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RESEARCH BRIEF

Development of Lesson Study Approach in Three Rural Elementary Schools of Taiwan

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Abstract: In rural schools, teachers feel particularly disadvantaged for teaching professional development. Implementing lesson study projects could promote teaching quality. The study investigated the development of lesson study approach in three rural elementary schools of Taiwan. A qualitative method was employed to collect and analyze data obtained from interviews with individual school principals, various observations, and focus group interviews for teacher collaboration. Through a year of lesson study processes, the schools of this study developed feasible examples for lesson study. School leaders' teaching demonstrations and a focus on student performance promoted teachers' participation in open classroom observations and collective discussions. Establishing alliances between schools resolved the problem of a limited number of teachers with the same specialty during collaborative lesson planning. However, because of a lack of experience and insufficient collaboration in lesson planning, the participating teachers did not completely establish the model of jump learning for improving students' thinking skills.

Keywords: Lesson Study; Teacher Professional Development; Rural Teacher Education; Elementary School Education.

Japanese lesson study has recently attracted the attention of teacher educators worldwide. Lesson study is an approach for teacher instructional improvement in which teachers work together to (a) collaboratively plan a research lesson designed to achieve the formulated goals of student learning; (b) teach the lesson in a classroom with the members of one teaching team to collect evidence on student learning; (c) reflect on and discuss the evidence after teaching activities to improve the lesson; and (d) if desired, teach, observe, and improve the lesson again in other classrooms (Lewis, 2002). In short, teachers collaborate to design a lesson, teach the lesson to students, mutually observe the teaching activities, and subsequently meet to discuss for improving future lessons (Fernandez, Cannon, & Chokshi, 2003; Sato, 2008; Saito & Atencio, 2013). On an ongoing basis, lesson study aims to promote the professional development of teachers and to enhance student learning. Particularly, when teachers engage in the aforementioned process, they may collectively develop a perspective on how students can learn more effectively. Lesson study is not only about designing a lesson but also about expanding the knowledge to other classrooms for teachers to improve instruction (Takahashi, & Yoshida, 2004).

Studies have demonstrated the benefits of lesson study in teacher professional development and student learning (Groves & Doig, 2010; Kadroon & Inprasitha, 2013; Lim, Lee, Saito, & Haron, 2011; Ono & Ferreira, 2010).

In rural areas of Taiwan, less qualified teachers influence the quality of classroom. Funding inequalities between urban and rural schools could lead to inconsistencies in student experiences, shortages of specialized teachers, and a lack of opportunity for teacher professional development (Peng et al., 2014). Teachers in rural schools feel particularly disadvantaged for professional development. Integrating the concepts of lesson study into rural schools may promote teaching quality.

Additionally, rural schools have a limited number of teachers with the same specialization, resulting in difficulty in collaborating for specific lesson designs. However, rural school teachers feel supported by their schools and colleagues in most aspects of their professional lives (Tytler, Symington, Darby, Malcolm, & Kirkwood, 2011). Matanluk, Johari, and Matanluk (2013) suggested that implementation of lesson study increases students' opportunity to participate in learning activities in rural school classrooms because of the limited number of students.

Based on the aforementioned perspectives, the implementation of lesson study in rural schools warrants attention. This study investigates the development of lesson study in rural elementary schools of Taiwan.

Visible Difficulties and Strategies in Teacher Collaboration

Based on the previous definition of lesson study, collaborative interaction is the core task of lesson study. Although teacher participation in collaborative lesson study projects has a positive influence on student engagement in classrooms, teachers struggle with adjusting from independence to collaboration (Puchner & Taylor, 2006); particularly, some teachers prefer to work alone in their classrooms (Edmunds, 2009; Nompula, 2012). Lewis and Hurd (2011) indicated that when a lesson study project is proposed, many teachers are initially reluctant to have their teaching observed by colleagues. Strengthening collegial networks to enable productive collective efforts is vital to teacher collaborations (Lawrence & Chong, 2010). When teachers believe that instruction can be improved and that they can learn effectively with colleagues, and when they allow other teachers to observe their lessons, they will be able to resolve existing teaching problems and develop innovative instruction (Lewis & Hurd, 2011).

A team of teachers from the same subject area is believed to benefit from collaboration. A clear difference in the subject area of teachers is considered as the main obstacle to collaboration; the suggestions of teachers from other subject areas would not be accepted because of a lack of involvement in common professional knowledge (Pawan & Ortlof, 2011). However, studies have determined that teachers could overcome subject boundaries and focus on teaching methods and techniques (Saito, 2012; Saito & Sato, 2012). It is unclear whether teachers' differences in subject areas affect their collaboration, particularly for rural schools, which may not have two teachers with the same specialty.

