

Lesson Study in the San Mateo-Foster City School District
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Abstract

Lesson study is a widespread form of professional development in Japan that has recently emerged in a number of U.S. sites. This paper describes a collaboration between researchers and practitioners at one U.S. lesson study site. The collaboration had simultaneous goals of building lesson study in one school district; documenting the implementation process, supports and challenges; and using this information to contribute constructively to the local and national lesson study reform effort. Data on the program (observations, interviews and written reflections) show that the lesson study goals, activities, and resources changed over time as teachers tried lesson study, and as knowledge about lesson study grew in the district and nationwide. Data also suggest that teachers' lesson study activities helped them to develop the kinds of instructional and subject matter knowledge that are goals of teacher professional development. Four implications for educational research are drawn, including the need for research methods that contribute in a timely fashion to innovations in progress; the need for cross-case theory building on lesson study; the danger of assessing the effectiveness of lesson study without recognition of the variety of local adaptations; and the low value held in many educational research circles for the types of lesson study research requested by practitioners and needed to support successful adaptation (e.g., research on experiential learning methods, practical

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guidelines and know-how related to lesson study, translation of more diverse models from Japan, etc.).

Our findings point up the potential value of lesson study for practitioners willing to take the risks associated with an emerging innovation, and the importance of opportunities for practitioners to find ways to enhance their lesson study knowledge and practice over time.

I. Introduction

Lesson study, the major form of professional development in Japan, is a teacher-led instructional improvement cycle in which teachers work together to:

- Formulate goals for student learning and long-term development;
- Collaboratively plan a “research lesson” designed to bring to life these goals;
- Conduct the lesson, with one team member teaching and others gathering evidence on student learning and development;
- Discuss the evidence gathered during the lesson, using it to improve the lesson, the unit, and instruction more generally;
- If desired, teach, observe, and improve the lesson again in one or more additional classrooms. (Fernandez et al., 2001; Lewis, in press; Lewis & Tsuchida, 1998; Yoshida, 1999).

Lesson study embodies many qualities of effective professional development identified by U.S. research,² and has enabled Japanese classroom teachers to build an emphasis on problem-solving and “teaching for understanding” in

² For example, it is based on a cycle of inquiry and improvement (setting goals, planning, doing, reflecting) and is collaboration that is both authentic and student-centered (see, for example, Loucks-Horsley et al., 1998, Little 1981, Murphy & Lick, 2001). See also Lewis (2002); Stepanek, (2001); and Wang-Iverson et al., (2000) for discussion of the potential of lesson study in the US.

Japanese elementary education over the past four decades (Lewis & Tsuchida, 1998; Takahashi, 2000).

The publication of results from the Third International Mathematics and Science Study and *The Teaching Gap's* call for "something like lesson study to be tried in the United States" (Stigler & Hiebert, 1999) has generated considerable lesson study activity among U.S. educators, including state and local conferences, special journal issues, websites, videotapes, and lesson study groups in many regions of the U.S.³

With all of this recent U.S. lesson study activity, some observers of educational reform are beginning to speculate about the future of lesson study in this country. If our sobering history of education reform is any indication, lesson study will fail to make a significant impact; in the past, few reforms that have succeeded at an initial site have "scaled-up" successfully. The educational research community has played a significant role in documenting the difficulty of reform and building awareness of what to do (and not to do) in implementing innovations. However, relatively few published studies have been designed to contribute constructively to an ongoing reform effort. This paper describes a collaboration between researchers and practitioners to document lesson study as it emerges in one U.S. site, and to provide timely information designed to help the innovation take hold.

³ For example, conferences were held by the International Congress of Teachers of Mathematics, California State Subject Matter Projects, New Jersey Council of Teachers of Mathematics, New York Japanese School at Greenwich. Published references include Coeyman (2000), Council for Basic Education (2000), Germain-McCarthy (2001), and Stepanek (Spring, 2001).

II. Year One: Lesson Study Emerges in the San Mateo-Foster City School District (Spring 2000-Spring 2001)

Four educators in the San Mateo-Foster City (SMFC) school district⁴ heard about lesson study in the Spring of 2000, at a workshop focused on the TIMSS videostudy (Stigler & Hiebert, 1999). The four educators – three teachers who also served part-time as math coaches and one project coordinator – saw lesson study as a means to create lasting change in their district and build on on-going efforts to promote teacher collaboration. In later reflecting on their reasons for wanting to adopt lesson study, the four educators mentioned the goals listed in the left column of Table 2. The educators hoped to improve the district's professional development model, which they regarded as ineffective and constantly changing; to build teacher-driven, collaborative learning and instructional improvement; and thereby to improve student mathematics learning. As one of the teacher-coaches said, they considered lesson study as a model for their district because:

This seemed like something that could really become institutionalized almost organically.... You just have to start it and teachers would love it and so they would just keep it going. Once you could get them in the habit of collaborating, they would continue to collaborate.... I guess that might have been a naïve idea, but just kind of idealistically thinking if you can just give teachers that positive experience of collaborating together they will keep wanting to do that when they see how powerful it is.

Japanese teachers typically adopt lesson study as a way to promote student development, and they begin lesson study by discussing the ideal qualities they would like students to have in the future, and students' actual qualities now⁵. In contrast, San Mateo educators adopted lesson study with an initial focus on

⁴ A small K-8 school district south of San Francisco.

⁵ However, Japanese educators recognize that lesson study is a way to build collaboration and develop a community of practice, e.g., Nakamura et al (2001).

improving learning among teachers, and the hope that improved student outcomes would come over time with the use of lesson study.

Lesson Study Implementation, Year One

A key factor in implementing lesson study during year one was the team of four educators just described (henceforth called “the leaders”), who actively studied, organized, and advocated for lesson study in the district, drawing on each others' strengths, which included mathematics expertise at different grade levels.

Their actions to implement lesson study during the 2000-2001 school year are shown in Figure 1 as seven implementation steps. The leaders did not characterize their actions as an implementation cycle; they simply took steps that made sense at the time. However, Figure 1 may provide a useful representation of their actions by drawing attention to (1) the non-sequential and repeating nature of the implementation activities and (2) the specific steps taken to implement lesson study during year one. In the SMFC district, these seven implementation activities overlapped in time, as shown in Table 1. District leaders assumed that these steps would need to be repeated many times before the district would reach their lesson study goals; for instance, they did not expect to change the district's norms of teacher collaboration in one year.

Step 1: Learning about lesson study. The leaders actively sought opportunities to learn about lesson study through print and video materials, live observation, conferences, and consultation with lesson study researchers and practitioners, as summarized in Table 3. These resources provided both an overall picture of lesson study and examples of and detailed information on

specific lesson study features, such as sample lesson plans and guidelines for developing a research lesson and using a lesson plan during a classroom observation. Their learning was supported by many factors, including the willingness of the superintendent's office to support this practitioner-initiated learning agenda, travel funds, and the fact that one team member was fluent in Japanese.

Step 2: Shaping the lesson study model. The leaders believed they would need to adapt the Japanese lesson study model to their local circumstances and needs. As one leader said:

We did actually have the idea that we were going to have to translate this Japanese model into something American.We knew that exactly how it was done in Japan wasn't going to work here precisely. I think that we were realizing at the time that teachers would need to understand this and they would need to implement it and they would need to enjoy it if it was going to persist in any way.

The leaders solicited volunteers interested in doing lesson study in mathematics or science.⁶ Although lesson study occurs in all subject areas in Japan, the leaders focused on math and science in order to take advantage of Eisenhower professional development funds. Their lesson study design included teachers meeting in small teams of 3 to 5 individuals for 20 hours across the year, outside of school hours, to plan as many as three research lessons. In addition to the focus solely on math and science, a second departure from Japanese practice was to provide a \$500 stipend in return for 20 hours of work.

As one leader said:

⁶ Because of funding requirements, only middle school teachers were supported to focus their lesson study work on science. All groups that implemented lesson study in year one focused on mathematics.

If it was somehow open-ended, it might be on the one hand unclear and frustrating.... On the other hand,if everyone was getting the same stipend there would be a lack of equity about 'they might give that many hours and we gave so many more hours'.... There is no compensation as far as I know in Japan; that is part of the expectation of the job. But we can't, simply because of the contractual nature of our working conditions,decide to add hours and commitments to people's time and expect to get a lot of response.

While some resources listed eight collaborative teacher activities that comprise lesson study,⁷ district leaders collapsed lesson study into four primary activities: collaboratively planning a lesson; teaching and observing a lesson (calling on substitutes to cover classrooms); discussing, revising, and (if time) reteaching the lesson; and providing the lesson to district leaders to be published on the district intranet.

The leaders knew that lesson study in Japan began by agreeing on a common goal for students. On the advice of a Japanese colleague teaching in the U.S., they purposefully "short-circuited" the goal-setting process by providing a goal rather than having participants spend time defining a common goal.⁸ By providing this goal – "that all students will be successful in mathematics" – they wanted to give teachers more time to "get into the lesson study process." One leader said:

We knew we were skipping that [goal-setting]. Because that seemed really big to us and we didn't know how to get people from different schools in different grade levels to be able to do that.

⁷ *The Teaching Gap* (Stigler & Hiebert, 1999) identifies eight steps involved in lesson study: Defining the problem, planning the lesson, teaching the lesson, evaluating the lesson and reflecting on its effect, revising the lesson, teaching the revised lesson, evaluating and reflecting, again, and sharing the results. Other authors collapse divide these activities in different ways. For example, Lewis (in press) collapses these tasks into four steps.

