

Teacher Agency in the Modification of Japanese Lesson Study in the United States

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This paper investigates how Japanese lesson study has been modified in the context of the U.S., and how this modification has affected teacher agency based on the framework of the ecological approach proposed by Priestley et al. (2016). There are two major findings. First, Japanese lesson study has been adapted and modified in the U.S. as an effective form of professional development which tends to focus on a single subject, primarily mathematics. Math-focused lesson study has significantly contributed to the development of U.S. lesson study and promoted agency of math teachers, but may have hindered the expansion of lesson study into whole-school professional development, involving all subject teachers. Second, Japanese lesson study is inherently inseparable from the whole-school professional development called kounaikenshu, but, in the U.S., seems to have been adapted as a stand-alone activity. Consequently, the crucial role of long-term goals in lesson study has tended to be overlooked. The study concludes that lesson study disconnected from whole-school professional development may limit achievement of teacher agency, and in turn, professional identity.

Keywords: lesson study; teacher agency; ecological approach; *kounaikenshu*-based lesson study; democratic professional development

1. Introduction: Issues of Teacher Agency in Lesson Study

More than two decades have passed since Japanese lesson study was first introduced in the United States and other countries around the world. Lesson study is a traditional Japanese form of professional development in which teachers collaboratively research, plan, practice, and reflect on lessons to improve students' learning. It has a long history, dating back to the Meiji era (1868–1912), the dawn of public education in Japan. In recent years, Japanese les-

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son study has received a great deal of attention worldwide. It began spreading in the U.S. through the account of Stigler and Hiebert (1999), *The Teaching Gap*, which introduced a concrete example of Japanese mathematics lesson study. Since then, lesson study has been introduced in many countries across Europe, Africa, and Asia (Lewis et al., 2009; Matoba et al., 2006; Rappleye & Komatsu, 2017).

Regarding this situation, Kim (2021) expresses concerns that lesson study tends to be seen merely as an effective method to improve lesson practice. He adds that Stigler and Hiebert succeeded “in extracting the essence of Lesson Study and disseminating it from Japan to the world; however, during the process, many beneficial aspects of ...Japanese Lesson Study, mostly the philosophical implications to teacher education, vanished” (p.200). He remarks that “Lesson Study is democratic professional development that supports and is supported by teacher agency” (Kim, 2021, p.205). However, Kim warns that recent neoliberal educational reforms are threatening teacher agency around the world, including in Japan (2021). Kim’s concerns seem to have raised some essential questions: What is the philosophy of Japanese lesson study? What is democratic professional development? What is the role of teacher agency in pursuing democratic lesson study?

With these remarks in mind, this paper focuses on how Japanese lesson study has been modified in the U.S. over the past twenty years and how that modification has affected the key issues highlighted by Kim, such as “philosophy,” “democracy,” and “teacher agency”. In particular, this paper primarily focuses on teacher agency as an analytical viewpoint because there is an urgent need to address the situation threatening teacher agency in the current educational reform movements. Therefore, a thorough review of the literature on U.S. lesson study was conducted, with the main focus on publications during the induction period of Japanese lesson study in the U.S., which laid the foundation for the subsequent expansion. In addition, a two-hour semi-structured interview with Dr. Catherine C. Lewis, one of the foremost American researchers on lesson study, was arranged. The interview questions were intended to elucidate the process of induction of Japanese lesson study into the U.S. as well as her perspectives on the issues that U.S. lesson study is currently facing. Furthermore, another literature review was conducted on theoretical and practical accounts of teacher agency in order to extract an appropriate analytical viewpoint for this study.

2. The Current Situation of U.S. Lesson Study

As mentioned earlier, Japanese lesson study became widely known to U.S. educators and researchers through *The Teaching Gap* by Stigler & Hiebert (1999). Their ethnographic accounts detailing how lesson study was implemented in a local Japanese school intrigued many American educators and researchers. In fact, between 1999 and 2004, more than 335 schools in at least 32 states in the U.S. conducted lesson study, with many conferences, reports, and papers on the topic (Lewis et al., 2009; Wang-Iverson & Yoshida, 2005; Watanabe, 2002).

