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Introduction

Lesson study is the activity which is familiar to Japanese teachers, even researchers of pedagogy. As the core policy to evaluate lessons in classroom, lesson study has traditionally a long history. This is one of the remarkable activities and has formed the culture of how Japanese teachers are trained and fostered. According to a large -scale national survey, teachers in elementary and junior high school nowadays are required to have the teaching skills for the classroom, in other words, teaching competence. To encourage their personal and professional growth, lesson study is evaluated as the most effective approach in training programs. Schools need to enhance the chances for teachers to visit a classroom e.g. study training (Akita, 2011, p114). Not only in training of teachers in service but also in training prospective teachers attempts to improve their teaching competency is regarded as a desideratum. This idea is also recognized in establishing the current Post-graduate Teacher Training School. Lesson Study is the most important factor in educating/training teachers because it improves teaching competency.

Moreover, the United States and other nations have started paying attention to lesson study in Japan. Those countries are following the Japanese science and mathematics pedagogy based on “recommendations that the exploratory lesson encourages students to understand and to deeply consider all aspects of the lesson” and expect that the Lesson Study will be the methodology for a teachers’ professional development (Wolf 2010, p.25). C.C. Lewis placed lesson study in the core of the vocational growth for Japanese teachers. He announced the five characteristics of Japanese lesson study (Nakano 2009, p.6):

- 1) Observed by outside teachers.
- 2) Planning together in longitudinal terms.
- 3) Bring specific goals or prospects into the lesson.
- 4) Recording the lessons.
- 5) Debating the lessons.

The definition of a lesson plan is ambiguous. Here I take it that the research for lesson planning is done and practiced on a daily basis at school. I excluded the analysis of lessons by other researchers in this paper. This paper is devoted to making clear how lesson study is evaluated in the teaching competency and professional growth of science teachers, overviewing its historical background, and to examining the significances and remaining issues in view of the realities of science

lesson study.

1. Lesson study for the teaching com

covers the needs of all. In other words, lesson study is not sufficient enough to endorse the formation of the first, fourth and fifth competencies (pedagogical principle competency, pedagogical research competency and pure science research competency). Therefore we understand that it has limitation on the personal and professional growth of science teachers as through lesson study.

2. The establishment of Lesson Study in the Meij

seems to have become institutionalized. According to “the Subjects and its degree of Ordinary Normal School” in 1887 from Imperial Rescript on Education (1880), it stipulated; “To learn the subject’s methodology, teachers should sometimes visit the affiliated elementary school with their students. Explain the content of the lessons to the students, observe and criticize the teachers practicing the lessons, and demonstrate lessons to everyone by yourself.” In a revision in 1892, “actual teaching practice” was prescribed in more details, and the strategy was promoted to regard as a research into lesson study those teacher trainings implemented at the affiliated elementary school of Higher Normal Schools.

A educational magazine, *The Research of Education* published by the research society for elementary school education in the affiliated elementary school of Higher Normal School, had a great influence and authority throughout the nation. In a review in 1904, the research society specified a monthly project about “the research of how to criticize actual teaching practice.” As the lesson study spread in Japan from 1897 to 1906, most affiliated elementary schools suggested “the points on how to criticize lessons” as the viewpoints of lesson study. For example, in Hokkaido, the points followed were: 1) Materials, 2) Method, 3) Teacher, 4) Student. The content of each check point was as follows;

- 1) Materials: Connection with the previous lesson plan; the appropriateness of degree, the volume of subjects and time spent; the order of the sentences or content; the relation to other subjects, the existence of miswriting and misconception.
- 2) Methods: the existing knowledge is used to help understand the new knowledge; the comparison between the existing knowledge and the new knowledge; the new knowledge is organized and comprehensive; the appropriateness of the applied practice, the volume of the questioning; the preparation and appropriateness of using teaching tools as a sample; the appropriateness of using the blackboard; the appropriateness of grading students’ credit.

Along with the official statements, the local board of education and other educational associations held lectures, which helped show how important lesson study was. For example, the conference of critics for lessons in Akita prefecture in 1887, announced “after the class, discuss the lessons, exchange opinions and inquire about the problems.” The meeting of teaching practitioners in Iwate prefecture reported in 1888:

“The meeting organized by teachers started in 1886 and was held every month at different school. None of the teachers were absent, showing their love of education. “The meetings of critics for lessons in each elementary school were held on the second Sunday of the month where they analyzed the lessons. Other prefectures also held a kind of meeting or conference in each county or at each individual school.

The form of the conference or meeting was transformed from the suggestion of the lesson model to the observation of lessons. The affiliated elementary school of the Higher Normal School was the center of conducting lesson observation and gradually it promoted the form with a meeting taking place at each school in turn and other local areas or schools. This movement coincided with the time when Herbartian teaching theory was settled into the Japanese education principle at the end of 19th century. The boom of the lectures first appeared in 1867 for the spread of the Herbartian theory.

