for distinguishing between two ideas and evaluating their relative worth are developed. In the final stage of Knowledge Integration, ideas are reflected on and refined so that they fit together. Such integration often seems to occur during the Reflect Phase of the lesson study cycle, after teachers see and discuss the research lesson and contrast it with prior practice. One team member integrated two different criteria for evaluating fraction models (real-world context, consistency), in her reflection at the end of the lesson study cycle:

> "We think we're doing students a favor by relating fractions to food. However, the type of food constantly changes, and we know that a pizza is never really divided into eight equal slices (we've all dove in for the biggest slice at one point or another!). Measurement provides a consistent context in which to imbed the teaching of fractions. Not only would this context make sense, but it would give students more real-world contexts in which to learn. I recently bought a house, and measurement and fractions have come into play several times".

Self-determination theory also provides an important lens on the Reflect Phase, because the post-lesson discussion has great potential to affect team members' experiences of autonomy, competence, and belonging. If data suggest that the instruction supported student learning, team members may deepen their sense of competence and gratitude to colleagues; if data suggest the instruction was problematic, team members' sense of competence and belonging may be threatened. Likewise, self-efficacy theory provides an important lens. The post-lesson discussion can provide a powerful boost – or a powerful threat – to a teacher's sense of efficacy as, for example, a new teaching strategy is tried successfully for the first time, or a familiar strategy is called into question by observers' reports.

3.4.1 Challenges of the Reflect Phase

Major challenges during the Reflect Phase occur within the post-lesson discussion and in the subsequent process of integrating what is learned into daily practice.

1. *The post-lesson discussion does not enable learning.* The post-lesson discussion can fail to build the team's learning for various reasons, which are typically related to the quality of data collected or the quality of the process used to present and discuss it. Data quality may be poor because observers could not see or hear well or because the lesson did not make students' thinking visible. Or observers may not be experienced at noticing and recording the *process* of student learning – imagine the observer who simply notices that a student obtained the correct answer, without noticing the particular counting strategies and materials used to arrive at the answer. Likewise, observers may take an evaluative stance in which they judge student actions, rather than an inquiry stance in which they try to describe and understand student actions. Data collection guidelines provided in the plan may not yield rich data because they are not well-connected to a theory of action; for example, observers may be instructed to notice whether students persevere, rather than to notice the specific resources students use to re-engage with a problem when stuck.

   Even if observers collect valuable data, the post-lesson discussion process may not make good use of observers' data. For example, observers invited to talk about whatever they saw – rather than to focus their observations on key questions related to the team's theory of action – may produce a laundry list of noticings whose significance is unclear. Sometimes observers have difficulty synthesizing what they observed and connecting it back to ideas found in the Teaching-Learning Plan because the team has not clearly laid out the lesson flow – the model of how and why student thinking is expected to progress over the lesson that observers' data can confirm or disconfirm.

   A third source of challenge in post-lesson discussions can stem from the general culture of the post-lesson discussion. Making sense of data and using it to investigate the team's theory of action require an inquiry stance, not simply an evaluative stance toward the lesson. A culture too focused on politeness – or

conversely on critique – can undermine inquiry. Thus, lesson study seeks to establish a culture focused on learning.

2. *Team members are not motivated to bring learnings from lesson study back into daily practice at their school or to continue lesson study.* Sometimes lesson study turns into a performance that is disconnected from daily practice and improvement at the school. Teachers may find the lesson study process valuable and integrate what they learn back into their own practice, but not feel motivated to share their learning with other teachers at their school or to initiate subsequent cycles of lesson study.

3.4.2 Strategies to Support the Reflect Phase

1. *Make use of knowledgeable others to review the draft lesson plan (including the data collection plan) and provide final commentary.* A final commentary by an expert in the content and its teaching-learning can add an important dimension to the team's learning by linking the team's work to research and developments outside the school. The final commentator can also provide a model of skilled observation and of how to use classroom data to address the team's questions and goals.
2. *Use a protocol to guide the post-lesson discussion; if observers outside the team will attend the research lesson, consider using a facilitator from outside the team.* Using a discussion protocol increases the likelihood that the post-lesson discussion will focus on presentation and discussion of observers' data, with a focus on the ideas posed by the team. An outside facilitator can keep observers on track with the discussion protocol and redirect any observers who have difficulty deploying an inquiry stance. If there was a disconnection between the team's goals and the lesson that unfolded or the data that was collected, an experienced facilitator may also be able to help bridge that gap – for example, by huddling with the team before the post-lesson discussion to revise the questions the team would like to address during the post-lesson discussion.
3. *Hold an end-of-cycle reflection meeting*. After the post-lesson discussion is concluded, it is useful to have a separate meeting (for the team only) to reflect on the cycle. http://lessonresearch.net/reflect-step/consolidate-your-learning/