⁸ The Japanese colleague indicated that goals would be meaningful to teachers only if they had time to discuss and come to common agreement about what the goals meant.

The SMFC lesson study model specified the use of substitutes to cover teachers' classes during research lessons, another difference between their model and lesson study in Japan. One leader explained that, because of legal requirements: "Substitutes are absolutely needed here. We cannot send teachers out and leave classrooms unsupervised."

The leaders also made modifications designed to create a safe environment for participating teachers. As one leader explained: "We allowed for just about any degree of participation. You didn't really have to teach the lesson if you didn't want to." District leaders offered to teach the lessons or have teachers do the lesson without observation by colleagues. Based on their philosophy that teachers would like it if they tried it, the lesson study model focused on getting as many teachers as were interested involved in the process, and creating a safe environment for building and discovering the value of teacher collaboration.

Step 3: Leveraging support for the lesson study effort. The leaders discussed lesson study with district administrators in charge of various funding streams, in order to find support for training opportunities, substitutes, and stipends for teachers. As leaders later recalled, the top district administration was not actively supportive, but did not "get in the way" of the lesson study effort. District leaders also arranged continuing education credits through a local university as a further incentive for teachers' participation.

The leaders also recruited outside researchers (Lewis and Perry, of Mills College) to document the district's lesson study effort, provide formative feedback on progress and challenges, and provide evidence to teachers that their work was of broader significance. As one of the district leaders said later, "The validation...was incredibly valuable for us and for the teachers – of this effort

being worth it." As these examples illustrate, the leaders focused on building acceptance of lesson study during year one.

Step 4: Recruiting and training lesson study participants. In Spring 2000, district leaders pitched lesson study to district principals and asked them to dedicate one professional development day at the beginning of the 2000-2001 school year to introducing lesson study to teachers in the district. Although principals declined the request, district administrators provided financial support for three different lesson study training opportunities which allowed leaders to "entice people with a lot of different ways they might get introduced to it." During these sessions, the leaders introduced interested teachers to research on lesson study, showed the TIMSS videotape of a Japanese mathematics lesson, and discussed implications of lesson study for district professional development. They also introduced their model of lesson study and the support teachers could expect, including stipends for after-school participation, substitutes for research lessons and assistance from the teacher-coaches if they had questions.

During these events, teachers who wanted to participate in lesson study were asked to form small lesson study groups by grade level (or adjacent grade levels) and to begin selection of a research lesson topic from the district mathematics curriculum that was consistent with the district's overall goal of success for all students in mathematics. Participants were advised to focus on a topic that was difficult to teach or learn, and to link their work to the district mathematics standards. For many groups, it was difficult to select a good research lesson topic. As one leader pointed out, Japanese teachers could start lesson study by consulting books of research lessons, but in the U.S., "We don't

have that base of lessons already described and written up to use as a starting point.... We don't have that shared body of great lessons to begin from."

Lesson planning guidelines provided during the training encouraged teachers to consider students' prior knowledge, likely student responses to the lesson, ways to assess the lesson's success, and how the lesson fit in a unit or sequence of lessons. Leaders later reported that these initial guidelines were "pretty minimal," since they themselves were still learning about lesson study.

Step 5: Doing lesson study. In the first year of implementation, twenty-eight teachers formed seven lesson study teams (six school-based elementary teams and one cross-school middle school team). Groups had freedom to decide how to use their funded time, and each teacher received three half-day substitutes.

In the training, district leaders had emphasized that lesson study was "about the lesson, not about the teacher." Within this broad guideline, each team established specific processes for when and how to work together. For example, one team agreed to adopt a learning (rather than teaching) attitude in their planning meetings. Another team agreed that self-critical reflection would promote more learning than would a defensive attitude and that each teacher should have ownership, voice and responsibility for the research lesson's outcome. While some participants were initially wary of working together and of being observed by colleagues, at least one teacher in each group volunteered to teach the research lesson and be observed by colleagues. Teachers reported that the focus on the lesson rather than on the teacher promoted safe collaboration.

Given the loose guidelines, it is not surprising that the seven groups varied in their lesson study implementation. All but one of the seven groups collaboratively planned at least one research lesson; the remaining group collaboratively selected their lesson topic and activity, but the lesson was planned by the teacher who taught it. Some groups planned one lesson; other groups planned two lessons. Some groups taught, revised, and re-taught a single lesson in different classrooms with different instructors, while other groups moved on to plan a second lesson. All groups debriefed their lessons and in most cases this occurred immediately after the lesson, although one group had to schedule their debriefing at a later time, resulting in some fading of their memories. Some groups invited the leaders to attend their meetings and lessons, while other groups worked on their own, with little outsider input. In addition, some groups were comprised of individuals with more mathematics content knowledge than others, which seemed to enable these groups to focus more deeply on mathematics content. Most lesson study work was finished by April to accommodate other end-of-year priorities such as standardized testing.

Step 6: Reflecting on lesson study. Reflection on the lesson study process was supported by much informal information gathered by the leaders through their own group membership or coaching in district schools. Additional formal sources of information included interviews with each of the lesson study groups, observations of group meetings, and lesson plans submitted by each group.

In moving ahead with lesson study without clear guidelines about how to do it, the leaders had taken a calculated risk. They recognized that many teachers were unaccustomed to feedback on their instruction and might have negative experiences with collaboration that would undermine the entire lesson study

effort. The data available at the end of year one suggested to the leaders that the lack of clarity inherent in their “learn as we go” approach and the pitfalls of collaboration had been outweighed by lesson study’s advantages over other forms of professional development, as two participants’ comments reflect:

Most other professional development I've been through has been sitting at a meeting and taking in new information for a day. And then they're like, "OK, go do it!" The practicality of that is really hard. There's no follow-up and you don't talk about how it goes after you do it or anything like that. You go for a day and you get all excited and you're like "Oh, that's such a good idea!" and then you're like "What did he say again? What should I be doing right now?"

I liked this because rather than putting a portfolio together and saying this is what I did all year and then putting it in the closet, we actually used this. And it really affected our students. To me, that was beneficial.

When teachers were asked to report on what they found useful about lesson study, every participant mentioned collaboration. Comments from both experienced and inexperienced teachers illustrate the perceived benefits of multiple views on the lessons:

When you've been doing certain lessons for many years, you don't have a fresh outlook on it. So if you bring in someone who hasn't done the lesson yet and you discuss it, you've got someone asking the right questions like 'Now why is it you do this?' And 'Is this part necessary?' And 'Are the kids ready at this point of the year?' That's what I think is really valuable.

[The lesson] wouldn't have been nearly as powerful if I had done that by myself. I would have just followed what it said in the book. And that's what didn't work for me last year, but I didn't know where to change it.

The collaborative structure of lesson study pushed teachers to come to joint understandings, for example about student capacity, effective teaching strategies, and mathematics. One teacher leader reported:

A lot of times it seemed like we were trying to establish common vocabulary, common understanding. We would say, "OK, let's do fact families." Then we would all go, "Well, what does that mean? What are fact families? What numbers are you talking about? How do you do it?" We had to have a big discussion about what is place value. So, if you're going to say, "Oh, this is really important. They don't get place value." Well, what does that mean? What don't they get? Just coming to those common understandings of what are we talking about.

Teachers also appreciated the observation component of lesson study, both in terms of observing the lesson and teaching in front of colleagues. Even teachers who were initially wary about being observed valued the experience, as one teacher indicated:

I haven't been watched since either being observed by the principal or since my demo lesson to be hired.... [With lesson study] I'm not being criticized, I'm being watched [and other teachers are] looking at the lesson and looking at the kids. So it was a positive environment of being observed. I was nervous definitely, but when it got down to it, I forgot that you guys were there. I was just with the kids.

The joint observation of the classroom lesson, followed by reflection about the lesson, also helped teachers to establish common understandings about how to improve the lesson. As two teachers said:

You could all hypothetically have conversations at lunchabout kids or what would you do in [a] situation, but you don't experience anything together.Because you both weren't there, you might have a slightly different picture of it. And so, I think that's a huge problem.

I think the best part of it was the ability to sit and discuss after the lesson with the four of us. Being able to debrief and talk about it and what went right and what could be improved. That kind of thing, to me, was the most valuable.

When asked if they would continue lesson study the following year, all teachers were enthusiastic about its benefits, but several mentioned that competing demands in the coming school year (for example, school-wide

adoption of a new language arts program) would make it difficult to continue lesson study. Fifteen out of twenty four teachers interviewed at the end of the first year planned to continue doing lesson study.

In addition to the challenge of finding time to do lesson study, topic selection was a second major challenge for most groups. Teachers had difficulty anticipating where they would be in the curriculum at the time that the research lesson was going to occur. A teacher whose group decided to focus on word problems commented:

We're doing measurement right now, but I'll stick this in and kind of work on story problems, but.... I'm kind of constrained to go back to something that we already did.

Interviewer: So it feels a little bit out of place?

It feels a little bit out of place. We knew that they [story problems] were going to come a couple of times during the year, so we thought it would be [a] good [topic]. But they've already come a couple of times during the year...

Starting from the district curriculum also required teachers to hone their selected topic down to a manageable size for a research lesson, a problem that teachers in Japan rarely face because of their spare curriculum (Lewis & Tsuchida, 1998). Lessons, typically taught over several days,⁹ needed to fit into one-hour timeslots. As one teacher said about their topic:

My suspicion is that we picked a really cool problem but that it was maybe beyond what was a good problem for a first attempt. It might have been easier for us, when we're trying out something for the first time, to choose something that is very familiar that we already teach within our classroom and perfect an activity we already had than maybe launch out and try something else.When I go back and I look at it now, I think we really took

⁹ The district's elementary mathematics curriculum for a particular grade level includes a series of curriculum units, where each unit is divided into activities and lessons. For example, the third grade curriculum consists of multiple math topics, one of which is geometry; teachers' guides suggest teaching the three geometry units using 10 activities in 43 sessions (one-hour math classes).

on something that was huge. We could have taken on something that was much simpler as a first task.