Concerning the current situation, Lewis points out that it is unclear in what sense American teachers and researchers use the term “lesson study.” She also mentions that lesson study seems to have been attempted by many educators in the U.S., but tends to be practiced for only the period of a research grant and discontinued afterward; thus, lesson study has not

yet taken root in American schools (Lewis, 2016).

Furthermore, Lewis underlines the issue of teacher agency in U.S. lesson study in her interview as follows:

The importance of teacher agency... I think a lot of lesson study efforts are organized with a kind of top-down facilitation, and the teachers go through it, and they find it very valuable, but they don't see it as something they would choose to do again. They would do it if someone invited them and gave them money, but they don't necessarily see it as something they own. So, I think that's a big problem. (Lewis, personal communication, June 13, 2020)

The teachers with a passive attitude toward lesson study mentioned in this quote are very different from the agentic teachers depicted in Lewis's first introductory book on lesson study (2002). The stories introduced in this book persuasively indicated to readers that many American teachers were fascinated by the nature of lesson study, which is "teacher-directed, teacher-driven ... teacher-oriented" (Lewis, 2002, p.15). In other words, lesson study was first recognized as an effective form of professional development to promote teacher agency. However, if many U.S. teachers currently think that lesson study is valuable, but "don't necessarily see it as something they own," there must be something inhibiting teacher agency.

3. Conceptualizing Teacher Agency

Teacher agency has become a central issue in teacher education and professional development (Durrant, 2020; Edwards, 2017; Flessner & Payne, 2017; Maclellan, 2017; Priestley et al., 2016). Although there must be some relationship between lesson study and teacher agency, there appears to be little research on how they are related. For example, *The SAGE Handbook of Research on Teacher Education*, which provides a global overview of current teacher education research, has a section titled "Learning Teacher Agency in Teacher Education" (Clandinin & Husu, 2017). However, there is no mention of lesson study in this section, although it introduces other types of teacher education programs for enhancing teacher agency, such as university-led programs and university-community partnership programs. Similarly, a great deal of research on lesson study has portrayed agentic teachers conducting lesson study through ethnographical accounts, but it is challenging to find a description that focuses directly on teacher agency.

(1) The Ecological Approach to Teacher Agency

Despite the growing interest in teacher agency, research on the topic remains scarce, and may even create a misleading impression of teacher agency (Leander & Osborne, 2008; Priestley et al., 2016). According to Priestley et al. (2016), teacher agency tends to be misleadingly defined as an individual capacity that people possess, but it should be defined as "the *interaction* of individual 'capacity' with environing 'conditions' (emphasis in original)" (p. 22). They refer to this view as "the ecological approach to teacher agency" (Priestley et al., 2016). Priestley's colleagues further explain this ecological conception:

In this sense, we can say that the achievement of agency will always result from the in-

terplay of individual efforts, available resources and contextual and structural ‘factors’ as they come together in particular and, in a sense, always unique situations. Methodologically an ecological approach to understanding agency thus focuses the attention on the unique configurations of such ‘factors.’ (Biesta & Tedder, 2007, p. 137)

As described in this quote, the ecological viewpoint of teacher agency is inevitable, given that teachers work with many intertwining factors (Ketelaar, et al., 2012; Lasky, 2005). Moreover, many of these factors are often unobservable, as Stepanek and her colleagues note: “Classroom life is full of habits and routines that pass unnoticed. They will often remain invisible until they are viewed from a different angle or in a new context” (Stepanek et al., 2007, p.1).