In addition to the aforementioned difficulties, Murata (2010) indicated that any challenge should be carefully examined and understood locally when schools and teachers integrate lesson study into existing school and classroom systems. For example, Lee (2008) indicated that a group of Hong Kong teachers adopted lesson study to improve their instruction, requiring teachers to stay after school for the lesson study meeting and to do additional paper work. Considering their already heavy teaching duties, this could be a burden. If the challenge in teacher collaboration is from structural incompatibility (e.g., teachers do not have a common planning time in their school day), administrative intervention may overcome the difficulty. If teachers are not familiar with the inquiry process, the lesson study program may be modified to support teachers to participate for their own professional development. In sum, to adopt lesson study in different cultural environments, schools must understand the emerging challenges and carefully adjust the lesson study to support teacher learning.

Instruction Tasks in Lesson Study

Teachers working together could focus on student thinking rather than on teaching techniques, and investigate the effectiveness of lessons (Lewis & Hurd, 2011). When teachers' discourses involve what children actually learn and what teachers learn from observing children, lesson study could support the professional development of teachers (Suzuki, 2012).

Specifically, teachers could assess students' thinking several times during a class period by asking them to write down their current thoughts; students could then analyze and explain their thoughts in small groups, thereby creating opportunities for students to articulate their ideas, compare them to other points of view, and receive feedback from the instructor and their peers (Cerbin & Kopp, 2006). The aforementioned strategies are similar to group discussion or cooperative learning among students. Lesson study requires teachers to examine the benefits to various types of learners, how groups should be structured, and the requirements for groups to work well. Cajkler, Wood, Norton, and Pedder (2014) found that teachers who engaged in lesson study reported that the process improved the understanding of their students. Cajkler, Wood, Norton, Pedder, and Xu (2015) further evidenced that a focus on student learning promotes teachers' confidence in teaching that increases opportunities for students to engage in interactive activities, for example, by involving problem-solving and peer teaching in groups.

Understanding students' learning and thinking processes is vital when teachers implement lesson study. Sato (2014) proposed that learning is "jumping" with peers. When students have obtained a sufficient knowledge base, teachers provide each student group with more difficult questions beyond the learned knowledge, such as questions with problem-based learning. Teachers then encourage students to discuss with each other to inspire them to "jump" to high-level thinking for solving challenging tasks. During lesson study and teacher–student interaction, teachers must listen carefully and ask questions that promote students' flexible thinking. This activity design extends basic knowledge and facilitates students' thinking through students' sharing and self-reflection; thus, it is called the jump learning activity by Manabu Sato (2014).

Olsen, White, and Sparrow (2011) explored three case study teachers who, after completing the lesson study process, changed their teaching methods from frequently asking general questions without knowing what to do with the information that students gained to asking purposeful questions and using the students' responses to guide instructional decisions. However, Nesusin, Intrarakhamhaeng, Supadol, Piengkes, and Poonpipathana (2014) showed that time constraints make it difficult for students to express their thoughts adequately.

The Study

Theoretically, lesson study aims to improve teachers' classroom instruction and enhance student learning through a process of collaborative interaction. For rural school teachers, implementing lesson study projects could promote their teaching quality because of favorable collegiality and a limited number of students; however, certain disadvantages still exist. Taiwanese school teachers' habit of working alone in their classrooms may result in difficulties in teacher collaboration in the initial stage of implementing lesson study.

Fujii (2015) proposed that researchers must consider cross-cultural differences when introducing lesson study in other countries. Accordingly, this study did not duplicate the Japanese model of lesson study but explored the potential development of lesson study for schools outside Japan. This study focuses on the rural school teachers' experiences in the implementation of lesson study approach for the first year, specifically on problems and successful examples, and determined whether the teachers collaboratively developed jump learning strategies in lesson study.

Based on a literature review, lesson study is an emerging educational strategy for rural school teachers. It lacks sufficient information and has few explicit demonstrations; consequently, the data of this study depended on a self-reported understanding of the processes and observations

of teachers' participation in lesson study projects. Thus, a qualitative phenomenological approach with a collective case study methodology was employed. The participants' comments and all observations were used to identify perspectives on lesson study.

