THE IMPLEMENTATION OF LESSON STUDY AS A MEANS OF PROFESSIONAL DEVELOPMENT FOR PRE-SERVICE PHYSICS TEACHERS

Rahmi Putri. Z[1], Febrina Rosa Winda[2], Fadillah Rahmayani[3]

[1,2,3] *Universitas Jambi*
E-mail : [1]rahmiputri.z@unja.ac.id, [2]febrinarosawinda@unja.ac.id,
[3]fadillahrahmayani@unja.ac.id

ABSTRACT

Basically, teaching skills will develop through the many experiences that an educator has undergone. Mastery of pedagogical knowledge is part of a teacher's professionalism in teaching their students. Through this study, pre-service teachers can share knowledge and improve their teaching skills by participating in lesson study activities in the classroom. This research is a qualitative study, in which lesson study activities were carried out through the teaching performances of four model teachers, divided into four meetings. In each meeting, one model teacher conducted a lesson, and the teaching activity was then observed, evaluated, and provided with suggestions for improvement. Every student contributed to the observation process, evaluation, and provision of suggestions for improving the teaching process. From the four meetings, it was found that: (1) each model teacher had their own unique characteristics and excelled in their own way; (2) improvements were evident in each meeting for every model teacher, including in terms of delivery, use of instructional media, provision of stimulation, and the level of student participation; and (3) all students gained new knowledge and teaching skills that they can apply in their future teaching practice.

Keywords : *Lesson Study, Professional Development, Pre-Service Physics Teachers*

INTRODUCTION

A teacher must possess four competencies in educating students, namely pedagogical, professional, social, and personal competencies. Pedagogical competence refers to a teacher's ability to teach and manage knowledge so that it can be effectively delivered to students. This is also known as Pedagogical Content Knowledge (PCK). Through adequate Pedagogical Content Knowledge (PCK), teachers are able to convey the knowledge which teacher has in an appropriate manner (Lampley et al., 2018)

Pre-service teachers with lower content knowledge often feel concerned about their teaching abilities, especially when encouraging students to participate in problem-solving activities that require higher-order thinking skills. Therefore, practice opportunities are needed so that pre-service teachers can learn how to incorporate appropriate learning content into their teaching (Rozenszajn et al., 2019). This can be enhanced through collaborative learning activities such as lesson study in the classroom. Lesson study provides opportunities for teachers to verify and improve their content knowledge with the assistance of more knowledgeable others, while also increasing their confidence in teaching (Baricaua Gutierez, 2016)

Lesson study provides opportunities for pre-service teachers to reflect on what they have taught and take benefit from the observations of others (Soto Gómez et al., 2019). It improves the quality of instruction and enriches teachers' knowledge in organizing effective teaching strategies for every topic taught (Zhang & Liu, 2018). It also helps identify appropriate instructional designs for teaching problem-solving skills and developing students' independent thinking skills (Wood, 2018).

Based on these issues, lesson study was implemented in the Senior High School Physics Curriculum Analysis course for fourth-semester college students of the Physics Education Study Program. Research by (Zhou et al., 2017) explains that through lesson study, pre-service teachers can improve their teaching abilities, especially in teaching with technology. Lesson study is effective in improving pre-service teachers' competencies in designing instructional plans and teaching practices (Vitantri & Asriningsih, 2016).

The lesson study activities were conducted to assist pre-service teachers in designing lesson plans in accordance with the applicable curriculum, integrating learning content that meets students' needs, integrating technology in learning content, and applying appropriate teaching strategies and techniques. In addition, through lesson study, pre-service teachers are expected to improve their teaching skills through classroom observations of their peers' teaching practices. Lesson study activities connect pre-sevice teachers with teaching practice. Research by (Gomez et al., 2016) explains that lesson study can improve teaching practices. In addition, lesson study can strengthen classroom management skills and instructional planning among pre-service teacher students (Angelini & Álvarez, 2018). These lesson study activities were conducted in three structured stages: Plan, Do, and See (Handayani et al., 2015).

METHOD

A qualitative research method was employed to describe the real field context and to obtain an in-depth understanding of the lesson study activities that had been conducted. Data were collected from lesson study activities carried out by fourth-semester college students of the Physics Education Study Program. These data included detailed lesson plans, students' reflective journals,

and observation notes regarding teaching performance recorded by the instructor, in this case, the course lecturer.

In general, lesson study activities are conducted by groups of teachers working collaboratively. The activities involve establishing learning objectives, designing instruction, organizing strategies, and developing assessments to achieve learning goals. Since pre-service teachers have limited teaching experience, the lesson study activities were divided into three stages: **Plan** (designing instruction), **Do** (implementing the teaching activity), and **See** (reflecting on the teaching activity based on observation results).