Although district leaders had emphasized lesson study as a cycle of inquiry, they observed that teachers who had not previously been involved in collaborative lesson planning seemed to focus most on the lesson planning rather than the observation or debriefing aspects of lesson study. Having teachers begin their work by selecting a particular math lesson to fit an already established goal – rather than developing a common lesson study goal – may have exacerbated this focus on lesson planning. However, the data also suggested that teachers' views of lesson study developed and changed throughout the year as they tried it. Teachers reported the stipend they received allowed them time to collaboratively explore, falter, and figure out where they were going. One teacher commented on how her perception of the lesson study process changed:

I originally thought, 'Well, this is silly. We're just going to go do a lesson and then we're going to rewrite the same exact lesson after we teach it.' Which didn't happen.

Leaders saw that their “learn as we go” approach and loose lesson study guidelines had resulted in implementation that looked different across the seven lesson study groups. As leaders learned from their own participation in lesson study, they shared their learning with other groups:

As we were going..., we had some real issues about how to make the debriefing process more effective. Only from ourgroup going first and realizing how we could do it better.... And then quickly running to other groups and saying "Oh, let's share this information with you."When we started off, we didn't even have any guidelines for people about what to do or how to debrief and process afterwards.... What we began to suggest....is that people have different jobs when they are observing, because the first time we did it, everybody just observed, without any kind of like assigned

task.So we realized we had to have specific data that we were collecting because when we are getting together to talk about it, we're not referring to data. We're just referring to our subjective memories about what happened. I didn't feel like the post-lesson discussion was deep enough and rich enough about really reflecting on content and getting at the content. So that we knew that we needed to be collecting data better.I remember I went to the [school name] lesson when they were getting ready to do the lesson and saying "OK, think about this.What is everybody going to be looking for and watching for?" The [groups] that we didn't go to, they didn't necessarily get that direction.It seemed like people appreciated having some kind of direction.

This comment illustrates three important lessons learned by the leaders during year one: the need to try lesson study in order to refine it, the need for guidelines for participants just beginning to do lesson study, and the value of providing content and lesson study support for lesson study groups.

Step 7: Sharing the knowledge with others. The leaders shared their lesson study experiences with other educators at local and statewide conferences of math and science educators in spring, 2001, providing an opportunity to further their reflection on their lesson study effort and to compare it to lesson study in other sites.

III. Lesson Study Modifications: Summer 2001-The Present

This section highlights some of the modifications made to lesson study after the first year of implementation.

Changing Lesson Study Goals

As SMFC educators learned more about lesson study, their original hopes for lesson study became more clearly defined and they began to see other potential benefits. Table 2 illustrates their original lesson study goals (left) and the additional goals they added in the second year (right), beginning in Summer of

2001. Although they continued to focus on the same four categories of goals – professional development, teacher collaboration, instructional practice, and student learning – in year two they developed more specific goals around collaboration and the lesson study model.

For example, while district leaders originally hoped that lesson study would change the culture of collaboration within schools, they later realized that this goal assumed that teachers already understood the value of collaboration. Teacher feedback at the end of the first year suggested that many teachers had not experienced a positive model of collaboration like lesson study before and did not understand prior to this experience how they could benefit from collaborative work. As one district leader reported:

I thought it was obvious, the power of collaboration. And then I came around to thinking that that's one of the goals – for teachers to discover and value the collaboration.

District leaders also learned that, in addition to having teachers value collaboration, it was important for teachers to understand and acknowledge how difficult good collaboration could be. As a leader said:

I realize how much more complicated collaborating is than just having people get together and share ideas. Now that I've really had to plan lessons with people and had to work at when to be quiet and when to listen.... And am I being a good listener and trying to figure out do we all have the same ideas. Really realizing how multi-dimensional good collaboration really is. On a personal level, [one of my goals is] realizing how can I be good at that or how can I do that better. And how can I help other teachers understand the role that they play in being a good collaborator.

In acknowledging that some teachers neither understood the value nor the difficulty of good collaboration, district leaders began to acknowledge the need to facilitate good collaboration as part of their lesson study model.

District leaders also began to understand that lesson study was more than a process for planning and revising a lesson; they began to see how the full cycle of lesson study activities worked together to uncover issues around teaching and student learning. As one leader reported: "I think at the beginning the emphasis was much more on the lesson and....as people work, they realize that it really is about the entire process." This learning happened partly in response to teachers' comments about how valuable the debriefing aspect of lesson study had been for them.

In addition, as their understanding of lesson study expanded beyond a lesson focus, district leaders began to see that lesson study could be used as a tool to assist with other aspects of teaching. This shift led district leaders to consider two additional goals for teacher participants. First, they wanted to help teachers understand that lesson study could support the implementation of other curricula or programs. As one teacher leader put it "...it is something that can be used to address a lot of the issues that we are forced to address all the time." In a sense, they wanted to deepen teachers' understanding of lesson study, to help them see that lesson study is not a "program" to add to their list of responsibilities. This, they felt, would increase teachers' excitement and enthusiasm about lesson study.

The leaders also began to make connections with other practitioners and researchers involved in lesson study efforts emerging across the U.S., an experience that led them to see SMFC's role in a larger nationwide lesson study movement. The leaders wanted teacher participants also to understand their role as pioneers in a national movement.

Lesson Study Implementation, Year Two

With a deeper understanding of lesson study and what they could gain from it, district leaders also realized the need to revise some of the processes they had developed in the first year, and a number of modifications were made in the seven implementation steps. One noteworthy characteristic of year two was the extent to which the leaders reached beyond their own district for guidance on how to refine their lesson study work. In this respect, the district's lesson study effort became more of an open system in year two: Through their emphasis on and ability to span their own district boundaries, they learned from others and developed a niche and reputation for themselves and their district in the broader education system. In a sense, the lesson study cycle of planning, doing, reflecting, and revising was being applied not just by individual lesson study groups to their topics, but by the leaders to the district's lesson study process as a whole.

A second noteworthy difference in implementation between years one and two was the rate at which the district cycled through the implementation steps. In the second year, leaders organized a two-week summer institute, a spring lesson study open house, and support for ongoing lesson study groups throughout the year. Hence teachers were able to cycle through the stages of implementation at an accelerated rate, allowing learning and adaptation of the lesson study model to happen in a more continuous way. In year two, the district's lesson study effort became more about continuous improvement than a sequence of implementation steps.

Step 1: Learning about lesson study. When they began lesson study, leaders' knowledge of lesson study was drawn mostly from Japanese models,

including live and videotaped demonstrations and written descriptions of Japanese lesson study. As the innovation spread nationally and district leaders faced the need for more information to refine their lesson study processes, lesson study resources were growing in number and changing in form. Table 3 displays the lesson study resources that were available to SMFC educators in the first and second years of implementation. It shows the increased use in year two (boldface type) of district experience doing lesson study and of the experiences of other lesson study practitioners (both Japanese and American).

Collaborative lesson study with other Japanese and American practitioners proved to be an especially important learning resource for SMFC educators, because they could see alternate approaches to lesson study and discuss areas in which they had difficulty. A two-week summer institute, jointly planned by us and SMFC educators, brought together SMFC and Japanese educators to learn about geometry and lesson study, including about 25 SMFC educators, six Japanese educators, two teachers from School Two in Paterson New Jersey and ten observers from other parts of the U.S.. The conference demonstrated nine mathematics lessons that were jointly planned, taught, and discussed by groups of Japanese or U.S. teachers. American lesson study groups taught four research lessons; Japanese lesson study groups taught five research lessons, allowing participants to observe and learn from both expert and novice lesson study practitioners.

District leaders reported that the summer institute provided an intensive "shot in the arm" that they needed to further their learning and notice fine points of lesson study. As one district leader said, by organizing the summer workshop after their initial year of implementation, they were able to gain more than they

might have in the previous summer because they could make connections to their existing lesson study knowledge. Another district leader remarked:

Having the Japanese teachers there was incredible. All of their lessons were really fascinating and interesting and it was reassuring for teachers to see Japanese teachers having the same kinds of struggles that we have – they didn't do everything perfectly. Sometimes the materials management wasn't perfect or they didn't get everything included in the lesson. They're not necessarily gods.... But they did have these great lessons, too.... so it made it seem really attainable. And then also to have the whole process modeled. So what they did seemed attainable and acceptable to us. It wasn't like, "Oh, we'll never figure out how to do that." It kind of demystified it – "Yeah, we can do that."

Teachers also commented on how the summer institute deepened their understanding of lesson study. For example, one teacher, who experienced lesson study for the first time during the summer workshop commented:

[Afterwards] I had a better understanding of what lesson study was. [Earlier] I had this misperception of what lesson study was – you create a lesson, people watch you and it's over. I didn't realize that there was so much dialogue before and after and how that dialogue, I think, is much more important than the actual lesson. Because that's where you're growing as professionals, you know?It was nice to be working.... as professionals and not just.... that teacher talk that you do in the teachers' room.