(2) The Framework of the Ecological Approach to Teacher Agency

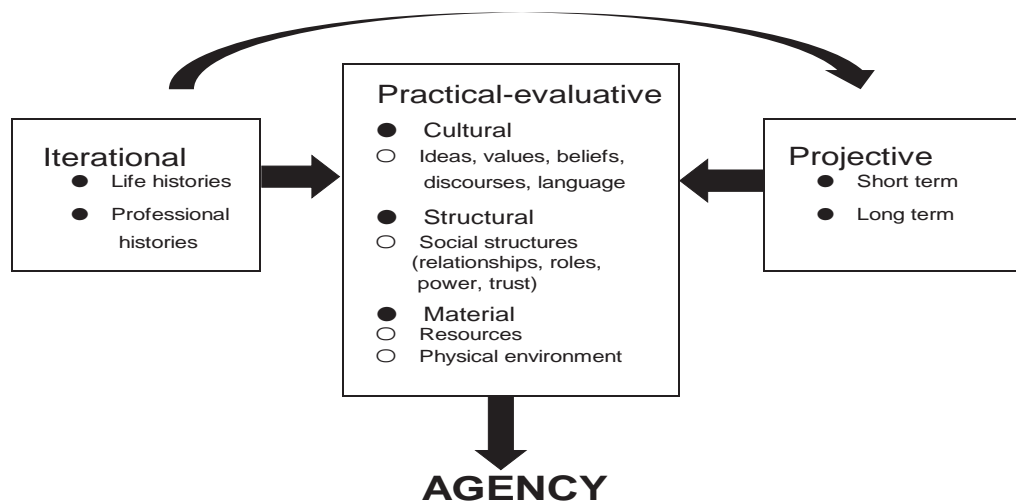
Based on the ecological approach to teacher agency, Priestley et al. (2016) establish a framework to examine the interplay of multiple factors which promote or inhibit teacher agency¹ (see Figure 1).

First, the iterational dimension contains “teachers’ life histories” as well as “professional histories.” Needless to say, teachers’ past personal and professional experiences are both influential factors that shape teacher agency. Second, the projective dimension concerns teachers’ aspirations in their work, which could be “long term” or “short term.” For example, some teachers may have long-term positive aspirations to support underserved students, while others may have short-term negative aspirations to finish a school year without any trouble. Finally, the practical-evaluative dimension relates to teachers’ day-to-day working conditions. The practical refers to “what is practically possible and feasible in this concrete situation” (Priestley et al., 2016, p.34), and the evaluative is “the way in which the actor evaluates both the ‘issues’ at hand and the possibilities for action in the concrete situation” (Priestley et al., 2016, p.34). The practical-evaluative dimension includes “cultural,” “structural,” and “material” aspects. The cultural aspects cover “ways of speaking and thinking, of values, beliefs, and aspirations, and encompass both inner and outer dialogue” (Priestley et al., 2016, p.30). The structural aspects relate to “the social structures and relational resources that contribute to the achievement of agency” (Priestley et al., 2016, p.30). The material aspects have to do with “the situation (the built environment, the physical resources, etcetera)” (Priestley et al., 2016, p.34). Priestley and his colleagues emphasize that the practical-evaluative dimension has a major influence on teacher agency because it forms teachers’ decision-making and action on a daily basis.

While teachers have adequate skills, knowledge, and aspirations to attempt innovative methods in support of students’ learning, the cultural, structural, and material aspects of the schools at which they work may inhibit their agentic practice. Priestley and his colleagues conclude, “To promote teacher agency is therefore not only a matter of teacher education and professional development in order to increase teachers’ capacity and capability but also requires attention to cultures and structures” (2016, p.35).²

The ecological framework by Priestley and his colleagues provides important analytical viewpoints. Therefore, based on this framework, the following sections investigate how Japanese lesson study has been modified in the U.S. as well as how the modification affects teacher agency from the ecological point of view.

Figure 1. Framework of the Ecological Approach to Teacher Agency



(Priestley et al., 2016, p.30)

4. The Modification of Japanese Lesson Study in the U.S.

Although lesson study in the U.S. differs from that in Japan in many ways, there is one fundamental difference to be discussed regarding the system. In Japan, lesson study essentially functions as a part of whole-school professional development called *kounaikenshu*, whereas lesson study in the U.S. appears to be conducted as a stand-alone activity.

