**Abstract**

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Purpose - Teachers in the USA have been conducting lesson study for more than ten years since it was introduced from Japan in the late 1990s. Although interest in conducting lesson study in the USA is still strong and greater numbers of teachers have become involved in this professional learning, there are significant obstacles to conducting high quality and effective lesson study that enhances teachers' content and pedagogical knowledge, as well as improving their instruction and student learning in classrooms. Because of the needs of improvement in lesson study in the USA, so it can be administered effectively and sustained, the purpose of this paper is to discuss the current status of lesson study in the USA, what high quality and effective lesson study is, and what ideas might be help to improve lesson study in the USA. Design/methodology/approach - In this paper, issues that are common barriers to conducting effective lesson study, such as: US teachers' misunderstanding or lack of understanding of lesson study; teachers' insufficient knowledge of content, pedagogical content, curriculum knowledge; lack of support from administrators for lesson study; non-systematic approach to implement lesson study; and having short-sighted vision to conduct lesson study will be discussed. The discussions are based on the author's 12 years of experience working with teachers, schools, and school districts in the USA, interactions and information exchanges with other lesson study educators and researchers and professional development coordinators in schools and districts in the USA, and existing research documents in the USA. Through this discussion, the author attempts to provide suggestions for improving lesson study in the USA. Findings - In order for lesson study to be successful, teachers need to think of lesson study as a way to improve their own learning as well as student learning. Spending more time studying mathematical content and curriculum, developing a strong pedagogical content knowledge with colleagues, and establishing a professional community of learning through lesson study will help it to be effective for improving classroom teaching and learning. Originality/value - The paper provides some helpful suggestions for improving quality and effectiveness of lesson study in order to improve: classroom teaching - teacher's content, pedagogical content and curriculum knowledge; and student learning. The paper is particularly valuable for lesson study practitioners, and administrators and staff developers who are implementing lesson study in schools. [PUBLICATION ABSTRACT]

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**Introduction**

It has been more than ten years since lesson study was introduced to the USA from Japan in the late 1990s ([28] Takahashi and Yoshida, 2004; [3] Chokshi and Fernandez, 2004). Initially, lesson study was introduced as a professional development approach to improve US mathematical classroom teaching and learning by the researchers of the TIMSS video study ([26] Stigler and Hiebert, 1999) and lesson study ([13] Lewis and Tsuchida, 1998; [32] Yoshida, 1999). Low performance of US students among developed nations on international mathematics achievement studies (e.g. TIMSS, [17] National Center for Education Statistics, 1999; PISA, [18] National Center for Education Statistics, 2006) and findings of insufficient math content knowledge particularly with US elementary teachers (e.g. [16] Ma, 1999) led to questions about mathematics teachers' content knowledge and quality of instruction and to a reexamination of the professional development approach practiced in the USA.

Lesson study appealed and continues to appeal to the math education community as a viable method of supporting professional development of US teachers. The promise of lesson study in this regard stems from the following characteristics of systemic reform and classroom-based professional development: collaborative and collegial communities with shared goals and planning for teaching and learning; observations to collect data in regard to student learning and methodology/materials, followed by reflective conversations that further inform the teaching and teachers' practice; and a commitment to continuous value-added professional development throughout a teacher's career, focussed on examining classroom teaching and student learning.

Lesson study coincided with a drive to reshape existing professional development approaches that had been characterized as single shot, discontinuous, and not focussed on practice-based improvement of teaching and learning ([13] Lewis and Tsuchida, 1998; [26] Stigler and Hiebert, 1999; [32] Yoshida, 1999; [8] Fernandez and Yoshida, 2004; [28] Takahashi and Yoshida, 2004). The National Staff Development Council recognized lesson study as one of the "powerful designs" for developing professional learning communities (PLCs) ([6] Easton, 2004). Because of this recognition, interest in lesson study from teachers and administrators gained momentum around 2005.