The three rural elementary schools volunteered to participate in the lesson study project that a local government initiated. School A and School B comprise six classes and 10 faculty members. Each class has approximately four to eight students. School C has 20 faculty members and 12 classes with approximately 9 to 12 students in each class. Most parents of the students in these schools earn a living by agriculture. The three principals, Principal Chao (School A), Principal Lin (School B), and Principal Lee (School C), are female, possess a master's degree, and were aged 45 to 49 years. According to the three principals, the teachers in the schools have strong collegiality. The teachers' years of teaching experience ranged from three to 26. Three or five teachers are substitute teachers in each school. All teachers were involved in the lesson study project. However, they had no experience in lesson study, and only a small number of teachers had heard about it before the project. Of the participants in each school, male and female teachers were approximately equal in number.

Because the three schools have a limited number of teachers with the same specialization, the teachers were not arranged into any specific learning community but collectively implemented lesson study activities under the arrangement of school administrators.

Lesson study usually involves the participation of outside experts who often inject new knowledge and help teachers to reflect on their practice (Groves, Doig, Widjaja, Garner, & Palmer, 2013). I, a professor from a university of education, was invited by the local government to coordinate the three aforementioned schools. To increase the participating teachers' awareness on lesson study, as evidenced by Lawrence and Chong (2010), in the initial stage of the lesson study project, I visited each school and provided all teachers with ideas on the processes of implementing lesson study as described in literature review, including collaborative lesson planning, open classroom observation, and collective discussion on the lesson after teaching. Except for the initial ideas, I, as an observer, did not involve the processes of teacher collaboration.

From August 2014 to July 2015, I collected data by attending many lesson study activities as described in Table 1.

Table 1 *Summary of Activities that the Author Attended for Data Collection*

	Open classroom observation	Collective discussion after teaching
School A	3	3
School B	4	4
School C	2	2

However, because of my limited time, the activities that the three schools implemented included more than those that I attended. According to the three school principals, the teachers were encouraged to collaboratively plan lessons. All teachers were required to implement open teaching demonstrations in turn. Additionally, the teachers were required to participate in classroom observation, a collective discussion for teaching, and a focus group interview (FGI) at least once.

I collected data from multiple sources to identify patterns and themes in the findings: collaborative lesson planning (approximately one hour), which provided the participating teachers' dialogues regarding a lesson design; classroom observation (40 minutes per a class), which provided this study with a knowledge base in the instructors' implementation on the lesson; and collective discussion (approximately one hour), which provided the participants' efforts in the discussion on the lesson. All discussions and observations were video recorded, and the audio records were transcribed.

Additionally, a FGI within one hour for participating teachers of each school was immediately conducted after the meetings of collective discussion. Four to six teachers participated in each collective discussion meeting and FGI. The formal questions

were developed on the basis of the contents of classroom observation and collective discussion, and they involved the following: (a) What you perceived regarding open classroom observation and collective discussion? (b) Why did you do that? (c) Did you encounter any problems? The interviews were semi-structured and audio recorded. A total of nine FGI were conducted during the project.

When visiting each school, I conducted an interview (approximately one hour) with the school principal. The interview questions focused on "what you did in," "what you perceive regarding," and "what you think about" the lesson study project. The interview with the principal was conducted twice each school during the project.

All participants were informed about the data collection and agreed that all data could be corrected and organized for publication at any time without discrimination or harm. An ethical approval has been obtained from an institutional ethics committee of Taiwan prior to any data collection.

The data analysis involved using a process of constant comparisons for recurring words and emerging patterns (Lincoln & Guba, 1985). The data from these various sources were then organized and analyzed in meaningful units, categories, and then themes.

The transcripts of all interview data were read several times to enable an in-depth understanding of collaboration between teachers. By reading the interview data, collecting and comparing the findings regarding teachers' experiences in collaborative interactions, the themes of the teacher collaborations in the project were identified.

During the FGIs, as recommended by Bloor, Frankland, Thomas, and Robson (2001), indexing was used. Indexing increases data manageability for analysis. When a response to any FGI question (e.g., a lack of sufficient discussion among students) occurred during each FGI, the key terms of the response were recorded instantly as a possible index. On the basis of this method, the initial index was maintained or a new index was developed. When a pattern emerged reflecting a correlation among several indexes, the pattern was reviewed to identify relationships and trends among the various viewpoints.

I also triangulated the data from the interviews, observations, and the FGIs to increase the credibility of the study findings, and further identified the participants' common perspectives, especially on common problems and successful examples in lesson study, as mentioned in literature.