Reflecting on the accounts in *The Teaching Gap*, Stigler and Hiebert (1999) explain that “*kounaikenshu* is the word used to describe the continuous process of school-based professional development that Japanese teachers engage in once they begin their teaching careers,” and “one of the most common components of *kounaikenshu* is lesson study” (p.110). Furthermore, Fernandez and Yoshida use the term “*konaikenshu*³-based lesson study” (2004). They explain, “What makes *konaikenshu* unique is that it is a form of in-service professional development that brings together the entire teaching staff of a school to work in sustained and focused manner on a school-wide goal” (Fernandez & Yoshida, 2004, pp.9-10). They continue, “This combination of *konaikenshu* and lesson study provides a concrete process (i.e., working on study lessons) for thinking about how to bring a school’s selected *konaikenshu* goal to life” (Fernandez & Yoshida, 2004, p.13).

Despite the efforts of these researchers, describing the relationship between lesson study and *kounaikenshu* in their early works, it seems that the interest of U.S. readers was exclusively focused on the lesson study part, with less attention paid to the relationship between lesson study and whole-school professional development. Considering the differences in teacher culture between the U.S. and Japan, it is not surprising that lesson study was solely spotlighted. In the U.S., individual teachers often choose a professional development program to participate (Hill, 2005), with few whole-school professional development opportunities for all teachers in a school akin to *kounaikenshu* in Japan (Lewis et al., 2011). In addition, American teachers tend not to partake in a culture of planning lessons with colleagues and observing one another’s lessons, as in lesson study (Fernandez & Cannon, 2005; Lewis,

2002; Lewis & Hurd, 2011; Lewis et al., 2011). In short, lesson study and *kounaikenshu* were both unfamiliar practice for U.S. educators and researchers. Given these cultural differences, starting lesson study as a stand-alone activity must have been an inevitable modification in the U.S. Nevertheless, this modification is assumed to have a substantial impact on teacher agency because it is the adaptation of only a part of the whole.

(1) Teacher Agency in Mathematics-Focused Lesson Study

In the U.S., lesson study, which is decoupled from *kounaikenshu*, primarily focuses on mathematics (Doig & Groves, 2011; Lewis et al., 2009). Because Japanese lesson study was introduced through *The Teaching Gap* based on TIMSS video research, many mathematics educators and researchers have played critical roles in promoting lesson study in the U.S. As a result, multiple lesson study groups led by mathematics coaches, specialists, or researchers have been organized to develop diverse forms of seminars, workshops, and teaching materials. They have also promoted various networks among mathematics lesson study groups at the local, district, regional, national, and international levels. All of these have contributed considerably to improving the quality of mathematics education in the U.S. (Hart et al. 2011; Lewis, 2002; Lewis & Hurd, 2011).⁴

Referring to the framework of the ecological approach to teacher agency (Figure 1), how can mathematics-focused U.S. lesson study be interpreted in terms of teacher agency? First, regarding the projective dimension concerning teachers' aspirations, the fact that mathematics is the primary target in U.S. lesson study is considered to ensure teachers' long-term high aspirations to support students' learning because mathematics is one of the core subjects treated as a typical indicator of students' achievements, significantly impacting their lives. Thus, high expectations for improving mathematics instruction through lesson study can enhance teachers' long-term aspirations not merely for closing the achievement gap but also for supporting students in succeeding in their lives. However, if overemphasized performativity threatens teachers, they may have to shift their goals from long-term to short-term ones to fix the situation quickly. Moreover, the fact that U.S. lesson study tends to be discontinued due to the end of a research grant or the short duration of a program is assumed to inhibit the achievement of teacher agency.

Second, in terms of the cultural and social structural aspects of the practical-evaluative dimension, it can be expected that math-focused lesson study would greatly promote teacher agency. In most cases in the U.S., teachers join lesson study groups on a voluntary basis; they could be same-grade teachers working at the same school or like-minded teachers in the same school district. Therefore, the participants are expected to have similar professional backgrounds, that is, professional histories in the iterational dimension of the ecological approach, which have led them to join the lesson study group. They are also likely to have many things in common, such as their attitudes, viewpoints, and communication styles. Such positive cultural and social structures are assumed to enhance teacher agency. However, it should be noted that the cultural and social structural aspects of voluntary math lesson study groups are not the actual conditions, in which participants have to work with not only like-minded teachers but diverse groups of teachers who may have conflicting ideas. Thus, the participants' agency may be inhibited once they return to their actual working conditions.