Although many schools and districts are currently conducting lesson study in the USA and more schools and districts are considering starting lesson study, there are obstacles making it difficult for teachers to practice high-quality and effective lesson study. In this paper, I characterize "high-quality and effective lesson study" as the practice of lesson study that helps teachers enhance their content knowledge and pedagogical content knowledge to improve instruction in classrooms, develop good "eyes" to see and analyze student learning, and ultimately to produce better student learning. While lesson study could be used for teachers to create instructional products or best practices, I am not addressing or describing this as a goal for lesson study. My fear is that teachers outside of lesson study communities will implement these products or materials without understanding the intentional goals and expected student outcomes, because of their lack of understanding of content and pedagogy and/or lack of skills to observe and assess student learning in the classroom. Without engaging in lesson study in PLCs, the materials developed in lesson study product-development groups will most likely not be used effectively to improve student learning. In addition, many teachers, particularly in the USA, do not have the strong understanding of content, pedagogy, and curriculum design. It is unsuitable for teachers without this expertise to engage in product development. Instead, I believe that in order to improve student learning in regular classrooms, the majority of teachers in the USA need to be focussed on lesson study that help to developing their content, pedagogical content, and curriculum knowledge by developing PLCs where they can help each other improve throughout their careers.

Although development of strong content knowledge, pedagogical content knowledge, and curriculum knowledge are necessary for effective instruction ([25] Shulman, 1986; [1] An *et al.* , 2004), the development of this foundation of knowledge is often thwarted by obstacles that have been identified by lesson study researchers and educators in the USA (e.g. [29] Wang-Iverson and Yoshida, 2005; [3] Chokshi and Fernandez, 2004; [28] Takahashi and Yoshida, 2004; [14] Lewis *et al.* , 2006; [30] Watanabe *et al.* , 2008). These obstacles include:

(1)] misunderstanding and/or lack of understanding of lesson study;

(2)] insufficient content and pedagogical knowledge of teachers;

(3)] lack of support and resources to conduct high-quality lesson study;

(4)] non-systematic approach for conducting effective lesson study; and

(5)] short-sighted planning for improvement and lack of professional development time.

As a lesson study educator, practitioner, and researcher, I have observed and experienced the obstacles listed above firsthand through my work with teachers and schools across the USA in the last 12 years. These barriers to conducting lesson study appear to be widespread, pervasive, and difficult to change.

The purpose of this paper is first to describe the issues that are barriers to conducting high-quality and effective lesson study in the USA. The following descriptions are based on my 12 years of experience working with teachers, schools, and school districts in the USA. During these 12 years, I worked with 11 school districts, about 30 schools, and several teacher-organized groups in the USA. In addition, the descriptions are also informed by interactions and information exchanges with other lesson study educators and researchers, and professional development coordinators in schools and districts in the USA. After describing and addressing the factors in my experience that have hindered the development of effective lesson study groups, I will propose some remedies to the issues discussed, again, based on my experiences. I believe the discussion of the issues and ideas for resolving them will benefit not only the teachers in the USA, but also the teachers in other countries who have started or are thinking of starting lesson study. It is my intention and trust that discussions of the issues and obstacles encountered in the field will help improve the quality and effectiveness of lesson study as a powerful tool to enhance classroom instruction and learning (including system, teacher, and student learning).

**Misunderstanding and lack of understanding of lesson study**

In early 2000, at the initial stage of implementation of lesson study in the USA, there were not many resources for learning about and conducting lesson study. Many of the practitioners started to conduct lesson study by reading research documents such as A lesson is like a swiftly flowing river ([13] Lewis and Tsuchida, 1998), *The Teaching Gap* ([26] Stigler and Hiebert, 1999; [32] Yoshida, 1999). There were very few lesson study open houses in the USA, and very few lesson study-related conferences, presentations, or workshops available to give teachers the opportunity to learn lesson study through actually experiencing the process firsthand and networking with other experienced lesson study practitioners. Moreover, only a few people in the USA had adequate lesson study experience to help educate teachers considering conducting lesson study. As a result of these circumstances, US lesson study in the early stages was often altered in ways that significantly lessened its effectiveness. With little experience as participants in effective lesson study groups, US teachers were ill-prepared compared to their Japanese counterparts who had been conducting effective lesson study for many years and accumulating experience and wisdom in developing a system and culture of and for lesson study. Similar observations were made in the research studies conducted by [7] Fernandez *et al.* (2003).

Many researchers have identified US teachers' misunderstandings and/or a lack of understanding of lesson study (e.g. [3] Chokshi and Fernandez, 2004; [5] Diaz *et al.* , 2005), but I will focus on two points that I believe are the most important to consider and discuss in regard to conducting high-quality and effective lesson study in the USA.