What facts were gleaned at the conference of critics for lessons or at the meeting of teaching practices? It was pointed out that following the official lists that were regulated in the school the check points was mentioned but there was hardly any serious discussion or the improvement. The principle of the school always held a complete authority. He or she criticized the members of the meeting firstly and gave a critique of the lessons at the end. This seemed to be a more formal ceremony than a meeting. Here is a quotation from one of the reports;

“There are conferences or meetings enthusiastically held at schools in various local areas with the aim of helping to improve and progress the pedagogical methodology, which was welcomed in the field of education. However, examining the facts in more detail, it is nothing more than to refer to the effects such as “going around the desks once more than usual.” It is really a poor way to observe the lessons, as a result of which teachers cannot concentrate on the lesson; some of them experience their nerve breakdown due to petty threats. Consequently, they are merely following the more formal way rather than trying to improve things.”

The conferences and meetings held all over the nation had a unique character as described above. It was proposed as model of teaching to teachers and confirmed that they should follow the model and finally it spread nationwide via these meetings. They were used as a function to install the lesson format. Since then, the conferences of critics for lessons or the meetings dealing with teaching practice have had a tendency to be little more than formal ceremonies.

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schools for the research by Ministry of Education, prefectural board of education, or municipal board of education. In any type of meetings, teachers basically go to the host school and observe the demonstration lessons, and have the study meeting later.

Besides those institutionalized study meetings conducted by schools or board of education, educational groups and private companies hold the meetings as well. There is Japan Association of Elementary Science Education and Japan Association of Secondary Science Education as examples of educational groups. The groups have branch offices throughout Japan, as in “Kanto” region (surrounding Tokyo), and each of them holds large-scale conferences where lesson study is the central concern. It is common that the participants go to the conference site (mostly at schools), observe the demonstration lessons planned under a certain research project, and attend the study meeting about the lessons.

Private companies also co-host study meetings with regional board of education as an activity of Corporate Social Responsibility (CSR). Those companies voluntarily give a positive impact on society. Sony Science Education Program for Children of Sony Education Foundation has more than fifty years of history as a publicly-offered granting program.

Usually more than 200 schools (both elementary and junior high schools) apply for the program, and the schools which are awarded for their excellent programs get grants to hold the conference to study, showing their original science education program and science class in front of 300 to 400 teachers from all across Japan. Other schools or textbook companies can also set up a booth at the conference to provide information about new materials for science education (Sony Education Foundation, 2011).

Table 2. Lesson study conference in c

Table 3. Lesson study conference in city "A"

Table 4. Lesson study

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[Holding the conference]: All participants are given the handouts of lesson plans and they all go to observe the demonstration lessons. After the lessons are finished, the study meeting is held. Some schools provide the participants with the class record to have a deeper discussion at the study meeting in the short time between the lesson and the study meeting. It is also common to give some handouts or brochures about their recent study as in "Program for Study Meeting" and "Annual Report of Study". In the study meeting, the host school explains the concept and research question of the lesson study, the educational principle, and the original suggestions. Then, the teachers who show their demonstration lessons explain what they focus on, what they attempt first, and what they reflect about their lessons. After the teachers, the participants exchange opinions and

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[Reviewing and a social gathering]: This is an opportunity to exchange opinions about not only the review of the study meeting but also a variety of topics, with no boundary between the hosts and participants. Snacks are served when it is held in the host school, but the social gathering is sometimes arranged outside school, which has been decreasing these days.

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exchanging their opinions. The participants usually make compliments on the demonstration classes or reward the teachers for their work.

Next problem is that, in the preparation, teachers try to find new and appealing materials (experiment materials) for lesson study, and do not pay much attention to the overall activities of their teaching, students' learning, the interaction between teachers and students, and the communication among students. There seems to be a strong tendency to put much emphasis on material development.

Finally, supervisors make comments or give advice at the end of the meeting, which make the whole meeting settle down peacefully. Even when their comments do not get a right point for the discussion, the teachers and participants rarely object the comments. No wonder they feel discontented with the supervisors opinions.

Conclusion

Lesson study in Japan has more than a hundred and twenty years of history, and it has contributed to develop teaching competencies of teachers, spread dominant pedagogical theories, and unifies the style of teaching. Lesson study for science has been institutionalized and added into the teachers' duties, and it encourages science teachers to develop the professional growth and share the dominant model of teaching, mainly through the preparation and the study meeting. However, the meeting today has the same problems as the one in the Meiji era when the first lesson study conference was held. More importantly, professional growth is developed through various situations such as pre-service education, in-service training, daily self-improvement, and learning from each other in collegiality. As many scholars in other countries who know about lesson study point out, it might be too early to conclude that joining lesson study conference or demonstrating lessons once or twice year cannot assure the professional development of science teachers.

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