Third, with respect to the material aspect, math-focused lesson study appears to have promoted teacher agency. As mentioned above, many mathematics educators and researchers

have been actively involved in developing high-quality teaching materials and instructional approaches. In addition, the critical practice for lesson study termed *kyozaiikenkyu* (study of instructional materials) has been introduced to U.S. teachers by mathematics education researchers, such as Watanabe, Takahashi, and Yoshida (2008). By studying and analyzing instructional materials, curricula, and standards, American teachers have cultivated critical thinking and innovative mindsets in mathematics instruction. All of these are significant activators of teacher agency.

(2) Teacher Agency in *Kounaikenshu*-Based Lesson Study

Despite the fact that mathematics-focused lesson study has played an irreplaceable role in the development of U.S. lesson study, it has also led to the misconception that lesson study is only for mathematics. Consequently, whole-school lesson study remains uncommon in the U. S. (Lewis et al, 2011). In fact, some researchers have attempted to clarify this misconception from the early days. For example, an introductory book on lesson study by Wang-Iverson and Yoshida (2005) notes that “many think that teachers in Japan conduct lesson study only in mathematics, but it is conducted in all subject areas, including music, gym, and moral education” (p.26). Lewis (2002) also emphasizes the applicability of lesson study to all subjects. First, Lewis entered the research field of lesson study through her first-hand experience of Japanese science lesson study (Lewis & Tsuchida, 1997, 1998). Since then, she has attempted to introduce various types of lesson study focusing on other subjects such as science, language arts, and history, even though there are few examples (Lewis, 2002; Lewis & Hurd, 2011). In terms of the benefits of school-wide lesson study, Lewis argues that “teachers see the impact of their work magnified...Conversations change as teachers know what their colleagues mean ..., and human relationships change as teachers work together to bring to life a shared educational vision throughout a school” (Lewis & Hurd, 2011, p.83). In this quote, Lewis highlights the critical role of “a shared educational vision throughout a school.” She refers to it as a “long-term goal” in lesson study and emphasizes the vital linkage between lesson study and long-term goals (Lewis, 2002; Lewis & Hurd, 2011). Wang-Iverson and Yoshida (2005) echo this point by stressing that long-term goals are “the heart of the research theme” (p.122) of *kounaikenshu*.

Returning to the framework of the ecological approach to teacher agency (Figure 1), how can lesson study as an integral element of *kounaikenshu* be understood in terms of teacher agency? First, in terms of the projective dimension, it is highly likely that the shared long-term goals among colleagues will enhance teachers’ aspirations. Concerning long-term goals, Lewis remarks:

I usually start with asking them [teachers] to imagine their students ten years from now. And what are the qualities they want their students to have, and who are their students now? And what’s the gap between the two of those? That really motivates them as teachers so that it’s focused on their goals. (Lewis, personal communication, June 13, 2020)

As quoted above, long-term goals are not necessarily limited to learning mathematics or any other subject matter but, rather, are more broadly related to students’ development as human beings. For instance, Lewis provided examples of long-term goals from Japanese whole-school lesson study, such as “to value friendship, develop their [students’] own perspectives

and ways of thinking, and enjoy science” (2002, p.33). For many American teachers, it is often challenging to understand why such noncognitive and dispositional aspects must be included among lesson study goals. Lewis shared with us an episode in which some U.S. teachers said, “What on earth do friendships have to do with learning science anyway? Let’s skip the fuzzy stuff” (2002, p.33).

In fact, many researchers have noted that U.S. teachers tend to set their lesson study goals exclusively focusing on specific content goals with little or no emphasis on students’ dispositional dimensions, whereas Japanese teachers tend to establish their goals by focusing not only on students’ intellectual aspects but on social, emotional, and dispositional aspects as well (Doig & Groves, 2011; Fernandez & Cannon, 2005; Fernandez & Yoshida, 2004; Lewis, 2002; Lewis & Hurd, 2011; Lewis et al., 2011). Due to these differences, the crucial role of long-term goals in lesson study is often overlooked when it is adapted outside Japan (Doig & Groves, 2011).