The activities began with dividing students into four groups, with each group selecting one member who was considered the most capable of teaching to serve as the model teacher. The lecturer acted as both facilitator and mentor throughout the lesson study activities. The lesson study activities were conducted over four meetings, with one model teacher featured in each meeting. Each model teacher, together with their group members, prepared a lesson plan to serve as a guide for teaching. The model teacher from each group then taught in front of the class. After the teaching session, a discussion and evaluation were conducted, and suggestions and feedback were provided collaboratively by the pre-service teachers and the lecturer as mentor. The results of the lesson study activities from the four meetings were then organized into columns and categorized so that they could be used as learning materials and research evidence.

RESULTS AND DISCUSSIONS

The Stage 1: Plan

The stages of the lesson study activities implemented in the classroom were as follows:

1. Students were divided into four groups, with each group assigned a different topic in Physics learning.
2. Each group conducted research on the learning curriculum, determined the learning outcomes, and formulated the learning objectives.
3. Each group developed a Deep Learning Lesson Plan.

The preparation of the Deep Learning Lesson Plan followed the following structure:

First Section : The first section began with:

a. Learning Topic Title
b. Educational Unit
c. Phase
d. Time Allocation
e. Developer/Author

Second Section : The second section continued with:

a. Identification: Graduate Profile Dimensions
b. Learning Design, consisting of learning objectives, pedagogical practices, learning partnerships, learning environment, and digital utilization.

Third Section : The third section focused on the Learning Steps.

In the learning steps, teachers divided the instruction into several meetings according to the needs of the learning topic. In planning the activities, teachers incorporated the values of mindfulness, meaningful learning, and enjoyable learning. The learning stages could be divided into the activities of Understanding, Applying, and Reflecting.

Fourth Section : Teachers developed the assessment component.

The assessment was used to evaluate students' learning after participating in the instructional activities and consisted of formative assessment and summative assessment.

4. From each group, one student was selected as the model teacher. The model teacher was then given the opportunity to teach according to the prepared Deep Learning Lesson Plan for one meeting. The teaching performance was observed jointly by peers and the course lecturer.
5. Reflection activities consisted of providing suggestions and feedback, followed by a collaborative evaluation.

Stage 2: Do

Based on the teaching activities conducted by the model teachers, the following findings were obtained:

Table 1. Teaching Activities Conducted by Model Teachers

Model Teacher	Teaching Material	Model Teacher Performance	Suggestions and Feedback
1	**Motion**	The observations of first Model Teacher were as follows: ✓ The model teacher only utilized the Smart TV as an electronic whiteboard, whereas the Smart TV could have been used more extensively, such as for PowerPoint presentations, displaying images/videos, or using PhET simulations to support learning. ✓ During the lesson, the teacher explained the material too quickly. This was indicated by the absence of an apperception activity at the beginning of the lesson to stimulate and motivate students to learn. ✓ At the end of the lesson, the teacher hurriedly concluded the session by summarizing the lesson independently.	Based on the implementation by the model teacher, the following suggestions and feedback were provided for improving classroom teaching activities on motion: ✓ Teachers need to maximize the use of technology, especially when such facilities are already available in the classroom. ✓ Teachers should provide an initial apperception activity for students, which can be delivered through stories, images, short videos, or simple simulations/demonstrations in front of the class. ✓ Through the effective use of technology and initial apperception activities, learning is expected to be mindful, meaningful, and enjoyable. ✓ Before ending the lesson, teachers should conduct a reflection activity with students to assess their understanding and jointly summarize the learning activities.

2	**Projectile Motion**	The observations of Second Model Teacher were as follows: ✓ The model teacher demonstrated good classroom management. ✓ The teacher allocated time for apperception activities to stimulate students' focus and motivate them to learn enthusiastically. ✓ The teacher effectively utilized instructional media, including PowerPoint presentations and PhET simulations to support explanations. ✓ The teacher responded well to students' questions. ✓ The teacher provided appreciation and rewards to students who actively participated during the lesson.	Based on the implementation by the model teacher, the following suggestions and feedback were provided for improving classroom teaching activities on Projectile Motion: ✓ Although the explanations were already good, teachers should know when to slow down and speed up their explanations to accommodate differences in students' levels of understanding. ✓ Teachers should not rush through simulations conducted using PhET because the platform allows deeper explanations through direct examples and provides students with more opportunities to learn through visual representations. ✓ Before using PhET or other instructional media, teachers should thoroughly study and practice using the media beforehand to understand in detail what will be presented in class.
3	**Newton's Laws**	The observations of Third Model Teacher were as follows: ✓ The teacher explained the material well. ✓ The teacher presented too much material in a single meeting, which caused students to become confused about the key concepts that needed to be learned during that lesson. ✓ The teacher used PowerPoint and PhET	Based on the implementation by the model teacher, the following suggestions and feedback were provided for improving classroom teaching activities on Newton's Laws: ✓ During instruction, teachers should limit the scope of material covered so that the content in each meeting is not overly dense. ✓ Less dense material allows students to gain deeper understanding through the development of thinking skills, application through PhET