This focus on doing lesson study was carried over into the second school year with two additional events. A research lesson and debriefing session were organized at one school that had decided to expand lesson study school-wide to introduce it to the staff in an authentic way. The district also organized a lesson study open house, scheduled for Spring, 2002, in which both Japanese and SMFC educators would demonstrate and discuss lesson study. Both events built on relationships with individuals and materials that had been developed over the summer. A district leader commented on the usefulness of these public events:

That [summer workshop] was kind of like we were learning, learning, learning and then [sound effect] this huge shot in the arm. We learned a lot really quickly. It was really good for the momentum to have an intensive experience too. And I think that the open house in the spring is going to have that effect again.... You know, there is going to be another jolt of learning.

As lesson study was being tried out in different locations throughout the country – for example, Paterson, New Jersey, Bellevue, Washington and Nashville, Tennessee – different ideas about lesson study were emerging and information about these efforts was made available through personal networking, conferences, the internet, and print and video resources. For example, an internet-based lesson study listserve and a lesson study discussion forum were developed by researchers and technical assistance providers, lesson study was a significant focus at several state and national mathematics conferences, and research reports on other U.S. lesson study efforts were emerging. District leaders drew on information about these other lesson study models to motivate their own lesson study effort.

Expanded documentation of SMFC lesson study activities provided a third important element of year two learning. New forms of documentation included several added to the summer workshop: daily reflection forms, interviews with both U.S. and Japanese lessons study groups, collection of lesson artifacts (lesson plans, student work, teachers' lesson observation notes) and observation and videotaping of research lessons and lesson discussions. During the school year, additional documentation included a reflection form to track teachers' learning throughout the school year, observations of the meetings of several lesson study groups, and interviews designed to elicit information about lesson study goals

and processes. As one leader reported, this research made a difference because it provided an outside perspective on their own effort:

Your involvement forced us to get clearer about what we're doing. And that's always a good thing. I mean, we can hardly tell you what we're doing if we don't know; we have to try to clarify it. The documentation.... We would have always known.... that that would be a really important thing to be doing and we would have never gotten past the smallest tiny step. Because there are just not enough hours in the day to do our work, let alone try to take on new things like this and do that too.

Step 2: Shaping the lesson study model. Table 4 highlights features of the SMFC lesson study model in years one and two. As the boldface type illustrates, three major refinements to the SMFC lesson study model in year two centered on the activities expected of the participants. Leaders added two previously omitted activities – goal-setting and ongoing reflection – and asked for final lesson plans to be accompanied by a synopsis of learning that happened as a result of the lesson study work. Although they had consciously skipped goal-setting during year one in order to save time, they realized the value of goal-setting in helping teachers to establish a common direction for the research lesson, connect the lesson to their long-term goals for students, and thereby increase the motivation to do lesson study. In year two, although district leaders did not *require* that each lesson study group do a goal-setting activity, several of the groups worked with district leaders to establish specific goals for their lesson study work. Refinements in the training process and materials facilitated this shift toward goal-setting. Throughout the second year district leaders continued to struggle with how to facilitate the goal-setting process to help lesson study groups develop meaningful goals.

As the leaders began to see lesson study as a way to build thoughtfulness about instruction, and not just a way to plan a lesson, they began to realize the importance of helping teachers reflect on the lesson study work. They also began to see that simply sharing lesson plans over the district intranet – without evidence of what had been learned in the process – did not necessarily support one another's learning from the lesson study work. As one district leader reported:

I think what we've realized now is that we have to have a reflection piece in there as well. And that wasn't something that jumped out at us about the Japanese model. We didn't notice that at first. It wasn't until we were doing it that we realized, oh yeah, that's a real big piece of it. When we had read.... that you go to bookstores and you buy these books[of] lessons that have been taught, we thought that was just a sharing of the lesson and not necessarily a sharing of everything that had been also learned along the way. So I think the first year, that wasn't part of what we saw as the model for lesson study.

A second set of changes to the lesson study design stemmed from the greater funding available the second year. Increased funding (due to successful external grant requests written by the leaders) enabled support for lesson study in language arts as well as math and additional funding for substitutes. Increased substitute time was provided because district leaders and participants recognized how valuable, yet how time-consuming, teachers' collaboration was. Also in recognition of the time-consuming nature of collaboration, the leaders revised downward their expectations about how many research lessons each group would complete during the school year from three (the year one request) to one or two. This shift was expected to enable teachers to delve mooringly into each lesson.

Step 3: Leveraging support for the lesson study effort: Leaders applied for and received funding from both a local and a national foundation and a local school change project. The opportunity for the program officer to participate firsthand in lesson study during the summer workshop was instrumental in obtaining local funding. The external funds supported teachers' attendance at the summer workshop (most of them new to lesson study), extension of lesson study to new schools where teachers had not previously participated, and extension to language arts. One leader reported that the option to focus on language arts during year two opened up lesson study to teachers who were not comfortable with mathematics.

A school-wide "lesson study lab school" also emerged in year two, at a school where four teachers had participated in lesson study during year one, and where a staff poll indicated widespread interest in devoting two out of four staff meetings per month to lesson study. The school-wide effort received further support when one of the original lesson study leaders became the school's principal following transfer of the prior principal. New participants at the school were able to draw on the experience of teachers who had participated in lesson study during the first year or summer workshop. Although these teachers spoke about lesson study's difficulty, they also affirmed its worth.

During year one, the leaders supported lesson study mainly by securing funds and serving as "lead learners"¹⁰ alongside the rest of the participants. During year two, the leaders expanded their conception of support to include other outside specialists. The summer workshop dramatically illustrated the value of outside expertise in lesson study and subject matter, as participants

learned new strategies for organizing the debriefing session around key questions, and were provoked to think about the big ideas in geometry. In year two, leaders encouraged lesson study groups to involve outsiders at all stages of their lesson study work, and they recruited specialists with mathematics and language arts expertise to provide feedback on lesson plans from the earliest stages of planning.

Step 4: Recruiting and training lesson study participants: During year one, leaders believed it would be challenging to interest teachers in a new approach to professional development, and they targeted their recruitment toward what one leader dubbed "early innovators." Recruitment during year two was made easier by the testimonials of teachers who had participated and the credibility provided by external funding.

The leaders reported that they changed each training event during the first year as their own experience with lesson study increased; Table 6 reveals substantial change, also, from year one to year two. For example, during year one training events were organized at the district level, but by year two several events were held at the site level, at schools that had a critical mass of teachers interested in lesson study. Another change from year one to year two was the addition of intensive, multi-day learning opportunities, like the summer workshop and week-long spring open house during which teachers could observe lesson study in action, participate, and apply as well as acquire knowledge about it.

In the second year, leaders had videotape and print resources that showed both U.S. and Japanese lesson study models and that enabled new participants to

¹⁰ We are indebted to Lynn Liptak for this term; see Lewis, 2002.

explore some of the more difficult aspects of lesson study before they tried it. For example, in year two, teachers viewed and discussed a videotape of San Mateo teachers conducting lesson study that illustrated some of the difficulties in anticipating student thinking. In year two, leaders emphasized to new participants that they were not trying to recreate a Japanese lesson study model, but rather that they were building their own lesson study model adapted to their specific circumstances. As one leader described the change:

[At first] we wanted to explain to people what lesson study looked like in Japan. Now when we do it, we give people the idea that lesson study came from Japan and what it looks like in Japan, but then we also really paint a picture of what it looks like here in San Mateo because now we can talk about that.

The capacity to draw on US models of lesson study – particularly one developed in their own district – and distinguish it from Japanese lesson study seemed to make lesson study less threatening to new participants.

Step 5: Doing lesson study. The district as a whole implemented two lesson study cycles during year two: one during the summer workshop and one during the school year (still in progress). Table 7 shows some of the differences in lesson study implementation between years one and two, including increased use of guidelines and outside specialists during year two.

During the two-week summer workshop, four lesson study groups spent about eight hours collaboratively planning lessons taught the following week and observed by the planning group and other workshop participants (about 20 people). With the assistance of an outside moderator, the teachers who planned the lesson discussed it and then invited audience members to comment and ask questions. All of the lessons and discussion sessions were videotaped.

Leaders made two changes to the lesson study guidelines for the summer workshop. First, they provided a lesson plan template (based on a lesson plan developed by a Japanese teacher who taught during the workshop; see Appendix A) and asked teachers to use this it to guide their planning. A second change was to ask teachers to complete daily reflection forms describing their learning. Comments were read daily and used to make adjustments to the workshop.

During the school year, 61 teachers formed into 15 lesson study groups at nine schools. Of these teachers, 35 were new to lesson study. While the groups' work is still unfolding, it seems that the templates and use of outside specialists are being embraced by at least some groups. For example, one school-wide group and one four-person team set goals for their lesson study work using a tool provided by Lewis, based on Japanese practice (see Appendix B). Another group reported that consultation with a local literacy expert led them to shift their research lesson topic, and their approach to instruction. One leader described the shift:

Their lesson study group was working on literacy issues – they're the third through fifth grade teachers for the second language learners at [school name]. And they were working around a particular problem of kids who seemed to be stuck at... at a particular guided reading level. ...They brought in some expertise, and it really raised their consciousness about issues of phonemic awareness... They wouldn't even have been investigating this otherwise, and felt like suddenly now they were doing a lot more other instruction around phonemic awareness for these kids and finding that... they were making great gains in their benchmarks for reading. And they arrived at that because of being interested in thinking about it for their lesson study. And it wasn't about just one lesson; it was about this is a whole piece of our instruction that we should be focusing more on.

During year two, leaders offered teachers more guidance on debriefing, following a Japanese model from the summer workshop, in which discussion

focused on three or four important questions about the lesson or about learning more broadly. U.S. teachers welcomed this format, since they had been dissatisfied with their previous format for discussing lessons:

Our past experience with lesson study... when we're debriefing the lesson, we usually just get together and everybody talks as fast as they can about everything they remember and what impressed them. So we're trying to learn to be more systematic about how to debrief a lesson.