Results

Through data collection and analysis, four themes were observed to explain the participants' perspectives on participating in lesson study projects. These themes also indicate the changes in the development of lesson study among rural schools.

School Leaders' Teaching Demonstrations Reduced Teachers' Anxiety in Open Classroom Observation that Differed From the Original Expectation

Based on a perspective from literature, teachers may be reluctant to be observed when teaching. However, surprisingly, the teachers, rather than the principals, initiated the application for lesson study. Principal Lee described that several teachers actively proposed implementing lesson study during a meeting, and afterward, other teachers followed the decision. Another common perspective, indicating teachers' willingness to attempt implement lesson study, also emerged from an FGI in School A.

However, the teachers hesitated in making a decision on how to achieve the goal. Some teachers considered that lesson study seems to be a classroom observation of a novice teacher with a recommendation from senior teachers. When I introduced the lesson study processes in the initial stage of the lesson study project, the participating teachers expressed their anxiety for open classroom observation. In the projects, each teacher in participating schools was encouraged to implement open classroom observation that differed from their original perceptions.

Principal Lee also admitted that she could not identify the processes of implementing lesson study at the beginning stage. After listening to my introduction about lesson study, the three school

principals considered open classroom observation as a milestone for teacher collaboration.

> Teachers may fell anxiety in open classroom observation and be afraid of being commented about own teaching activities. However, based on my observation in everyday life, my school teachers have strong, positive relationships with each other. I would expect them to implement open classroom observation in turn. (Principal Lin, personal communication, 19 November 2014)

Theoretically, Taiwanese teachers have worked alone for a long time. Understandably, open classroom observation is an obstacle to teacher collaboration. To increase the teachers' confidence in open classroom observation, Principal Chao volunteered to be the first teacher to be observed by all participating teachers. Principal Chao expressed her reason.

> Actually, I cannot promise to perform a perfect instruction in front of my teachers. However, I want to increase the teachers' confidence in open classroom observation through my teaching demonstration. If I dare to be observed even though I am not a perfect instructor, why do they worry about open classroom observation? (personal communication, 5 November 2014)

In addition, the two other principals actively demonstrated specific strategies in collaborative lesson planning for a teaching team at the beginning stage of the project. The directors of the departments in the two schools also served as the first instructors to be observed. Following the leaders' demonstrations, other participating teachers commenced open classroom observation.

Teachers Initiated a Reformed Lesson Study Along with Changes in the Focus

The teachers' anxiety in open classroom observation reduced but remained inevitable. Teacher Tang recalled that she spent a lot of time on preparing a lesson because she was afraid of embarrassment from an imperfect teaching performance during open classroom observation. Notably, Teacher Tang wrote an instructional plan herself rather than through collaborating with other teachers because she did not believe that teachers with different specialties were willing to or could effectively plan a lesson together

> I must say that I need to spend additional time to realize his lesson. After all, I did not and would not teach the lesson… Actually, when I am busy with my teaching work, I am not willing to engage in other teachers' lessons. (Teacher Yang, personal communication, 27 November 2014)

According to the data from the FGI, many teachers also did not collaboratively prepare lessons. Only Teacher Yu from School C collaborated with other teachers for lesson planning by finding a common time, during which he asked for lesson suggestions.

> I wanted to obtain some recommendations from other teachers. I actively asked them about my designed lesson after expressing my lesson idea. Afterward, we discussed each detail in the instructional process of my lesson plan. Because of this discussion, I revised the lesson plan. (Teacher Yu, personal communication, 27 November 2014)

The meeting for collaborative lesson planning did not deeply involve lesson preparation, but involved a discussion on the preparation for classroom observation. Teacher Yu expressed the expectation for observing the students' learning performance instead of the teachers' behaviors. Additionally, Teacher Yu divided the observing teachers into groups to observe each group of students to understand the learning effectiveness of all students. After the teaching activities, the observers described their observations and discussed the students' learning problems (e.g., students' lack of sufficient vocabulary resulting in the reading difficulty of a textbook) and potential solutions (e.g., each student first indicates unfamiliar words in the reading material before teaching). Teacher Yu's initiative in open classroom observation led to extensive discussion.

Because of the focus on students' learning behaviors, the participating teachers enthusiastically discussed the students' learning problems.