		simulations to support instruction. ✓ The PowerPoint explanations were still focused primarily on textual explanations without being accompanied by supporting images or examples.	simulations, and problem-solving through practice exercises. ✓ Teachers should effectively utilize instructional media so that there are no disruptions or distractions caused by the media being used.
4	**Fluids**	The observations of fourth Model Teacher were as follows: ✓ The teacher managed the classroom effectively. ✓ The teacher provided apperception activities to motivate and stimulate students' learning. ✓ The teacher brought teaching aids to support explanations. ✓ The teacher involved students in the learning process by providing opportunities to ask questions. ✓ The teacher utilized Bamboozle Quiz for evaluation purposes.	Based on the implementation by the model teacher, the following suggestions and feedback were provided for improving classroom teaching activities on Fluids: ✓ Teachers need to have a thorough understanding of the concepts within the learning topic, including the teaching aids that will be demonstrated in class. ✓ Teachers should connect explanations with examples from the surrounding environment to make learning more engaging for students. ✓ Evaluations should be designed in accordance with the learning objectives so that students' abilities can be measured effectively.

Based on the table above, it can be seen that: (1) each teacher had their own unique characteristics and excelled in their own way; (2) improvements were evident in each meeting for every model teacher, including in terms of instructional delivery, use of learning media, and the provision of apperception activities to stimulate and increase student participation; and (3) all pre-service teacher students gained new knowledge and teaching skills through the lesson study activities that they can apply in their future teaching practice.

Stage 3: See

Based on the activities that were carried out, several reflections from the lesson study activities were obtained as follows:

1. Lesson study improves pre-service teachers' science content knowledge. Research by (Hourigan & Leavy, 2019) explains that lesson study activities can increase pre-service teachers' awareness of the importance of deep content knowledge for implementing student-

centered learning. In addition, through lesson study, teachers are given the opportunity to collaboratively develop lesson plans based on shared discussions and reflections (Fujii, 2016).
2. Providing opportunities for pre-service teachers to develop professionalism in teaching through direct practice. Research by (Soto Gómez et al., 2019) explains that lesson study is highly beneficial in reconstructing teaching practices and strengthening teacher professionalism.
3. Improving knowledge and utilization of instructional strategies and learning media. Research by (Junaid & Baharuddin, 2020) explains that lesson study can improve teachers' pedagogical competence, as reflected in their ability to design learning activities that are active, creative, effective, innovative, and enjoyable.
4. Increasing pre-service teachers' confidence when teaching in real classroom settings. This is consistent with the findings of (Handayani et al., 2015), who stated that lesson study activities designed collaboratively within groups and guided by supervising lecturers can reduce anxiety and increase students' confidence in teaching.
5. Providing opportunities for students to share experiences and teaching knowledge. Research by (Groth et al., 2020) explains that lesson study activities can connect teachers who already possess strong teaching skills with those who still feel less confident in their teaching practice. Through lesson study, teachers can assist one another in reflecting on their teaching activities, including lesson planning, teaching materials, instructional media, and teaching techniques.

CONCLUSIONS

Lesson study link pre-service teachers with teaching practice. Through lesson study activities, pre-service teachers are given opportunities to increase their teaching experience, improve their skills in designing lesson plans, and enhance their teaching practices. From Do stage, it was found that: (1) each teacher had their own unique characteristics and excelled in their own way; (2) improvements were evident in each meeting for every model teacher in terms of instructional delivery, use of learning media, provision of stimulation, and the level of student participation; and (3) all students gained new knowledge and teaching skills that they can apply in their future teaching practice.

Several benefits for pre-service teachers were identified from this activity: (1) lesson study improves pre-service teachers' science content knowledge; (2) it provides opportunities for pre-service teachers to develop professionalism in teaching through direct practice; (3) it improves knowledge and utilization of instructional strategies and learning media; (4) it increases pre-service teachers' confidence when teaching in real classroom settings; and (5) it provides opportunities for students to share experiences and teaching knowledge.

The limitation of this study lies in the lesson study participants. Lesson study activities conducted with peers acting as students will naturally produce different results from lesson study activities conducted in schools with actual students.

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