Teachers were also asked to reflect on their group's learning at the end of meeting, using a very brief reflection instrument available on the district's computer server so that groups could complete their reflections on-line. Despite the shortness and easy accessibility of the reflection instrument, leaders found that teachers still have difficulty finding the time to do this type of reflection.

A mid-year (winter) district-wide meeting of all lesson study participants also reflected changes from year one to year two. While it was regarded in both years as an opportunity to hear teachers' feedback on lesson study and to make mid-year corrections, in year two leaders regarded it also as a chance to build lesson study momentum and provide moral and professional support for participants. Leaders observed that the second year's meeting focused on specific reports of lesson study activities, rather than generic comments about lesson study.

Step 6: Reflecting on lesson study. Leaders reflected on what they had learned about lesson study, in order to share their knowledge with others. One leader summarized a list of their learning, compiled prior to a meeting with county educators:

District leader: We have things [on our list of what we have learned] like the importance of reflection. You need to build it in along the way – that's the only way to collect it. And that it has to be there – we didn't do that the first year. The impact of having knowledgeable others involved... Not deciding on who is going to teach the lesson... And then the idea about it is really important to take the time to get the big picture about what they're teaching... Like we're going to teach fractions with unlike denominators and you kind of want to jump into that thing, but you really have to spend time talking about it in a big way before you can hone in on that particular skill.

Interviewer: So, focusing on the content instead of the curriculum?

District leader: Exactly. And then articulating it. What's before? What's after? What are we assuming that kids already know? What do we have to be able to build on? Having a format for the post-lesson discussion and really focusing those lesson discussions... We learned that students are incredibly flexible – you can put 30 people in a room to watch them and it's no big deal. We also learned that teachers are much more flexible than we thought. And I know a lot of people say, "Oh, teachers would never do that." And they do. It's not a big deal. That it spreads teacher to teacher. In places where it's grown, it's not because an administrator said "It's because I want you guys to do this." It was because other teachers were excited and said "Oh, you should do this." And there isn't one right way to do this.

The summer workshop provided opportunities to see how collaboration among teachers and use of outside specialists each promoted learning. A lesson planning session among SMFC teachers during the first week of the summer workshop, illustrates how teachers' collaborative work led them to new understandings about mathematics, specifically triangles. In this situation, elementary teachers were planning a lesson designed to help third grade students learn that a triangle has three straight sides and that there are different shapes of triangles:

Teacher 1: [In the lesson] is the teacher... identifying only the three [triangles] that are in the third grade standards? So it's just equilateral, isosceles, and right? We're not going into scalene?

Teacher 2: But what about scalene?

Teacher 3: Absolutely we should have scalene, because if a child says "there are four kinds [of triangles]", then go with it.

Teacher 1: And obtuse?

Teacher 4: That's an angle.

Teacher 1: But in here [district mathematics standards], it's an obtuse triangle. And in that test...

Teacher 3: It was an obtuse scalene triangle.

Teacher 2: [Points to an example of a triangle] So is that a scalene?

Teacher 3: [Refers to material she brought in about triangles] What does it say?: "A scalene has no equal sides and an obtuse scalene has one angle larger than ninety degrees and no equal sides."

Teacher 4: ...I guess I always picture a scalene [triangle] with an obtuse angle.

Teacher 3: ...You know, we get locked into the pictures that are in the textbooks and we think that's that triangle.

Teacher 2: So we're going to put right triangle under...?

Teacher 3: Isosceles, equilateral, and scalene. I think we absolutely need be ready for scalene.

Teacher 4: And do we do a right triangle?

Teacher 1: That's one of the standards.

Teacher 3: So, actually, we should be doing four triangles.

Teacher 2: So then we have to talk about angles. They're going to ask how come it's called a right triangle and you're going to have to tell them about ninety degrees.

Teacher 1: ...Aren't all right triangles scalene, by the Pythagorean theorem? They have to be, right? They have to be.

Teacher 4: No, you have two lengths that are the same length – that's where your right angle is. And then your longer one could be your connector.

As their planning work continued, teachers built and discussed different types of triangles, and arrived at an answer to Teacher 1's question about the difference between right and scalene triangles for themselves.

A second example is drawn from a discussion of a lesson designed by U.S. teachers to help fifth grade students identify critical attributes of polygons. In that discussion, a Japanese educator commented that the most important element of geometry in the elementary grades was learning how to investigate geometric shapes. In reflecting on this comment, a SMFC teacher said:

I'm still stunned by what Mr. Takahashi said. And I'll just share with you and just stick my neck out. Maybe I'm the only one here who is stunned by that. He said how to investigate geometric shapes is the most important part of elementary geometry. How come I don't know that? Am I the only one here who doesn't know that? So, step number one, I would say for us in America is that we need to know what exactly is the most important thing

about our curriculum. And if they [students] don't get anything else, can they recognize that these shapes are comprised of different attributes. Because as we're crafting the lessons, if we don't know that, then we're just walking around in the dark. And maybe we'll bang into the wall, and maybe we won't.

In reflecting on what they learned from working with the Japanese teachers and seeing their lessons, SMFC teachers mentioned the idea of limiting the number of mathematical ideas in a lesson and purposefully connecting the lesson activities to the lesson's goal. In response to a question about what she had learned, one SMFC teacher wrote: "The importance of flow and continuity in a lesson. Does each part of the lesson further strengthen the ultimate learning objective? Are steps in a lesson building toward conceptual understanding?" Teachers also reported gaining new perspectives on how to use materials, for example, making sure that manipulatives and worksheets designed to support the lesson did not distract students from the lesson goal. In addition, after watching their Japanese colleagues, U.S. teachers commented on the value of letting students struggle to find their own answers and of exposing students' misunderstandings, in order to promote deeper understanding of a concept.

Two teachers commented:

I've been thinking a lot about our mindsets about our kids.... And my own struggle as a math teacher and not giving them the answer – letting them struggle.What if we had the mindset that we were teaching geniuses – that we were teaching an advanced class ... How much....are we not letting them discover because we don't think they can?Would our teaching be different if we were thinking we were teaching geniuses?

I saw that bringing out student misunderstandings about a math concept was healthy and part of a process of deeper understanding.... Step back and let kids think and struggle.

During year two, leaders also gained know-how about ways to facilitate collaboration within the lesson study groups. For example, they recommended

(based on the experience of one group during the summer workshop) that teachers finish most of the lesson planning before selecting the teacher that would teach the research lesson, a strategy that seemed to increase teachers' joint ownership of the lesson during the planning process. The leaders also added several tools and processes to guide group work, including a goal-setting process, reflection questions to help teachers think about what they were learning from their lesson study experiences, a lesson plan template, structure for lesson debriefing, and recommendation of involvement from subject matter specialists.

The leaders were initially apprehensive about the summer workshop, and particularly about asking students and teachers to accommodate up to 20 lesson observers, many of them from another country. The leaders decided to move forward, and they found that both students and teachers adapted gracefully and gained much more from the experience than anyone had imagined. The summer workshop experience reinforced the lessons of year one, with greater depth: Leaders saw the importance of content expertise and lesson study guidelines, and they saw how much could be learned from actually trying lesson study. Table 8 summarizes some of the lessons learned by SMFC educators.

Step 7: Sharing the knowledge with others. By year two, lesson study had begun to spread not just within the district but within the U.S. As a result, the leaders had more opportunities to talk about lesson study to others outside the district who were interested in learning about and trying it. (These opportunities often overlapped with SMFC educators' own resources for learning about lesson study, shown in Table 3.) Their active effort to share their ongoing learning about lesson study, through invited and self-initiated presentations at county, state,

and national conferences, revealed underlying assumptions about the value of support from a broader mathematics reform community and the difficulty of engaging in reform in isolation. One district leader commented that the future of lesson study would depend on individuals in different places developing strong connections so that they could learn from each other.

IV. What Role Should Research Play in Lesson Study?

Our account documents numerous refinements of SMFC's lesson study model over the first two years, including changes in goals, structures, supports, and the use of outside expertise. These refinements underscore the significant learning of project leaders and the changes for participants over this brief period. The data also provide evidence of progress in three out of four goal areas originally targeted by the leaders. (Impact on student learning was considered a more distal goal.) What are the implications of these early findings on the SMFC experience for lesson study practice and the broader enterprise of educational research in the U.S.?

Implication #1. More models are needed of research that constructively contributes to innovations in progress. We found relatively few examples of research designed to gather information from busy practitioners and rapidly use it to understand and promote improvement of an innovation in progress (for some exceptions, see Center for Research on the Context of Teaching, 2000, McLaughlin & Talbert, 1998, Schön & McDonald, unpublished; Schön (1991); Geiser & Berman, 2000; Berman & Chambliss, 2000). We wished for more examples of such research as we fashioned and re-fashioned data collection strategies, including leader and participant interviews, surveys, and observations

of lesson study activities, in order to help leaders identify and address successes and rough spots in implementation in a timely fashion.

We drew some valuable guidance from Chen's (1990) *Theory-driven Evaluations*, which advocates that researchers first construct a theory of action based on input from stakeholders. By eliciting information from stakeholders at particular points in the evolution of the reform, theory-driven research can adapt to practitioners' changes in goals or implementation plans. Theory-driven research builds on what educational researchers have documented about the difficult, unpredictable, and incremental nature of change (Fullan, 1991; Lindblom & Cohen, 1979; Williams & Elmore, 1976; Dobson & Cook, 1980) by encouraging researchers to pay attention to both planned and implemented change (Weatherley & Lipsky, 1977, Leithwood & Montgomery, 1980). Additional research models may help us in the research community develop "best practices" that are most effective for understanding and advancing complex educational innovations such as lesson study.

