Developing An Evaluation Framework in Lesson Study on Active Learning Methods

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1. INTRODUCTION

1.1 Lesson Study

A traditional teacher-training method in Japan called Lesson Study is composed of the following four steps: goal setting, planning, research lesson, and reflection (Lewis et al. 2006). Stigler and Hiebert’s (1999) book The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom brought Lesson Study global attention, describing findings from video recordings of Japanese, German, and American eighth-grade classes that were part of the TIMSS(Trends in International Mathematics and Science Study) 1995 survey. The book attributed the high performance of Japanese junior high school students to the skills of their teachers, suggesting that Lesson Study is an approach that provides teachers with such skills. Lewis (2016) states that Lesson Study includes many initiatives that are not part of American teaching culture, one of which is the importance of “research lessons that connect teachers’ discussions and practices.” There is a tacit understanding that classroom improvement in the United States ends when teachers receive knowledge; this is not the case with the practice-based lesson improvement system seen in the Japanese Lesson Study. Therefore, the research lesson process connects discussions about teachers’ empirical knowledge with their practice.

Much research on the Lesson Study method has reported on the nature of research lessons. Rock and Willson (2005) stated that a Lesson Study method in which university faculty members intervened in the creation of research lessons facilitated the transfer of teachers’ learning to their daily work. Lesson Study includes three types of support for teachers: social, emotional, and instructional (Laura et al. 2019), suggesting the need for support for the creation of research lessons. However, few studies have been conducted on models of Lesson Study that include expert support.
1.2 Teacher Training in Japan

The National Institute for Educational Policy Research (2014) found that although there is a high demand for teacher training in Japan, there are several obstacles to teachers’ participation in such training, one of which is the time consumed by their daily work. Japanese teachers have busy schedules because they spend more time on lesson planning and preparation, extracurricular activities, and administrative work than teachers in other OECD (Organisation for Economic Co-operation and Development) countries. This shows that teacher training in Japan needs to be more efficient in terms of time. However, little research has examined the Lesson Study model with a focus on time efficiency. Therefore, video-based training, which emphasizes time efficiency, was the focus of this study.

A previous study of pre-service teachers indicated that there was an increase in teachers’ knowledge when training was provided with clear objectives (Seidel et al. 2013). In addition, teacher training using portable devices has been shown to be more time-efficient and effective than face-to-face training, as it is easier to participate in such training (Watanabe & Akahori 2008). This suggests that the video-viewing model is effective in teacher training; however, as mentioned earlier, it is important in Lesson Study that teachers hold discussions with each other (Lewis 2016). Thus, it was deemed necessary to emphasize face-to-face discussions and provide time for face-to-face meetings. Therefore, we paid attention to the teaching methods of the flipped class.

In the flipped class method, basic materials such as explanatory lectures are given as homework before class, and the learning necessary to develop applied skills is conducted in class (Bergmann & Sams 2012). Flipped training has been reported to promote training transfer in the context of enterprise education (Nakahara et al. 2018). It has been pointed out that teachers’ attitudes and teaching methods tend to be caught up in the methods they have experienced as a reproduction of teacher culture (Kawamura 2002), and the flipped training program is expected to provide an opportunity for participants to come into contact with Active Learning methods themselves. However, the effects and challenges of flipped classroom research are unclear.

1.3 Training Evaluation

Describing the need for training evaluation, Kirkpatrick and Kirkpatrick (2006) stated: “Evaluation can tell us how to improve future programs.” The evaluation in training has four levels: reaction, learning, behavior, and results (Table 1). Kirkpatrick’s four-level model is considered to be the most commonly recognized model of training evaluation. However, some studies have identified a correlation with transfer training, which assesses whether the training is applied in practice, and Levels 3 and 4 (Alan & Lisa 2012).

Therefore, it is necessary to use Level 3 or higher for training transfer. However, few studies have evaluated Lesson Study using Kirkpatrick’s four-level model.
2. Purpose

The purpose of this study was to develop a lesson study model and an evaluation framework to support the creation of research lessons that are time efficient.

