

Research Article

Research in the eyes of the students: Bottom-up pedagogical teaching using lesson study

Alvin Odon Insorio¹, R. M. Jasareno De Castro² and Cherrie Coronado Manaloto³

¹College of Graduate Studies and Teacher Education Research-Philippine Normal University, Philippines (ORCID: [0000-0002-4746-6225](https://orcid.org/0000-0002-4746-6225))

²College of Graduate Studies and Teacher Education Research-Philippine Normal University, Philippines

³San Pedro Relocation Center National High School, Philippines

Teaching research suited to the student's level of understanding was one of the problems that arose since the implementation of senior high school programs. Teachers felt the students had difficulty understanding the research concepts, processes, and principles. A lesson study was conducted to determine how it helped the research teachers deliver the lessons in Inquiries, Investigations, and Immersion (3I's) subject. Moreover, it also aimed to determine how the students learned their lessons. The study was practical action research of three research teachers who followed the principles of lesson study for twelve research lessons that lasted for two months. One section from Grade 12 students was selected purposely based on the diagnostic test results in 3I's and examinations in Practical Research II. Multiple data collection methods were employed, like a semi-structured interview, classroom observation, open-ended questionnaires, and teachers' journals as rich data sources. The study revealed that lesson study could enhance the teaching of the research subject. Although there was a positive side to teaching using this approach, some suggestions still arose and were analyzed in this study.

Keywords: Bottom-up pedagogy, Lesson study, Student difficulties

1. Introduction

Teachers' collaboration in delivering the lesson is an excellent endeavor because the more minds involved, the better the outcomes may come. In fact, in some public schools or divisions in the Department of Education [DepEd] in the Philippines, there were fewer instances where teachers' collaboration from bottom-up teacher professional development (PD) programs were seen. These were observed wherein a group of teachers studied content and pedagogies collaboratively to plan lessons and do action research (DepEd Order 35, 2016). The said collaboration was a great move to enhance the quality of teaching wherein the classroom teachers work together to make the curriculum more meaningful and suited to the learning needs of their students. The teaching forces of DepEd continually inspire colleagues to conduct action research to improve teaching practices, which may produce quality education for their students.

One way of practicing teachers' collaboration to deliver the curriculum effectively is through lesson study. It allows the teachers to reflect on their teaching methods and strategies with colleagues, which is high-quality professional development since it has the elements of effective professional learning (Bayram & Bıkmaz, 2021). The process of lesson study develops shared governance where all voices are critical when thinking about teaching and learning (Lee & Madden, 2019). It also facilitates a deep reflection of the teachers' practices toward attaining shared learning goals. The Division of Naga City used lesson study as a professional growth strategy to enrich mathematics teaching and learning (DM No. 165, 2018). However, it is not yet used in teaching research subjects.

Address of Corresponding Author

Alvin Odon Insorio, Blk 10 Lot 16 Phase 3 Metroville Complex San Francisco, Biñan, Laguna.

✉ alvininsorio0413@gmail.com

How to cite: Insorio, A. O., De Castro, R. M. J., & Manaloto, C. C. (2022). Research in the eyes of the students: Bottom-up pedagogical teaching using lesson study. *International Journal of Didactical Studies*, 3(2), 12050. <https://doi.org/10.33902/IJODS.202212050>

On the other hand, the Inquiries, Investigations, and Immersion (3I's) is the last research subject for Grade 12 students for senior high school in the Philippines regardless of track and strand. It belongs to applied subjects where students are expected to conduct and defend group research by undertaking a rigorous process to manifest their acquired research skills from Practical Research 1 and 2. The subject is set to unfold the students' problem-solving and critical thinking skills through quantitative or qualitative research relative to their interests and preferred specialization. However, despite all research teachers' efforts to deliver the lessons effectively, students were still incapable of researching in the local context. They were afraid to start research work and not confident enough to deal with a research problem. Many students cannot successfully conduct and write research work (Sumaila et al., 2020). To remedy the above scenario, research teachers found ways to teach or reteach the concepts, principles, and research processes. However, the challenge for the teachers in delivering the lesson appropriately suited to the student's level of understanding is highly observed. Developing the research skills of senior high school students is an excellent task for a research teacher that requires collaboration among teachers.

Teaching subjects like Practical Research 1, 2, and 3I's required expertise and mastery of the research concepts, principles, ethics, and rules to conduct research properly. An excellent challenge for senior high school teachers to deliver the research lessons effectively and meaningfully in the eyes of their students. There is a scarcity of pedagogy teaching research methods that cause little guidance for research teachers (Wagner et al., 2011). Therefore, teaching strategies are modified based on students' learning needs and interests. Nevertheless, many students still found research subjects the most complex subjects in senior high school. Considering the results of the mean per section (MPS) in the school's first and second grading period for the school year 2019-2020 in Practical Research 2, only Science, Technology, Engineering, and Mathematics (STEM) students were able to reach the target.