Two teachers expressed the following during the FGI of School C:

> It is reasonable that every teacher wanted to promote their teaching effectiveness by improving students' learning problems. A concern in learning problems can lead us to sufficiently discuss. Previously, we did not know how to initiate this discussion… (Teacher Chen, personal communication, 5 December 2014)
>
> The instructor's perspectives on lesson design induced us to discuss with each other. With a focus of observation from the instructor's expectation, we could focus on the students' performance rather than the teachers' behaviors. This alleviated my worries regarding open classroom observation. (Teacher Su, personal communication, 5 December 2014)

Because the teachers did not collaboratively plan lessons, the processes of lesson study could not be completely conducted, resulting in a reformed lesson study. By asking for lesson suggestions instead of conducting adequate collaborative lesson preparation, with collective discussion on student learning and the reminder of the focus of classroom observation, the participating teachers' anxiety regarding open classroom observation reduced. This finding not only corrects teachers' mistakes in the observed subject during open classroom observation but also extends previous perspectives on teachers' reluctance in teacher collaborations.

Teachers Established the Model of Teacher Collaboration but Without Jump Learning

Through a year of lesson study processes, the participating teachers became familiar with open classroom observation and collective discussion on lessons after teaching. The practice model of teacher collaboration seemed established.

According to a collective discussion record, two observing teachers of School C indicated students' lack of sufficient vocabulary in a Chinese language arts class. Notably, no two teachers in the meeting taught the subject. However, during a collective discussion after a music lesson, adequate discussion among teachers was not achieved. Comparing the two aforementioned phenomena, teachers with different specialties could collectively discuss students' learning problems in a subject with basic literacy (e.g., language art) but not professional subject content for an elementary school.

Moreover, the participating teachers' instruction and discussion did not involve the strategies of student group discussion on learning material. Based on the theoretical idea of lesson study, teachers should facilitate students to engage in peer dialogue during learning. According to the record of a classroom observation in School B (18 December 2014), when Teacher Wang encouraged his students to express their own perspectives in groups, his students' performance on dialogue was not adequate. Except for two students who often speak, the other five students were silent. The reason may be a lack of activity design that asks students to write down their thoughts before peer dialogue and articulating their ideas, as mentioned by Cerbin and Kopp (2006). A similar phenomenon also occurred in Teacher Yang's class from School A (16 April 2015). The observation record described that one student directly told another student the answers for a learning worksheet, and there was no discussion. A comment on this phenomenon was mentioned in the FGI in School C.

> High-ability students always immediately express thoughts, whereas low-ability students are not at all prepared… I often encourage high-ability students to assist low-ability students; however, the high-ability students always show the correct answers of learning worksheets to low-ability students. (personal communication, 4 March 2015)

Although the participating teachers recognized that teacher collaborations should focus on student learning, they only discussed how to resolve student learning problems that they observed rather than how to establish a model of collaborative learning among students. Based on the viewpoint of Manabu

Sato (2014), group dialogue in classrooms is crucial for promoting students' jump learning. However, the analytical result of this study revealed that discussion among students and jump learning has not been developed, even though a process of teacher collaboration was established. By combining the participating teachers' statements in the FGIs with the analytical data of classroom observations, this study identified that teachers cannot facilitate sufficient dialogue among students. That is, for the learning required to enable thought jumping, the participating teachers did not succeed in the two semester of the lesson study project.

Alliance Between Two Schools Resolved the Problems in Collaborative Lesson Planning

Rural schools often have fewer teachers with the same specialty compared with urban schools. Establishing informal alliances between schools to provide teachers with opportunities to exchange perspectives on education may be a feasible strategy. Principal Chao initiated this idea, and afterward, Principal Lin enthusiastically responded to Principal Chao's invitation. They collectively arranged many in-service training activities for the teachers of both schools.

The reason for joint training for both schools was that at least two teachers who teach the same subject and grade could collaboratively prepare the lesson, according to Principal Chao. Principal Chao also proposed during the interview an additional value of a school alliance:

> …In addition to participations in more in-service training activities, teachers would have more opportunities to exchange experiences in teaching during common meetings. (Principal Chao, personal communication, 16 April 2015)

Another benefit emerged in the collaborative lesson planning among teachers of an alliance. Even though teachers admitted that they could not discuss "each lesson" with teachers of the same specialty from another school, they obtained several innovative teaching ideas from discussion on successful experiences in teaching in the joint training time. However, when teachers in one school were invited to observe the classroom instruction of another school, no teacher achieved it because of a lack of matching time. Establishing an alliance between two schools cannot resolve the problem of a teacher's classroom instruction being observed by teachers with different specialties, but provides an opportunity to exchange successful experiences in teaching.