Lesson study is a vehicle for developing and sustaining PLCs. Yet, in my experience, many teachers and administrators thought that lesson study would be a way to develop best practices by producing specific lessons to be used as exemplary lessons in the future. Lesson study was viewed as a way to create lesson templates that would eventually become a library of perfected lessons. The purpose of conducting lesson study in these cases was to create a research and development system for producing a collection of better lessons, rather than focussing on enhancing the teacher knowledge such as content, pedagogical content, and curriculum knowledge which would have systemically improved instruction and student learning in classrooms. While the idea of developing better practices and lessons may be a part of the lesson study goal, many teachers and administrators did not realize that an important purpose of conducting lesson study is to help teachers become life-long learners through developing and participating in a PLC. The process of lesson study involves and enhancing learning, interacting, stimulating, influencing, reflecting, and discussing with colleagues the teaching and learning in classrooms, which builds a PLC. Participants in lesson study can improve their content, pedagogical content, and curriculum knowledge, and develop systematic and coherent educational practices to support student learning and understanding. Building such a PLC through lesson study is not an easy task, and teachers and administrators must understand the purpose and challenges to doing so.

Lesson study can provide the needed system or structure to build a PLC for the teachers and administrators involved ([12] Lewis, 2004; [33] Yoshida, 2008). During lesson study, teachers engage in learning about subject content knowledge, pedagogical content knowledge, curriculum knowledge, and student thinking and understanding by working with colleagues. This learning opportunity is amplified by practicing three essential components of lesson study: well-researched and planned lessons with a clear hypothesis; live observations of the lesson with various participants; and focussed post-lesson discussions based on participants' observations. These elements are the heart of lesson study and are essential for teachers to develop life-long learning by collaborating with and learning from colleagues. To put these elements into practice, teachers need to develop skills for studying instructional materials, planning lessons, observing lessons, collecting data on student learning, reflecting on lessons, and engaging in discussions. The structure and process of lesson study creates many learning opportunities for teachers to study and learn with their colleagues in every stage of the process. The structure also helps teachers focus on thinking and improving their content and pedagogical content knowledge. Lastly, the structure puts teachers' professional learning centered on where they need to make changes in classroom teaching and learning.

Although the process of conducting lesson study may seem simple at first, learning to conduct lesson study effectively is not an easy task. It requires a cultural shift in how teachers think about their professional development in schools ([3] Chokshi and Fernandez, 2004; [33] Yoshida, 2008). For this to happen, administrators must rethink the professional development they are offering to teachers. It will take a long time to make such a cultural shift, but steady cultural change can happen in schools that have a clear, long-term vision of professional growth.

Second, many schools and districts conduct lesson study by quickly modifying the system, structure, or process without carefully analyzing or understanding the essentials of lesson study. Because of the lack of understanding of lesson study and impatience for conducting it thoroughly, the alteration of lesson study often leads to decline of its efficacy for teacher learning of content and pedagogical content knowledge. In my experience, some of the modifications or alterations of lesson study were far removed from the authentic lesson study process practiced in Japan, making it very difficult to call these modified practices "lesson study." For example, some educators practiced lesson study by developing lesson plans with colleagues but did not observe or discuss the lessons. Others observed videotaped lessons that may have given a skewed view of the classroom with a teacher and a few students in the classroom. They discussed these videotaped lessons without knowing how other students were thinking and understanding the lesson. Observing student learning during a live lesson with colleagues, sharing and discussing what they observed, airing different points of view and giving diverse perspectives gleaned from different background experiences enriches the discussion and experience. Moreover, the discussion provides evidence of student learning that was collected by each individual teacher participant. Altering the lesson study model by removing one or two of the essentials of effective lesson study - observing student responses and collecting student learning data in classrooms during the lesson - renders the activity something much different from "lesson study."