   This meeting can help team members think about what they learned at each phase of the cycle, what they want to bring back into their daily practice, and what changes in the lesson study cycle might support their learning in the next cycle. It can also surface questions and noticings that might spark the team's next inquiry and provide an opportunity to revisit the school's vision and needs in light of what was learned during the research lesson.
4. *Open the door on your team's work and connect it to your school's work; connect to an instructional leadership team or school steering committee*. The isolated work of a single lesson study group will never be as powerful as the integrated work of many groups of teachers, particularly if they are working on the same

vision at the same school. For example, when one group of teachers at a school establishes routines that help students explain their thinking, their work can benefit other teachers at the school both by nurturing student capacities that will affect other classrooms (when the students move on) and also by demonstrating that it is possible for students to explain their thinking. One key tenet of self-efficacy theory is that we learn from others' successes and are more willing to try something new when we see others being successful. Organizational studies of schools underline that improvement occurs when the professional learning of teachers connects closely to instruction (which lesson study does) and also connects to school initiatives. Collaborative Lesson Research (school-wide lesson study) provides one structure for ensuring that the work of individual lesson study teams is coordinated, that knowledge is shared across teams, and that the work advances a school-wide vision (Takahashi and McDougal 2016). Connecting your team's work with the important initiatives at your school will enhance the relevance of your team's work, increase its chances of longevity, and decrease the overload teachers often experience from multiple uncoordinated initiatives.

5. *Celebrate!* Self-determination theory reminds us that groups that meet our human needs, such as belonging, are more likely to elicit our commitment. Treating the research lesson teacher to a meal is a Japanese tradition that transfers easily to other countries. A shared celebration of the team's work is always in order – *especially* if the team has encountered many bumps along the way.

Reflection Questions

1. How did the post-lesson discussion add to our learning?
2. What learning do we want to carry forward from this lesson study cycle? For example, what learning about the content, about teaching, and about our students?
3. How will what we learned during this lesson study cycle influence our daily practice as individuals? As a school? How will we share what we learned with the profession more broadly?
4. What questions or ideas were sparked by this cycle that we want to investigate in future lesson study cycles?
5. How might we adjust and improve the lesson study process in the future?
6. To what extent did the lesson study cycle strengthen relationships among team members? For example, did it increase the likelihood we will consult each other informally about problems of practice in the future?
7. Did we allow sufficient time for team members to reflect together at the end of the cycle?

4 Discussion and Conclusion

This chapter lays out what we believe to be the major goals of each phase of the lesson study cycle (study, plan, teach, reflect) and ties them briefly to educational and psychological theories that support both the exploration of teaching and learning (theories relating to knowledge integration and pedagogies of practice) and development of the lesson study team itself (theories relating to self-determination and self-efficacy), along with challenges at each phase, strategies that may help teams overcome these strategies, and reflection questions that may help teams assess and refine their work. We do not see these ideas as final or definitive, since our understanding of lesson study has evolved steadily ever since our first published work on it in 1997. Given the complexity of teaching and the complexity of human learning, even four theoretical lenses are probably insufficient to provide a theoretical framework to understand lesson study impact. We hope that this chapter will stimulate much further conversation.

We hope that the challenges and strategies laid out for each phase can provide a useful framework for other researchers to add their own ideas and critique, so that, as a field, we have a common framework that continues to change and grow as more educators engage in lesson study. We also hope that lesson study teams will use the reflection questions associated with each phase as a way of reflecting on their own work and will add to these questions, creating a practical reflection tool that helps lesson study teams deepen their work.

Acknowledgments This material is based on work supported by three funders:

The Institute for Education Sciences of the US Department of Education under Grant No. R305A150043. Any opinions, findings, conclusions, or recommendations expressed in this article are those of the authors and do not necessarily reflect the views of the Institute for Education Sciences.

The Bill & Melinda Gates Foundation. The views, findings, conclusions, and recommendations expressed herein are those of the authors and do not necessarily express the viewpoint of the foundation.

The National Science Foundation under Grant No. 1503342. Any opinions, findings, and conclusions or recommendations are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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