In sum, the rural schools established an alliance between schools to provide teachers with opportunities to exchange experiences in common lessons; however, the method cannot achieve the goal of mutual observation on the common lesson because of a lack of matching time. Few studies have investigated the methods of establishing an alliance that this study revealed for lesson study in rural schools.

Discussion

Literature mentioned that favorable collegiality among teachers benefits their collaborations (Lawrence & Chong, 2010; Saito & Sato, 2012). However, strong collegiality did not substantially increase teachers' confidence in open classroom observation in teacher collaboration. The analytical results of this study revealed that school leaders' teaching demonstrations with an imperfect self-perception alleviated teachers' worries regarding open classroom observation. Perhaps the participating teachers perceived that their instruction may be more effective compared with the leaders' presentations, and thus their anxiety for teaching demonstration reduced.

Requesting a group of teachers with different teaching fields to collaboratively plan a lesson is definitely a problem in rural schools. The analytical result of this study revealed that a teacher asking for suggestions on lesson design from other teachers during collaborative lesson planning could overcome this problem. Previous studies have recommended that teachers with different specialties could overcome subject boundaries and focus on teaching methods and techniques (Saito, 2012; Saito & Sato, 2012); this study demonstrated that this is unfeasible

in collaborative lesson planning because of teachers' busy schedules and unwillingness to engage in a lesson they will not teach. This finding also extends a perspective from Pawan and Ortlof (2011) who indicated that teachers did not accept suggestions from other teachers in other subject areas during teacher collaborations for a lesson.

This study also found that when focusing on students' learning behaviors, the participating teachers could engage in open classroom observation and collective discussions. The participating teachers initially considered that the teaching teachers would be the subject being observed and discussed. Consistent with Cajkler et al. (2015), lesson study induced the participating teachers to change from focusing on teachers' behaviors to observing students' learning problems and proposing remedial strategies. According to Lewis and Hurd (2011), a team of teachers working together should focus on student thinking rather than teachers' techniques during lesson study. In this situation, teachers are not the subject being observed and discussed, thereby benefitting teacher collaborations and eliminating anxiety.

Moreover, the limited number of teachers in the same subject is a major problem in implementing open classroom observation and collective discussion in rural schools. Literature indicated a potential strategy (Saito, 2012; Saito & Sato, 2012); teachers could focus on general instructional strategies and techniques instead of subject knowledge to resolve the problem of few teachers with the same subject specialty. This study found that teachers with different specialties in a school could collectively discuss students' learning problems in a subject on basic literacy (e.g., language arts), but not in a subject with professional content (e.g., music art). This study's finding slightly exceeded the literature.

Based on the analytical result in this study, the strategy of student jump learning was not developed, resulting in insufficient discussion among students. As mentioned by Manabu Sato (2014), the factors involve whether students' core knowledge base for jump learning was established. When the participating teachers were willing to collaboratively design a lesson, a crucial concern was how to establish students' core knowledge base to improve students' group discussion. However, as mentioned, teachers with different specialties did not collaboratively plan lessons. The two problems in a rural elementary school, a lack of collaborative lesson design and a lack of jump learning, may exist a causal relationship.

Alliances among several schools could provide teachers from different schools with the opportunities to exchange experiences in a common lesson, to reveal alternative methods of collaborative lesson planning, and even to discuss students' learning problems. When lesson study identifies the collaboration of teachers in a school as a process of collaborative lesson planning, open classroom observation, and collective discussion for improving future lessons (Fernandez et al., 2003; Sato, 2008; Saito & Atencio, 2013), a rural school may have difficulties in implementing the project. However, the schools of this study developed feasible examples for lesson study.

In Taiwan, certain school teachers lack successful experiences in teacher collaboration, resulting in insufficient collaborative interaction. The aforementioned feasible examples could be considered as the solutions necessary for rural schools to improve efficiency to teacher collaboration.

Conclusion

Using data collected in one year, this study concludes that school leaders' teaching demonstrations for peer observation and the focus on students' learning performance could promote teachers' willingness to collaborate and reduce their anxiety regarding open classroom observation. By linking successful examples with problems in implementing lesson study, the methods of establishing an alliance between schools could resolve the problem of a limited number of teachers with the same specialty in rural schools for collaborative lesson planning and open classroom observation. However, because of a lack of sufficient collaboration in lesson planning, the participating teachers did not completely establish the model of jump learning for improving students' thinking skills, even though they initiated a reformed model of lesson study.

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