In Japan, people who practice martial arts, in particular *kendo* (Japanese swordsmanship), use a saying "*shu* -*ha* -*ri* " to describe the importance of learning about the basics from the masters. The word "*shu* " means to study and learn the form from the master and acquire the form with understanding. The word "*ha* " means to start experimenting with your own ideas (breaking the form) once you have acquired the master's form with understanding. If the experimentation goes well, the student can start to develop his/her own form. The word "*ri* " means to depart from the form of the master and establish a student's own form. In order for students to get to the "*ri* " phase, he/she has to go back and forth between "*shu* " and "*ha* " to master the basic form with solid understanding. A similar approach can be taken to conduct lesson study. We should try to respect and understand the authentic Japanese way of conducting lesson study that has been developed over a long time and has produced successful results for improving classroom teaching and learning. There are reasons why lesson study in Japan is conducted the way it is. Without understanding the reasons behind this, as well as how lesson study is conducted effectively in Japan, any attempt to conduct lesson study will not be productive and it will be difficult to sustain the practice. In my experience, teachers who practiced lesson study closer to the authentic Japanese way, gained more content, curriculum, and pedagogical content knowledge, and became more motivated and interested in conducting lesson study. When the teacher becomes interested in learning and understands how to effectively run lesson study so they can learn significantly from it, I believe teachers can then experiment with adjusting how to conduct lesson study in light of their individual school conditions. This way teachers can also compare how their learning experience changed and experiment the adjustments to lesson study more wisely. At this point the US lesson study practitioners could move to the " *ri* " phase, where they can start altering the original form of lesson study and begin customizing their own form of effective lesson study.

I have discussed two examples of the misunderstanding or lack of understanding of lesson study in the USA. There are only a few longitudinal and comprehensive studies of lesson study in the USA where we can see how teachers developed and conducted lesson study over a long period of time (e.g. [14] Lewis *et al.* , 2006). However, from my experience, lesson study groups often fail to develop or sustain the practice in their system if the group has not carefully spent time understanding the purpose and full potential of lesson study. One suggested action that would facilitate a deeper understanding of lesson study is for teachers to visit other successful lesson study sites so they can experience and learn about lesson study from those sites. Lesson study should not be conducted in isolation, where modifications are more likely to occur in ways that destroy the essential elements that make "lesson study." It is important to tap any and all opportunities to observe lesson study firsthand with your site's teaching colleagues as way to learn about the process of lesson study before pursuing your own lesson study. The experience of observing others who understand well and implement the lesson study practice will yield a common experience and language for the observing group that is starting its own lesson study professional community.

**Insufficient content and pedagogical knowledge**

Seminal research studies suggest mathematics teachers in the USA, particularly in elementary and middle schools, do not have sufficient mathematical content and pedagogical knowledge ([16] Ma, 1999; [23] Promoting Rigorous Outcomes in Mathematics and Science Education (PROMISE), 2006). To carry out effective and high-quality lesson studies, teachers need to acquire strong content knowledge and pedagogical skills so they can anticipate student learning behaviors and develop a plan that reflects appropriate content and methodology for the concepts to be taught.

International studies of high-achieving countries whose students outperform US students (e.g. TIMSS) suggest that secondary school students, including prospective teachers, typically take two or more years of advanced mathematics in high school prior to entering college. Moreover, in these high-achieving countries, high-performing students are entering the teaching profession through selection systems such as college entrance examinations and appointment examinations ([23] PROMISE, 2006; [9] Greenberg and Walsh, 2008). In contrast, research of the US system has found many prospective pre-service teachers represent the lower one-fourth of the achievement group in secondary schools and colleges (e.g. [23] PROMISE, 2006; [20] National Commission on Excellence in Education (NCEE), 1983).

One solution for this issue may be to require teachers to take more mathematics courses when they are enrolled in pre-service programs. However, this may not be the best solution. If the courses are not focussed on mathematics-specific pedagogy, aspiring teachers may not acquire the necessary knowledge, such as mathematics content knowledge, mathematics pedagogical knowledge, understanding of student thinking, and understanding of curriculum. Improvement of pre-service and in-service mathematics courses is important in order to increase teacher's mathematical content and pedagogical knowledge particularly at the middle and elementary school level. This will in turn help to improve the quality and effectiveness of lesson study.

The Mathematics Learning Study Committee at the National Research Council published *Adding It Up* ([11] Kilpatrick *et al.* , 2001) to introduce a vision of mathematical proficiency for students. This vision suggests that teachers develop an integrated knowledge about the mathematics they are teaching, a view that is supported by the Mathematical Knowledge for Teaching framework (e.g. [2] Ball *et al.* , 2008). It is not just content knowledge about the mathematics being taught, but specific content knowledge for teaching and pedagogical content knowledge such as knowledge about how the curriculum sequence builds student understanding, how student mathematical understanding develops, and how different instructional methods and materials help to develop different types of mathematical proficiency. Enhancing teachers' mathematics pedagogical and content knowledge for teaching is critical to improving the quality and effectiveness of the learning that occurs via lesson study and the PLCs thus represented.