Implication #2. Theory-building research on lesson study is needed. One case does not make a theory. Isolated case studies of lesson study's success or failure are less useful to the research enterprise – or to practitioners interested in adopting the reform – than would be a coherent theoretical model of lesson study's development that emerged across studies, and could be used by new practitioners or tested by researchers studying new cases.

One solution to these issues may be to utilize approaches designed to build theory across individual cases, such as "design research" or "design experiments" in mathematics and science education (Confrey & Lachance, 2000; Lehrer & Schauble, 2001). Additional cases can be designed so that they respond

to the theoretical models developed by prior research. The SMFC case study suggests a number of propositions that might be incorporated into a theoretical model of lesson study: for example, that benefits of collaboration need to be experienced before teachers can see why lesson study might be useful; that first-hand experiences of lesson study provide greater “jolts of learning” than written materials or presentations; that word-of-mouth among teachers is an effective spread mechanism for lesson study; that observation and discussion guidelines promote effective lesson study; and that teachers regard their improved understanding of learning, students and subject matter as more important benefits of lesson study than the lesson plans themselves.

Implication #3. Assessing “the effectiveness of lesson study” is problematic. Educators often ask us whether there is proof of lesson study’s effectiveness. Behind this question seems to be the assumption that lesson study should be tested and proven in one site before broad dissemination, much like a vaccine or piece of computer software is tested and then disseminated. When is it reasonable to test the effectiveness of an innovation like Japanese lesson study, which includes a complex set of practices supported by educational system features, school and local culture, curriculum, tangible and intangible resources, and an enormous amount of know-how, very little of which is currently known to U.S. researchers? Interestingly, our Japanese research colleagues tell us that, despite lesson study’s 100-year history in Japan, there are no research studies of its effectiveness (Ikeda, 2001). While Japanese teachers conducting research lessons scour their classrooms for evidence on student learning, motivation, and development, and while Japanese teachers frequently ask how lesson study can be made more effective in their setting, they do not ask the general question “Is

lesson study effective?" This question is a lot like asking, "Is teaching effective?" The answer is always "It depends."

Educator Deborah Loewenberg Ball (1996) has suggested that all significant reform should probably be viewed not as "'implementation' of programs" but as "adaptation and generation of new knowledge." Shifting from a view of reform as a fixed thing to reform as knowledge adaptation and generation has important implications for researchers. We need to focus on reform's unfolding at particular sites, and what these sites can tell us about the model features and local conditions that contributed to or detracted from helping these sites reach their reform goals. If all reform is local (like all politics is local), the question "Is lesson study effective?" should seem as hopelessly general as the question "Is teaching effective?" Such an overly simple question can contribute to the rejection of innovations that haven't yet been deeply or thoughtfully implemented, and to the rapid cycling of educational fads.

Implication #4. Rethink the types of educational research we value. Our experience in San Mateo-Foster City points up that the information requested and valued by practitioners is not necessarily the same as the information valued by the educational research community. For example, one of the first questions SMFC educators asked us was "What is a good agenda to support a research lesson discussion?" Looking across videotapes from research lesson discussions in Japan, we noticed that the agenda typically allows the lesson instructor to speak first, allows co-planners to speak next, provides a facilitator, and provides minimal time for free discussion that might turn into grandstanding. In addition, the quality of data collected during the research lesson greatly shapes discussion quality. Considerable resources and know-how about lesson study

exist in Japan, but have generally not been translated and provided to U.S. audiences. Most researchers (ourselves included) have focused on the big picture of lesson study, not the detailed know-how needed for it to work. In the world of educational research, big, new ideas like lesson study are sexy, but the know-how to make them work is not. Should we rethink our values?

Other resources highly valued by the SMFC practitioners included the lesson plans and curriculum materials that Japanese teachers use to guide their lesson study work, videotapes of lesson study in Japan, protocols for observation and discussion of lessons¹¹, and live observation of Japanese practitioners' lesson study, at the summer workshop and the Greenwich Japanese School and in Japan. Several SMFC teachers remarked that they thought they understood lesson study before the summer workshop with Japanese practitioners, but that they understood it in a much deeper way after working with Japanese colleagues. Researchers have a potentially important role to play in systematically developing and studying such experiences, but such research may not be broadly valued. As one educational researcher commented, it "falls in between the research section and the community service section of our vitas."¹²

The range of Japanese lesson study models currently available to U.S. educators is extremely limited. A single in-depth example of lesson study is available: the dissertation of Makoto Yoshida, which chronicles lesson study at a single Japanese elementary school and which provided the basis for *The Teaching Gap's* account of lesson study. Although we have studied (with Ineko Tsuchida) over 50 research lessons, the time spent in each school has typically been just a

¹¹ For example, those developed by the lesson study research group at Teachers College, Columbia University <http://www.tc.columbia.edu/lessonstudy/> or lsrc@columbia.edu.

few days. Imagine trying to characterize all of U.S. professional development based on an in-depth case study of one site and observation of fifty workshops! U.S. educators cannot be blamed for drawing heavily on the one case study and several videotapes of Japanese lesson study that exist. But we should recognize that these represent specific contexts, and that the essential and unique features of these lesson study examples have yet to be distinguished (Lewis, 2002).

Mathematics educator Takashi Nakamura (Ishikawa et al., 2001) points out that Japanese lesson study is not a single entity, and he classifies it into three major types, according to whether its primary purpose is: (1) to solve an educational problem through development of new curriculum or instructional approaches; (2) to enable individual practitioners to freshly examine their own practice in order to improve it; or (3) to stimulate a shared community of practice among teachers within a setting. He goes on to outline the many ways that lesson study differs according to its primary purpose. Nakamura's classification suggests how very limited the English-language accounts of Japanese lesson study currently are. Unfortunately, however, documentation of Japanese lesson study cannot be done well without strong background knowledge of the Japanese educational system and of the Japanese language. Yet language and cultural competence (in Japan or other geographical areas) does not seem to be valued by education departments to the extent that it is by many other disciplines. Departments of history, anthropology, literature, sociology, religion, art and business regularly advertise for faculty with a background in Japanese language and culture, but rarely does one see similar advertisements from education departments.

¹² Comment by Jere Brophy, 3/16/02, Conference on Design Research, Santa Fe, New Mexico.

Lesson study is a simple idea, but a very complex process. Who will do the hard work of documenting the know-how of lesson study and the particular adaptations and conditions that make it work (or fail) at U.S. sites? As an educational research community, we are addicted to the interesting new idea. Are we also willing to do the steady, long-term work of figuring out how the idea can actually be made to work in the real world?

Figure 1: Stages of Lesson Study Implementation in the SMFCSD: Spring 2000 – Spring 2002

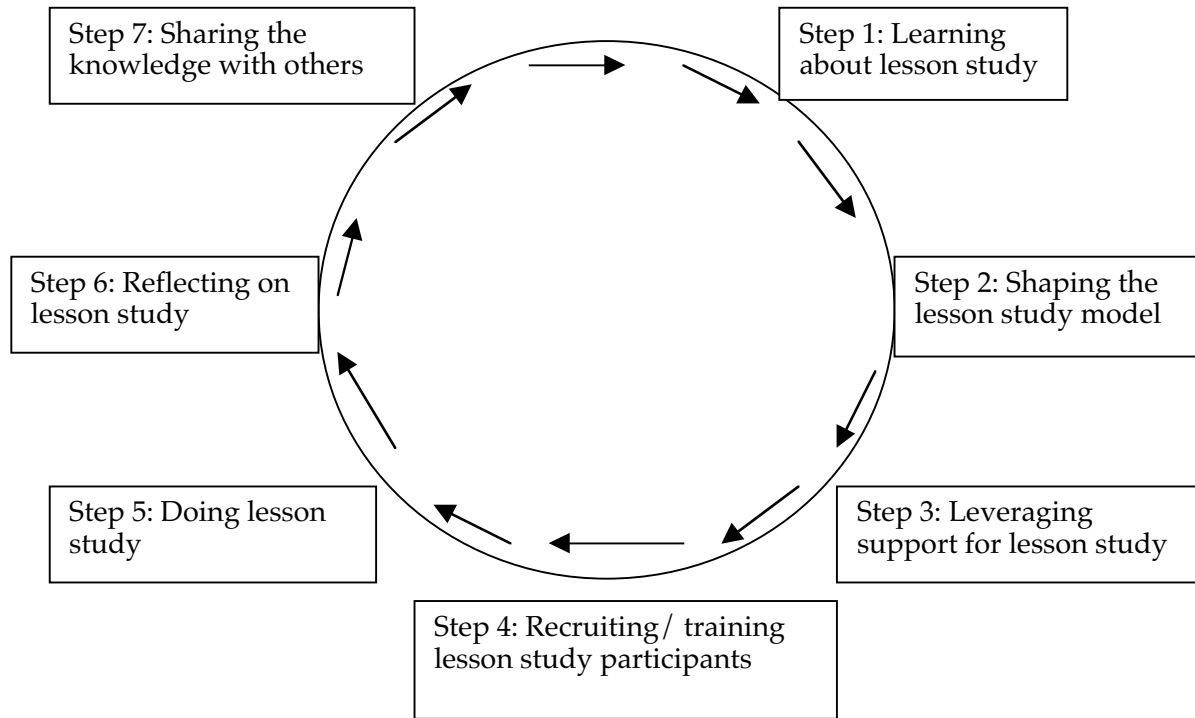


Table 1: Timeline of Lesson Study Activities in the SMFCSD: Spring 2000-Spring 2002

	Year 1 – Spring 2000-Spring 2001					Year 2 – Summer 2001 – Spring 2002			
	spring	summer	fall	winter	spring	summer	fall	winter	spring
Step 1: Learning about lesson study	X ¹³	X	X	X	X	X	X	X	X
Step 2: Shaping the lesson study model	X	X				X	X	X	X
Step 3: Leveraging support for lesson study	X	X			X	X	X	X	X
Step 4: Recruiting/training lesson study participants		X	X			X	X		X
Step 5: Doing lesson study			X	X	X	X	X	X	X
Step 6: Reflecting on lesson study			X	X	X	X	X	X	X
Step 7: Sharing the knowledge with others					X	X	X	X	X

¹³ "X" indicates that this implementation activity occurred during this time period.