In light of teacher agency as conceptualized in the ecological approach, it is necessary to establish a vital connection between lesson study and *kounaikenshu* through all teachers pursuing long-term goals for all students at their own school. Lewis’s comments below are highly insightful:

Building lesson study around long-term goals may offer protection against faddism and trivial goals. The long-term focus enables Japanese teachers to keep firmly in mind the qualities such as love of learning and capacity to get along with others that can otherwise get lost in the daily grind of school, a benefit that may be especially important in the US, where high-stakes tests can easily eclipse long-term thinking. (Lewis, 2002, p.33)

Lewis also adds that teaching students the content knowledge and skills is important, but lesson study reminds us of the broader meaning of teachers’ jobs, that is, “to shape the next generation and, indeed, the future society in which we will live. To the extent that lesson study’s long-term goals connect us to that larger educational purpose, they will provide motivational fuel” (2002, p.34).

In these quotations, Lewis underscores the critical function of lesson study to ensure teachers’ professional identity, which seems to have much in common with Kim’s insights referring to “philosophy” and “democracy” as described at the beginning of this paper. All of these are assumed to relate to teachers’ life and professional histories in the iterational dimension of the ecological framework of teacher agency. However, if lesson study loses its vital connection with long-term goals and functions as a mere tool for improving subject matter instruction, teacher agency will be severely damaged.

Second, with regard to the cultural and social structural aspects in the practical-evaluative dimension, it is expected that teachers may encounter challenging situations when conducting whole-school *kounaikenshu*-based lesson study. In *kounaikenshu* as whole-school professional development, teachers are usually divided into small groups, such as same-grade, same-subject, mixed-grade, or mixed-subject groups, the composition of which is up to each school. One major difference from the math-based lesson study group is that all subject teachers at the school are required to participate; that is, participation is not on a voluntary basis. Another difference is that teachers regularly attend a whole-school meeting to share each group’s work in progress. Therefore, teachers must collaborate with all colleagues, re-

ardless of whether they are like-minded. Such situations may impede the achievement of teacher agency. However, according to empirical research on whole-school *kounaiken-shu*-based lesson study, participants' diverse experiences, values, and beliefs in mixed-subject groups have been reported to make their reflection and discussion even more productive (Kitada, 2019).

Regarding the power of diverse perspectives in lesson study, Kim remarks thought-provokingly that "Lesson Study provides teachers with the opportunities to do democracy by creating a public sphere where teachers can collaborate and communicate with each other and, therefore, tackle teacher isolation" (2021, p.205). In addition, Sato (2019) highlights that democratic lesson study practices "open an avenue for collaborative learning through crossing borders of class, gender, race, culture and ability" (p.11). With these remarks in mind, it can be argued that teachers may experience challenging situations in whole-school *kounaiken-shu*-based lesson study, but this is a substantial part of democratic practice. Moreover, it is decidedly an actual ecological environment where teacher agency is expected to be achieved.

Finally, regarding the material dimension, it continues to be vital for teachers to practice *kyozaikenkyu* (study of instructional materials) to achieve agency, just as it is in math-focused lesson study. In the context of U.S. lesson study, it is fortunate that many teachers have already experienced the importance of studying their instructional materials, curricula, and standards from critical viewpoints in the field of mathematics. Such accumulated positive experiences will greatly encourage teachers to apply what they have learned to other subject matters. In this light, Lewis shares an encouraging anecdote, in which one teacher in a math lesson group spoke up with excitement: "It's really important to teach that problem solving chart and embed it all the time into everything that we do, whether it's social studies, science, math, or whatever" (Lewis et al., 2009, p.146).