**Lack of support and resources to conduct high-quality lesson study**

Many educators have asked about how lesson study can help to improve teachers' mathematical content and pedagogical content knowledge. Mathematical content and pedagogical content knowledge could be developed in the pre-service and in-service programs through lesson study in addition to content and pedagogy courses in universities and workshops. Lesson study can also provide strong support for developing such knowledge. However, teachers need to learn and develop the skills to practice lesson study effectively so they can improve knowledge in these specific areas. Improving the *kyozaikenkyu* process (instructional material investigation) in lesson study is one way to improve content and pedagogical content knowledge. *Kyozaikenkyu* is an important part of the lesson study process. It is a way for teachers to investigate instructional materials such as textbooks, standards, teachers' manuals, manipulatives, research papers, and other related resources to develop in-depth understanding of the content they are teaching ([28] Takahashi and Yoshida, 2004; [30] Watanabe *et al.* , 2008; [33] Yoshida, 2008). To do this teachers also examine curriculum alignment across grade levels to expand their understanding of how a new mathematical concept is developed by utilizing student prior knowledge across grade levels, methods for teaching the content, and how these methods influence what is understood by students.

Using this in-depth analysis of teaching and learning, lesson study teachers also determine the value of the mathematical activity they are proposing in their lesson plan. For example, the lesson's goal might be for students to develop a formula for area of a triangle, but teachers might value students coming up with many strategies to find the area. Students would represent the solution and compare and contrast math expressions to generalize the idea of creating or "discovering" the formula for area of a triangle. With this, the value of the mathematical activity shifts from learning the formula for area of a triangle and applying it as a procedure to investigating the development of the formula and generalizing to find if it meets all cases. When developing a lesson through conducting *kyozaikenkyu* , student learning is the focus with teachers paying special attention to students' prior learning experiences, their current state of learning, and their anticipated reactions and misconceptions.

Effective *kyozaikenkyu* improves the quality of the research process for developing a unit and lessons during the lesson study cycle. Teachers produce a well thought out research lesson plan with a clear hypothesis, a clear plan to implement the lesson, clear goals and outcomes, and clear evaluation methods for the instruction and the student learning. Because of the improvement, observation and data collection during implementation of the research lesson becomes more purposeful. Moreover, the post-lesson discussion becomes engaging, focussed, and deep. Although *kyozaikenkyu* is a highly recommended practice for improving the quality and effectiveness of lesson study by many lesson study educators and researchers, in my experience teachers in US lesson study groups often do not spend (or are not given) adequate time to engage in the careful and important process of *kyozaikenkyu* during lesson study.

Engaging teachers in high-quality *kyozaikenkyu* is not an easy task, but it is necessary to conduct effective lesson study. One idea for conducting effective *kyozaikenkyu* might be providing teachers with the best available curricular materials that are grounded in strong content and pedagogical knowledge. This will help teachers conduct the *kyozaikenkyu* process in a way that can support their lesson study work and achieve the visions that mathematics educators, such as the National Council of Teachers of Mathematics (NCTM), recommend. For example, [19], [21] NCTM's (2000, 2006) *Principles and Standards for School Mathematics* , and their document *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics* , suggests that teachers should focus on a small number of significant mathematical topics in each grade level. Spending more time on fewer topics and sequencing topics to develop coherently across the grades will help students build their knowledge of the mathematics that is necessary to understand more advanced mathematics in the future.

Some may reach the conclusion that teachers in lesson study should develop their own curriculum and this curriculum to reflect more coherence. However, asking teachers to develop a new curriculum should not be a priority of lesson study. Rather, the focus should be on teachers' learning and examining their current curriculum deeply. They should use lesson study to improve classroom practice by studying and creating ways that incorporate the recommendations of the math education community into their current curriculum. I believe this point is particularly important. It is not a wise idea to ask teachers who are developing deeper mathematics content and pedagogical content knowledge to develop a new curriculum, because achieving coherence and focus in a curriculum is very difficult even for those with expertise in this area.