Table 2: Preliminary and Revised SMFCSD Lesson Study Goals

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
<i>Goal 1: More Effective Professional Development Model</i>	
<ul style="list-style-type: none"> ▪ Lesson study as an institutionalized form of professional development in the district. ▪ Teachers who feel empowered to provide their own professional development and improve the profession. ▪ Teachers who draw on the knowledge of their peers. 	<ul style="list-style-type: none"> ▪ Teachers who are excited and enthusiastic about lesson study. ▪ Teachers who recognize their role in the development of a U.S. innovation; teachers who feel they are part of a national reform effort. ▪ Teachers who understand the value of lesson study beyond a single lesson. ▪ Teachers who see that lesson study can support the implementation of other curricula or programs.
<i>Goal 2: Teacher Collaboration</i>	
<ul style="list-style-type: none"> ▪ Teachers who collaborate with other teachers about math/science they are teaching. ▪ A culture of collaboration within schools. 	<ul style="list-style-type: none"> ▪ Teachers who discover the value of collaboration. ▪ Teachers who understand what good collaboration is, who are good collaborators, and who understand the role that they play in being a good collaborator.
<i>Goal 3: Improved Instructional Practice</i>	
<ul style="list-style-type: none"> ▪ Improved classroom practice. ▪ Improved math lessons. ▪ Teachers who understand how to teach better. ▪ Teachers who think deeply about math/science they are teaching. ▪ Teachers who think deeply about learning and curriculum. ▪ Teachers who link content and pedagogy. 	
<i>Goal 4: Student Mathematics Understanding</i>	
<ul style="list-style-type: none"> ▪ Greater student understanding of math 	

Table 3: Preliminary and Revised SMFCSD Resources for Learning about Lesson Study

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
<p><u>Observation/ Participation:</u> Personal experiences <i>watching</i> Japanese lesson study:</p> <ul style="list-style-type: none"> ▪ Travel to Japan with NCTM educators to observe/ participate in lesson study ▪ Attendance at Greenwich Japanese School Lesson Study Open House 	<p><u>Observation/ Participation:</u> Personal experiences <i>doing</i> lesson study:</p> <ul style="list-style-type: none"> ▪ Local two-week summer institute with experienced Japanese and U.S. lesson study practitioners. ▪ School-wide open house at lesson study lab school. ▪ Springtime district-wide open house.
<p><u>Networking:</u></p> <ul style="list-style-type: none"> ▪ Use of established relationships with Japanese educators, developed through travel to Japan. ▪ Lesson study presentations by Lewis. 	<p><u>Networking:</u></p> <ul style="list-style-type: none"> ▪ Use of established relationships with Japanese educators, developed through summer workshop and previous travel to Japan. ▪ Person-to-person contact through state- and nationwide conferences and a lesson study listserve, with other U.S. lesson study practitioners.
<p><u>Print materials:</u> Stigler & Hiebert's <i>The Teaching Gap</i>; Lewis' and Yoshida's research on Japanese lesson study, lesson plans and lesson study protocol provided at Greenwich Open House.</p>	<p><u>Print materials:</u> Pre-publication draft of lesson study handbook (Lewis, in press); Fernandez et al. (2001); Northwest Teacher (Stepanek, et al., 2001)</p>
<p><u>Video materials:</u> Lewis' research on Japanese lesson study (Can you Lift 100 Kg?); TIMSS videos of Japanese teaching.</p>	<p><u>Video materials:</u> Three Perspectives on Lesson Study, (Regents of the University of California, 2001); videotapes of SMFC teachers from summer workshop</p>
<p><u>Feedback:</u> Establishment of collaborative and support relationship with researchers Lewis and Perry.</p>	<p><u>Feedback:</u> Continuation of collaboration with Lewis and Perry</p>

Table 4: Preliminary and Revised Features of the SMFCSD Lesson Study Model

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
<p>Four basic steps:</p> <ul style="list-style-type: none"> ▪ Collaborative lesson planning, ▪ Teaching/ observing a lesson; ▪ Discussing/ revising/ (possibly) reteaching the lesson; ▪ Publication of the lesson on the district intranet 	<p>Six basic steps:</p> <ul style="list-style-type: none"> ▪ Goal-setting ▪ Collaborative lesson planning, ▪ Teaching/ observing a lesson; ▪ Discussing/ revising/ (possibly) reteaching the lesson ▪ On-going reflection ▪ Publication of the lesson and learning synopsis on the district intranet
Math/ science	Math/ science/ language arts
Elementary and middle school volunteers, organized into small teams of ~3-5 teachers	→ Continued →
One year commitment required, with stipend for 20 hours of work	→ Continued →
Substitutes available to cover classes during lesson and debriefing (3 half day subs per teacher)	2 full day or 4 half day subs per teacher
Up to 3 lessons per group expected	1 or 2 lessons per group expected
Continuing education credit available	→ Continued →

Table 5: Preliminary and Revised Support for SMFCSD Lesson Study

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
<p><u>Financial support:</u> Federal/ district and local foundation funding for math/ science lesson study.</p>	<p><u>Financial support:</u> Federal/ district funding, national and local foundation funding, and funding from local school change organization for math/ science/ literacy lesson study.</p>
<p><u>Administrative support:</u> Site and district administrators did not "get in the way" but did not actively support.</p>	<p><u>Administrative support:</u> Transition in district administration – support unclear; one site administrator agreed to support lesson study lab school; other administrators do not stand in the way – spring open house to help build local administrative support.</p>
<p><u>Advocacy:</u> Leaders</p>	<p><u>Advocacy:</u> Leaders and teachers who have participated in lesson study</p>
<p><u>Specialist support:</u> District leaders/ coaches, Mills College researchers, a few Japanese colleagues called on to provide guidance regarding overall implementation of lesson study and content/ pedagogy.</p>	<p><u>Specialist support:</u> District leaders/ coaches, Mills College researchers, Japanese and Paterson School Two teachers, foundation funder, school reform coach, other local math/ literacy experts called on to provide guidance on specific lesson study steps and content/ pedagogy.</p>

Table 6: Preliminary and Revised SMFCSD Lesson Study Training

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
One-day district-wide introductory sessions	One-day district- and school-wide introductory sessions and lesson study sessions, two-week summer institute, week-long lesson study open house
Informal discussion	Prepared presentation slides describing lesson study and its relationship to qualities of effective professional development; what lesson study is and is not; what is involved and expected from participants
Verbal guidance on steps to follow <ul style="list-style-type: none"> ▪ What steps to take (as described in Table 4) ▪ What to consider during planning (e.g., anticipating students' responses) ▪ What to focus on in the debriefing ("the lesson, not the teacher") 	Written protocol about steps to follow (see Appendix C), including: <ul style="list-style-type: none"> ▪ how to select topic, plan the lesson ▪ when to select the teacher to teach the lesson ▪ who to invite to the lesson ▪ how to document what happens
Use of Japanese models to illustrate lesson study process	Use of both Japanese and San Mateo models to illustrate lesson study; explicit discussion about not trying to recreate the Japanese model

Table 7: Preliminary and Revised SMFCSD Lesson Study Groupwork

Year 1 – Spring 2000-Spring 2001	Year 2 – Summer 2001 – Spring 2002
<p><u>Participants:</u> 28 teachers from 7 schools</p>	<p><u>Participants:</u> Summer workshop: 18 teachers from 10 schools, 2 districts; School year: 61 teachers from 9 schools, including one school-wide lesson study school (14 teachers continuing from year 1; 10 teachers continuing from summer workshop)</p>
<p><u>Guidelines:</u> Suggestions about what to address in plan; no lesson plan template.</p>	<p><u>Guidelines:</u> Lesson study protocol, goal-setting and lesson plan template, guidelines on debriefing, reflection form.</p>
<p><u>Support:</u> Mathematics coaches on-call as needed</p>	<p><u>Support:</u> Mathematics coaches on-call as needed or as group members, depending on the group. Specialists consulted for content and pedagogical advice.</p>
<p><u>Outcomes:</u> Variation in adherence to suggested lesson study activities</p>	<p><u>Outcomes:</u> Stronger adherence to suggested lesson study activities.</p>

Table 8: Cumulative Reflections on Lesson Study

- Lesson study is a process, not a format for lesson planning.
- Lesson study spreads teacher-to-teacher, from their excitement; not by mandate.
- There is no one right way to do lesson study.
- Lesson study must be balanced with – or provide a structure for – educators' competing time demands.
- Tools and guidelines can facilitate teacher collaboration (e.g., lesson study protocol, lesson plan template, reflection form, goal-setting form, guiding questions for debriefing session).
- "Knowledgeable others" provide valuable content, pedagogy, and lesson study support.
- Lesson study should begin with an understanding of the "big picture" (content).
- Intensive, experiential learning experiences are most valuable for surfacing content/ pedagogy issues.