5. Conclusion and Further Discussion

This paper investigated how Japanese lesson study has been modified in the context of the U.S., and how this modification has affected teacher agency based on the framework of the ecological approach proposed by Priestley et al. (2016). This study has two major findings. First, Japanese lesson study has been adapted and modified in the U.S. as an effective form of professional development which tends to focus on a single subject, primarily mathematics. Math-focused U.S. lesson study significantly promotes teacher agency through the interplay of various factors, such as teachers' high aspirations for supporting students' academic achievements, positive cultural and social structures among like-minded teachers, and well-designed materials developed by mathematics educators and researchers. Although math-focused U.S. lesson study has remarkably contributed to both improvement of mathematics education and development of lesson study in the U.S., it may have hindered the expansion of lesson study into whole-school professional development, involving all subject teachers. Second, despite the fact that Japanese lesson study is inherently inseparable from the whole-school professional development called *kounaikenshu*, it seems to have been adapted as a stand-alone activity in the U.S., in which the crucial role of long-term goals tends to be overlooked. Lesson study without long-term goals may limit achievement of teacher agency, and in turn, professional identity. It was also highlighted that teachers may encounter

challenging situations in whole-school professional development because they have to work with all their colleagues at school, whether or not they are like-minded. However, whole-school lesson study provides teachers with opportunities to pursue democratic practice in an actual ecological environment, where teacher agency is expected to be achieved.

These research findings indicate that it is necessary to consider the ecological conditions in which teacher agency is promoted or inhibited due to the modifications. The issues of teacher agency in lesson study should not be attributed to a mere lack of motivation on the part of an individual, as this will result in more fundamental problems being overlooked. Given the cultural differences between the U.S. and Japan, the modifications described above must have been inevitable. It is evident that math-focused lesson study in the U.S. has considerably promoted teacher agency in mathematics. However, challenges still remain in terms of promoting teacher agency in all subject areas. In the U.S., fortunately, many teachers have already accumulated some positive experiences through math-focused lesson study, which will be a vital encouragement for American teachers to take further steps. In fact, some lesson study groups started by a small group of math teachers at underserved schools in California have eventually expanded to school-wide lesson study. It is also noteworthy that, in the late 1990s, one of the first U.S. lesson study initiatives was implemented at economically and socially challenged urban schools in New Jersey. (Lewis, 2002). These facts suggest that lesson study in the U.S. can be expected to function as a practice for equity and social justice for students. The issues of equity and social justice can act as a motivational catalyst for implementing whole-school lesson study with a vital connection with long-term goals.

The findings of this study have critical implications for Japan. As mentioned earlier, Japanese lesson study has a long history, contributing to enhancing teacher agency through democratic practice. However, some researchers are concerned that the democratic nature of Japanese lesson study has rapidly transformed into a more formalistic and bureaucratic activity (Chichibu, 2005; Himeno, 2012). Moreover, some other researchers pointed out that Japanese lesson study has not paid adequate attention to the issues of equity and social justice (Saito & Atencio, 2015; Sato, 2006). Although school-wide lesson study tied to long-term goals is common in Japan, not all Japanese teachers have a deep understanding of why this is crucial. Therefore, the issues of teacher agency in the case of U.S. lesson study revealed in this study will certainly provide significant implications for Japanese educators and researchers as well.

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Notes:

- 1 By developing the work of Emirbayer and Mische (1998), Priestley et al. (2016) constituted this framework for their fifteen-month ethnographic study in three schools in Scotland.
- 2 The work of Rappleye & Komatsu (2017) is noteworthy because they analyzed the cultural impediments in adopting Japanese lesson study in the U.S.
- 3 Fernandez and Yoshida use the romanization *konaiakenshu*, but the meaning is the same as that of Stigler and Hiebert.
- 4 In the U.S. there is an accumulated body of research on mathematics learning, instructions, and curricula. For example, Goldsmith et al. (2014) reviewed 106 articles written between 1985 and 2008 related to mathematics teacher learning, and identified the important elements described in

those articles (e.g., beliefs, instructional practice, content knowledge, and curriculum). Although all elements are crucial, Goldsmith et al. pointed out that existing research is diffuse and “teachers’ learning is often treated as a black box” (p.25). The hidden mechanism of the black box can be expected to be revealed if lesson study is connected to this accumulated research.

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