An alternative idea might be to conduct lesson study with materials that have been developed in other countries that are grounded in strong mathematical content and pedagogical knowledge, are coherent and focussed, and in accord with the current reforms. With the introduction of the Common Core State Standards (CCSS) ([22] National Governors Association Center for Best Practice (NGA Center) and the Council for Chief State School Officers (CCSSO), 2010), conducting *kyozaikenkyu* on the CCSS with textbooks that follow the CCSS's vision is imperative. CCSS builds upon the strengths and the lessons learned from the current state standards and standards of top-performing countries such as Singapore, Hong Kong, Korea, and Japan. Its intent is to develop consistency across all states so all the students have access to high standards of education. The content of CCSS is focussed and coherently ordered in order to help students learn the content and retain the knowledge and skills. While the total amount of content studied in each grade level is reduced, the content itself is more challenging with the expectation of student mastery. In addition, the CCSS for Mathematical Practice expects students to improve their high-order skills such as the ability to justify and reason logically. These characteristics of CCSS are hallmarks of many of the curricula used in the worlds' high-achieving countries. Although several current US mathematics textbook publishers claim their textbooks are aligned with CCSS by underscoring the content taught, much of the content is not designed true to the CCSS's vision, such as coherency of the content and Mathematical Practice Standards across grade level ([31] Wu, 2011). Thus, conducting *kyozaikenkyu* on the textbooks from Singapore and Japan, that was particularly used to study and design CCSS, is very important and productive in order for the US teachers to understand how to implement CCSS in classrooms with an understanding of its vision.

Textbooks from Singapore and Japan have been developed to exemplify coherence and focussed instruction of mathematics. In my experience facilitating lesson study groups that include these texts as part of their *kyozaikenkyu* practice, studying Japanese or Singapore textbooks makes it easier for teachers to see how mathematical ideas build across grade levels with close attention to student thinking and adequate time for developing concepts. These eastern Asian textbooks do not contain many extras, such as long introductions, colorful pictures, biographical stories, or discussions of non-mathematical topics. They include very clear representations and clear explanations in very few words ([24] Schmidt *et al.* , 2002). US teachers are surprised to hear that the Japanese textbooks are a product of collaboration among lesson study practitioners (teachers), mathematics educators (university professors), and mathematicians in Japan. They contain many ideas gained from *kyozaikenkyu* and lesson study, such as a problem-solving approach to teaching mathematics, well thought out questions that encourage student thinking, consistent and strategic use of appropriate representations, and student note taking ideas. Japanese teachers conduct lesson study using the textbooks, teacher's manual for the textbooks, and the Course of Study Teaching Guide to improve their content knowledge and pedagogical knowledge. Topics in the Japanese textbooks are focussed and coherently sequenced. The teachers' manuals provide clear rationales for the topics covered, how they are sequenced, how students' prior knowledge will be fostered through lessons on new concepts, and typical student misunderstandings that become barriers to student learning ([27] Takahashi *et al.* , 2005; [28] Takahashi and Yoshida, 2004). The textbooks are not only very helpful for students to learn mathematics, but also for teachers to learn how to teach mathematics in classrooms; therefore, they are very useful resources for conducting high-quality and effective *kyozaikenkyu* and lesson study. For example, using Singapore and Japanese mathematics textbooks as a resource for *kyozaikenkyu* with US primary teachers (Grades K-2) has helped teachers understand how they can develop students' strong number sense. By studying the textbook and doing the activities in the textbooks, teachers learn about how to teach new mathematics concepts through the problem-solving approach.

Another significant difference between lesson study in Japan and the USA is the level of experience of the teachers in each country. Japanese teachers have accumulated many years' experience and knowledge about conducting lesson study. In Japan's long history of conducting lesson study, many experienced lesson study practitioners have been nurtured. Their contribution to the lesson study community is significant and has improved the quality of lesson study in Japan. In addition, many university professors participate in lesson study as observers, lesson discussants, or knowledgeable others and work with lesson study practitioners to maintain high-quality lesson study. These experienced lesson study practitioners and knowledgeable others are important to improve the quality of *kyozaikenkyu* as well. Even if a group of teachers engage in lesson study, if all the teachers have limited knowledge about the content they are studying, the quality of lesson study is compromised. However, if somebody who is knowledgeable in content and pedagogy can be involved in the lesson study, the quality of lesson study, as well as the quality of the *kyozaikenkyu* , increases. We say "two heads are better than one" in English or "three heads together produce a knowledge of Manjusri" (wisdom of enlightenment being of Buddhism) in Japanese. To support lesson study in the USA, I believe it is very important to nurture and involve experienced lesson study practitioners and knowledgeable others to support teachers and ensure high-quality and effective lesson study and *kyozaikenkyu* .