3. Method

The Lesson Study was designed based on the ADDIE model.

3.1 Survey and Determination of Training Content

To determine the subject matter of the designed Lesson Study, 42 junior and senior high school teachers and 13 teachers with administrative experience were given seven training courses: instructional methodology, on-campus branch manager, subject, student guidance method, information morality (personal information management, internet, etc.), ICT (Information and Communication Technology), and school administration. The results are shown in Table 2 and indicate a need for instructional methodology.

### Table 1. Kirkpatrick’s Four-Level Model

<table>
<thead>
<tr>
<th>Levels</th>
<th>Evaluation Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reaction</td>
<td>What were the participants’ reactions to the education?</td>
</tr>
<tr>
<td>2. Learning</td>
<td>What knowledge, skills, and attitudes were changed?</td>
</tr>
<tr>
<td>3. Behavior</td>
<td>What change in job behavior occurred due to the training program?</td>
</tr>
<tr>
<td>4. Result</td>
<td>What effect has education had on the organization and its goals?</td>
</tr>
</tbody>
</table>

Source: Kirkpatrick and Kirkpatrick (2006)

### Table 2. Results of the In-School Training Questionnaire

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Management M</th>
<th>Management SD</th>
<th>In-Service Teacher M</th>
<th>In-Service Teacher SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Instructional methodology</td>
<td>4.86</td>
<td>0.35</td>
<td>4.31</td>
<td>1.01</td>
</tr>
<tr>
<td>2 On-campus branch manager</td>
<td>3.73</td>
<td>0.62</td>
<td>3.76</td>
<td>1.17</td>
</tr>
<tr>
<td>3 Subject</td>
<td>4.33</td>
<td>0.94</td>
<td>4.48</td>
<td>0.88</td>
</tr>
<tr>
<td>4 Student guidance method</td>
<td>4.10</td>
<td>0.54</td>
<td>4.05</td>
<td>1.11</td>
</tr>
<tr>
<td>5 Information morality (personal information management, Internet, etc.)</td>
<td>4.62</td>
<td>0.62</td>
<td>4.02</td>
<td>1.28</td>
</tr>
<tr>
<td>6 ICT</td>
<td>4.00</td>
<td>0.71</td>
<td>4.26</td>
<td>1.02</td>
</tr>
<tr>
<td>7 School administration</td>
<td>3.80</td>
<td>0.75</td>
<td>3.24</td>
<td>1.34</td>
</tr>
</tbody>
</table>

In-service teacher (n = 42); management experience teacher (n = 13)

Bonwell and Eison (1991) defined active learning as a learning method that fulfills the following five criteria, as opposed to active learning, which has long been vaguely defined:

- Students are involved in more than listening.
• Less emphasis is placed on transmitting information and more on developing students’ skills.
• Students are involved in higher-order thinking (analysis, synthesis, evaluation).
• Students are engaged in activities (e.g., reading, discussing, writing).
• Greater emphasis is placed on students’ exploration of their own attitudes and values.

Although active learning was originally considered to be a teaching method in higher education, it is defined as proactive, interactive, and deep learning in Japan, and it is a teaching method that is also needed in secondary education (MEXT(Ministry of Education, Culture, Sports, Science and Technology) 2019). In addition, the participants of Lesson Study requested the addition of self-efficacy. Thus, the purpose of Lesson Study is “proactive, interactive, and deep learning and instructional design to enhance self-usefulness.”

3.2 Design of Training and Evaluation Methods

A training course was designed for the above content. As mentioned in the introduction to the background, a Lesson Study model was designed employing a flipped Lesson Study that does not put pressure on work time. In the Test-Operate-Test-Exit model, trainees first select necessary knowledge and skills in a pre-test (Test). Next, they learn only the part they did not understand in the previous test (Operate), taking a second test to decide whether they have met the criteria (Test). Upon passing, they can complete the contents (Exit). Otherwise, they return to the knowledge injection step (Operate). The evaluation framework is based on Kirkpatrick's four-levels model. The purpose of this study was to assess the extent of training transfer up to level 3. The evaluation framework is shown in Table 3, and the designed Lesson Study model is shown in Figure 1.