References

- Ball, D.L., (1996) Teacher learning and the mathematics reforms: What we think we know and what we need to learn. *Phi Delta Kappan*, March , 505-.
- Berman, P. and Chambliss, D., and colleagues. (September, 2000). *Readiness of low-performing schools for comprehensive reform*. Emeryville, CA: RPP International, High Performance Learning Community Project.
- Center for Research on the Context of Teaching (June, 2001). *Bay Area School Reform Collaborative: Theory of Action – Phase One (1995-2001)*. Stanford, CA: Center for Research on the Context of Teaching, Stanford University School of Education.
- Chen, H.T. (1990). *Theory-driven evaluations*. Newbury Park, CA: Sage.
- Coeyman, M. (2000, May 23). U.S. school, Japanese methods. *Christian Science Monitor*.
- Confrey, J. and Lachance, A. (2000). Transformative teaching experiments through conjecture-driven research design. In A.E. Kelly and R.A. Lesh (Eds.), *Handbook of Research Design in Mathematics and Science Education* (pp. 17-34). Mahwah, NJ: Lawrence Erlbaum Associates.
- Council for Basic Education. (2000). *The eye of the storm: Improving teaching practices to achieve higher standards*. Briefing book, Wingspread Conference September 24-27, Racine Wisconsin.
- Dobson, D. and Cook, T.J. (1980). Avoiding type II errors in program evaluation: Results from a field experiment. *Evaluation and Program Planning* 3: 269-76.

- Fernandez, C., Chokshi, S., Cannon, J. & Yoshida, M. (2001). Learning about lesson study in the United States... In E. Beauchamp (Ed.), *New and old voices on Japanese education*. Armonk, N.Y.: M.E.Sharpe.
- Fullan, M.G. with Stiegelbauer, S. (1991). The new meaning of educational change. New York: Teachers College Press
- Geiser, K.D. and Berman, P., and colleagues. (September, 2000). *Building implementation capacity for continuous improvement*. Emeryville, CA: RPP International, High Performance Learning Community Project.
- Germain-McCarthy, Y. (2001). *Bringing the NCTM standards to life: Exemplary practices for middle schools*. Larchmont, N.Y.: Eye on Education.
- Ikeda, T. (October, 2001). Japanese lesson study. Presentation at a follow-up meeting of the International Council of Mathematics Educators. __, North Carolina.
- Lehrer, R. and Schauble, L. (2001). Developing model-based reasoning in mathematics and science. *Journal of Applied Developmental Psychology*, 21:1, 39-48.
- Leithwood, K.A. and Montgomery, D.A. (1980). Evaluating program implementation. *Evaluation Review* 4: 193-214.
- Lewis, C. (In press). *Lesson study: A handbook for teacher-led improvement of practice*. Philadelphia, PA: Research for Better Schools (<http://www.rbs.org>).
- Lewis, C. (2002). Does lesson study have a future in the United States? *Nagoya Journal of Education and Human Development*, 1:1, 1-23.

- Lewis, C. & Tsuchida, I. (1998). A lesson is like a swiftly flowing river: Research lessons and the improvement of Japanese education. *American Educator*, Winter, 14-17 & 50-52
- Lindblom, C.E. and Cohen, D.K. (1979). *Useable knowledge*. New Haven, CT: Yale University Press.
- Little, J.W. (1981). *The power of organizational setting* (Paper adapted from final report, School success and staff development). Washington, DC: National Institute of Education.
- Loucks-Horsley, S., Hewson, P. W., Love, N., Stiles, K. E. (1998). *Designing Professional Development for Teachers of Science and Math*. Thousand-Oaks, CA: Corwin Press.
- McLaughlin, M., & Talbert, J. and colleagues (April, 1998). *Assessing Results: The Bay Area School Reform Collaborative, Year Two*. Center for Research on the Context of Teaching, Stanford University School of Education.
- Murphy, C. & Lick, D. (2001) *Whole-Faculty Study Groups: Creating Student-Based Professional Development. 2nd Edition*. Thousand Oaks, CA: Corwin Press.
- Takashi Nakamura, p.14-15, in Zadankai: Shougakkou ni okeru juugyou kenkyuu no arikata wo kangaeru. (Panel Discussion: Considering the nature of lesson study in elementary schools) in Ishikawa, K., Hayakawa, K., Fujinaka, T., Nakamura, T., Moriya, I., & Takii, A. (2001). *Nihon Sugaku Kyouiku Gakkai Zasshi, (Journal of Japan Society of Mathematical Education)*, 84:4, 14-23.

- Research for Better Schools, *Currents Newsletter* (Fall, 2000) *Against the Odds, America's Lesson Study Laboratory Emerges, vol 4.1.*, Philadelphia: Research for Better Schools <http://www.rbs.org>
- Schön, D.A. (1991). *The reflective turn: Case studies in and on educational practice*. D.A. Schon (Ed.) New York: Teachers College Press.
- Schön, D. & McDonald, J. (September 1997). *Designing school reform: Theory of action in the Annenberg Challenge*. Unpublished report.
- Stepanek, J. (Spring, 2001) A new view of professional development. *Northwest Teacher*, 2:2, 2-5.
- Stigler, J.W. & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York: Summit Books.
- Takahashi, A., (2000), Current Trends and Issues in Lesson Study in Japan and the United States, *Journal of Japan Society of Mathematical Education*, Volume 82, Number 12: 49-6, pp.15-21. (In Japanese).
- Wang-Iverson, P., Liptak, L., and Jackson, W., (2000). "Journey Beyond TIMSS: Rethinking Professional Development" Paper presented at ICME-II (International Conference on Mathematics Education), Hangzhou, China
- Weatherley, R. and Lipsky, M (1977). Street-level bureaucrats and institutional innovation: implementing special education reform. *Harvard Educational Review* 2(2): 171-97.
- Williams, W. and Elmore, R.F. (1976). *Social program implementation*. New York: Academic Press.

Yoshida, M. (1999). *Lesson study [Jugyokenkyu] in elementary school mathematics in Japan: A case study*. Paper presented at the American Educational Research Association (1999 Annual Meeting), Montreal, Canada.

Appendix A: Lesson Plan Template

Mathematics Lesson Plan for Grade __

1. Title of Lesson .
2. Goal:
3. Relationship of the Lesson in the California Mathematics Standards

Grade Two

Grade Three

Grade Four

Grade Five

4. Instruction of the Lesson

5. Lesson Procedure

Learning Activities	Teacher Support	Points of Evaluation
1. Introduction to the Problem		
2. Individual Problem Solving		
3. Comparing and Discussing 4. Find the Solution to the Problem		

5. Summing up		

6. Evaluation:

Appendix B: Goal-Setting Tool

Choosing a Lesson Study Theme

Think about the students you serve.

Your Ideals:

What qualities would you like these students to have 5 years from now?

The Actual:

List their qualities now.

The Gap:

Compare the ideal and the actual. What are the gaps that you would most like to work on?

The Research Theme: (long-term goal)

State positively the ideal student qualities you choose to work on. For example:

Fundamental academic skills that will ensure students' progress and a rich sense of human rights.

Your research theme:

Appendix C: SMFC Lesson Study Protocol

1. Form a group of four to six people who are interested in doing Lesson Study.
2. Decide on a regular time to meet.
3. Discuss a curriculum area of common interest or greatest need, decide on a topic for your lesson study focus. Be sure to log your hours as you meet.
4. Spend time researching and reflecting on the content standards related to this topic. What experiences have students had in previous grades related to this topic? What are they expected to master in your grade? What will they be doing in the following grade level? What can you do to help get them ready for future success? Are the content standards reasonable? What will be developmentally appropriate for the students you are targeting?
5. Pick a lesson that you could teach six weeks to two months out to give yourselves time to plan the lesson. You need about three to eight hours to plan the lesson. This time can vary widely based on if you are using a preexisting lesson from district curriculum or starting from scratch. For first time lesson study groups we advise choosing an existing lesson and modifying it to make it more effective.
6. Continue to meet to plan and fine tune the lesson. During this period in the lesson study process it is best to not have meetings too spread out. Meet weekly if possible until the lesson is ready. Spend the last five minutes of each meeting writing a summary of what was discussed and what your plans are for the next meeting.
7. Prepare to teach the lesson. Select a teacher to teach the lesson. Which classroom will be used? Call Jackie Hurd and request sub access numbers. Please select two possible dates. The more lead time we have to access numbers the more likely you are to get the dates you request. Do you want full or half day subs?
8. Consider who to invite to your lesson.

Please advise if we can invite teachers from other schools who are interested in the same topic or grade to observe your lesson. Would you like an “outside expert” invited to observe and comment on the lesson?

Please consider video taping or audio taping the lesson. Can Rebecca Perry or a lesson study coordinator attend the lesson or lesson planning process to help you further document and deepen your understanding of the lesson study process?

Will you invite your principal or any other teachers from your site?

9. Teach the lesson. Review the lesson study discussion protocol before the lesson. Discuss what data you would like to collect during the lesson. Assign roles for teacher observers.
10. Debrief the lesson. Choose a discussion moderator, focus the discussion around key questions. Refer to the data collected.
11. Reflect and write up your learning from the process. Decide whether to refine and reteach the lesson.
12. Prepare a final copy of the lesson plan and synopsis of the lesson learning to post on the district intranet.
13. Celebrate the completion of your thoughtful work!