**Non-systematic approach for conducting effective lesson study**

Another problem I found in lesson study in the USA is teachers, schools, and districts are conducting lesson study in a very isolated manner. To build a community of professional learning or lesson study where teachers can learn from each other, we need to break the barrier of isolation. Isolation is an enemy of lesson study and precludes the improvement of experience and knowledge in teaching and learning by teachers. We need to think about how we can share our experiences and knowledge gained from lesson study within and across schools to support student learning and understanding. When teachers and schools communicate with each other and better networks for exchanging ideas are created, it is more likely the teachers learn more and have more opportunities to develop better content and pedagogical content knowledge. When teachers are ready, it is important that they invite teachers from other schools and districts to engage in observation and discussion of research lessons collaboratively. Elementary school teachers in Japan usually have about ten occasions a year for observing and discussing research lessons in and outside of schools. Also, they usually teach a lesson in front of their colleagues as part of lesson study ([32] Yoshida, 1999). This means that teachers in Japan typically observe and discuss 100 research lessons over ten years. Most valuable is the fact that observing many well-thought-out lessons that are developed through lesson study and engaging in critical discussions with colleagues helps to shape an image of what good lessons look like in the classroom. In the USA it is often said that "good practice dies when a teacher retires" because of their isolation at work. So the good ideas developed through lesson study also might disappear if we cannot build a community to share and that understands the importance of sharing across the greater community as well.

**Short-sighted planning for improvement and lack of professional development time**

In the USA many researchers reported that teachers do not have much time to collaborate during their workday and they are usually isolated from each other (e.g. [10] Heider, 2005; [4] Darling-Hammond, 2003; [15] Lortie, 1975). In addition, the current climate of high-stakes standardized testing to meet the "adequate yearly progress" mandated by the No Child Left Behind Act (NCLB) of 2001 may encourage short-term improvement while weakening a climate for long-term steady improvement in classroom teaching and student learning. NCLB may have been introduced to improve the performance of primary and secondary schools in the USA by increasing the standards of accountability for states, school districts, and schools; however, the press for accountability can result in local practices that are counterproductive to student learning. For example, I experienced at least three different situations where teachers were teaching regular non-remedial mathematics classes using test preparation materials and were conducting "lesson study" as a way to meet a district or state mandate to participate in a PLC. Some appeared to be motivated to use lesson study as a way to develop an enjoyable lesson for students, in a test prep environment, rather than engaging in *kyozaikenkyu* to improve content and pedagogical knowledge. As the result, these "lesson study" groups generated much less teacher learning than those who implemented true *kyozaikenkyu* . Thus, it has been my experience that NCLB, which was developed to ensure equitable quality education for all students, has in reality thwarted long-term steady improvement. The climate produced has not been favorable to supporting the depth of professional development capable of being generated by lesson study groups that are given the time to develop as PLCs.

In addition, frequent administration changes in schools and districts do not support long steady improvement of classroom teaching and learning. In my experience in the USA, administrators (particularly those in urban school districts) come and go in a very short cycle. It seems as if every time administrations change, the direction of the education of students and professional development of teachers changes. For example, in two urban school districts where I worked, one school district had five different superintendents and four textbook changes in ten years. Another school district had six different superintendents in the same decade, but kept the textbook series constant. In both cases, the kind of professional development for teachers changed frequently as the superintendents changed. In this condition, the teachers could not sustain lesson study in these districts. This frequent change in administration is creates a barrier for establishing steady improvement of teachers' content, pedagogical content, and curriculum knowledge, as well as their classroom teaching and learning.

**Conclusion**

As I pointed out in this paper, there are still many obstacles for conducting high-quality and effective lesson study in the USA. Some of the issues are more difficult to resolve than others; however, we need to wisely improve lesson study practice so that teachers can feel it is a worthwhile professional learning that helps them to become better teachers. Alice [35] Gill (2002) at American Federation of Teachers said "when lesson study is done well, the learning itself is the most powerful support to sustain involvement and attract new participants. It will grow in the teachers and show in the students". High-quality and effective lesson study will produce learning for both teachers and students and creates a strong professional community where all the participants can grow and learn together. It is my hope that the issues and ideas for improving lesson study in this paper may help educators and researchers to engage in more lively discussions on how to begin and/or improve lesson study in the USA. Moreover, the discussion will provide an important contribution to teachers who are considering beginning lesson study outside the USA.

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