Table 3. Evaluation Framework

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Comparison of content and ease of learning with conventional classroom research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>Extent to which knowledge has been increased by watching videos</td>
</tr>
<tr>
<td>Behavior</td>
<td>To what extent did you apply the content of the video to your classroom practice?</td>
</tr>
<tr>
<td>Efficiency</td>
<td>The degree of improvement in the time and quality of research lesson creation compared to the conventional lesson study</td>
</tr>
</tbody>
</table>
In (1), a group training session is held, and a pre-test is given to all Lesson Study participants to select the knowledge required. In addition, the outline of the video content and the procedure for viewing the video content was communicated. Next, in (2), we ask participants to watch the selected videos and make assumptions. In (3), teachers are asked to use the video content in their lesson plans in preparation for the Research Lesson. In (4), the teachers who conduct the research lesson are evaluated (3), and those who do not conduct the research lesson will be tested on the video. From the results, we return to (2) or (3) if necessary. The students must repeat the above procedure, and when they reach the required level, they are considered to be ready for the lesson and wait until the Research Lesson. In (5), we will hold a Research Lesson and discuss the improvements in the Research Lesson at a post-meeting. Finally, (6) concludes the Lesson Study by providing comprehensive feedback and insights for development.

3.3 Development of Training Contents

We developed video contents for e-learning in inversion training. Ten videos on instructional design and three videos on self-efficacy were developed. The video content was created by referring to the video content of the remote asynchronous lecture given in the class of educational methods and technology, which is a compulsory subject in the teaching course at T university in Tokyo. Additionally, narration was added to the video. This class covers the basic knowledge of educational technology and has a heavy theoretical background. Therefore, we added a scene to introduce a specific teaching technique in the active learning video. The videos were delivered on Google Classroom so that the participating teachers could view them anywhere, at any time.
4. Implementation of Lesson Study

We conducted a developed Lesson Study with the participation of 23 teachers (one faculty member conducting the Research Lesson) in A City of Education, Mathematics Research Group. The program lasted from July to October 2020. The first workshop was held in August to confirm the teachers’ prerequisite knowledge and their ability to participate in e-learning. From there, the participating teachers engaged in e-learning until the day of the Research Lesson in October. We broadcasted a pre-recorded research lesson at a review meeting and conducted observations. Then, the participating teachers engaged in e-learning until the day of the research lesson in October. In view of the recent social situation, the research lesson was recorded in advance and replayed at a reflection meeting for observation. In the reflection meeting, the KJ method, which includes individual work with worksheets to ensure the homogeneity of perspectives, was applied to the observed lessons.

5. Data Analysis and Evaluation

The collected data are currently being analyzed according to the evaluation framework. Behavioral analysis will be conducted 1 month after the end of the Lesson Study in accordance with previous research on training. One issue is that some teachers have watched the videos, while some have not. We plan to qualitatively investigate the reasons teachers were not able to watch the videos in the flipped lesson study, according to the problems that can be seen from the quantitative data.

6. Discussion

We developed and implemented a reversible classroom study to ensure time efficiency. Additional research will be conducted to determine which factors are related to the presence or absence of video viewing, and whether the model takes into account the increasing time constraints of Japanese teachers.

Reference

Laura R. E. Stokes, Jennifer M. Suh & Timothy W. Curby (2020) Examining the nature of teacher support during different iterations and modalities of lesson study implementation. Professional Development in Education Volume 46, 2020 - Issue 1 97-111
Yuki WATANABE And Kanji AKAHORI (2008) Kyoiku Jissen Tositeno mobile Learning No Yuukousei No Kentsyou (in japanese)