Similarly, all students under the Technical-Vocational track and Humanities and Social Sciences (HUMSS) performed lower than STEM based on the diagnostic test result for the third grading period in 3I's. The research teachers decided to conduct action research to address the problem of why those students were struggling in the said subject. For this reason, this study is conducted.

The study is carried on in a public high school that offers both Junior and Senior High School [SHS] programs committed to delivering basic education services to the town's youth and the nearby municipalities as a technical-vocational school. The SHS under the TVL track has three strands such as Home Economics [HE], Industrial Arts [IA], and Information and Communication Technology [ICT]. In contrast, the academic track has two strands: Science, Technology, Engineering, and Mathematics [STEM] and Humanities and Social Sciences [HUMSS]. As of June 1, 2019, the school has 5 840 students, of which 760 are Grade 12 students with TVL and academic tracks. There are nine sections under the TVL track and four under the academic track, with an average of 55 students per class. In this study, a lesson study approach is implemented with research teachers in Grade 12 to address the challenges in teaching 3I's subject as the final research subject of the students in basic education. Three research teachers worked together, met once a week, and regularly communicated to polish the lessons and instructional materials needed to be taught in 3I's.

1.1. Literature Review

The lesson study [LS] approach is a way of PD practiced by three to six teachers. Teachers plan collaboratively in the lesson study process and then teach and observe the cooperatively developed lesson (Lee & Madden, 2019). It originated in Japan and spread widely to other countries in past years (Lewis & Lee, 2017). Usually, it lasts weeks or months as teachers come together to discuss the classroom problem, construct a lesson correctly, and observe. In contrast, one teacher is teaching and meets again to discuss student learning by examining student outcomes (Elipane, 2011). During the meetings, teachers actively define the classroom problem, discuss different teaching interventions, and collaborate on how those interventions suit the student's learning needs. As a result of the brainstorming, teachers construct a lesson that results from the shared wisdom and experiences of the teachers to reach the set learning goals.

LS made a significant contribution to the teacher's professional development as it helped them to become reflective thinkers (Bayram & Bıkmaz, 2021). It implies that LS allows the teachers to think and rethink their practices to deliver the lesson effectively. On the other hand, Bayram and Bıkmaz (2021) added the implications of LS for teacher's PD as follows: (1) enhancing pedagogical content knowledge; (2) becoming more reflective as a teacher; (3) encouraging teacher research; and (4) building teacher collaboration and collegiality. However, the main reason for doing LS is not to produce the best lesson. The lesson serves as a vehicle toward the shared learning objectives of improving the teaching-learning process (Elipane, 2011).

Through LS, teachers will work collaboratively to reach the shared goals set ahead, which they think are necessary to develop competencies for their students. However, less theoretical work explains how teachers learn in the LS context and how LS contributes to and supports teacher learning (Dudley 2015; Elliott 2012)

Roberts et al. (2017) found that preparation is vital in conducting LS. The preservice teachers should use critical content knowledge and establish lesson study teams and tools. On the other hand, Elipane (2011) made a study about incorporating a lesson study in preservice mathematics teacher education in Japan. He identified the skills, competencies, and habits of mind increased through LS, such as valuing powerful recourse for classroom teaching, using the classroom and school context as an avenue of inquiry, reflecting critically, and gorging the spirit of collaboration. In Brunei Darussalam, Leong et al. (2016) investigated the use of LS to enhance a meaningful understanding of Grade 9 students on the topic of pressure. They concluded that LS enhanced the students' meaningful understanding of pressure, wherein students could read a manometer to determine gas pressure. On the other side, in Nigeria, Lawal et al. (2019) conducted a quasi-experimental study on the effect of lesson study on the mathematics achievement of senior secondary school students. They found that LS enhances students' mathematics achievement better than one teacher's lecture method.

In South Africa, Ogegbo et al. (2019) explored teachers' experiences in teaching electricity and magnetism through LS. They revealed that collaboration through LS improved teachers' self-efficacy, classroom management, professional teaching strategies, writing a lesson plan, networking skills, and positive attitudes in teaching. Meanwhile, in Turkey, Bütün (2019) made a case study of eleven mathematics teachers in middle school about the challenges and advantages of implementing LS. He found that LS enabled teachers to share experiences and livelier to do an in-depth examination of the curriculum and resources concerning instructional materials. However, challenges arose like a time problem, a teacher's ego and fear of being observed by colleagues, an adjustment of students in research lessons, curriculum intensity, and the pressure brought by the central exam. Kanellopoulou and Darra (2019) reviewed the effectiveness of implementing the LS through 28 empirical types of research over the past decades (2008-2018). Their meta-analysis found that cooperation, reflection, and professional development were advantageous to LS implementation. However, the time needed to prepare a lesson, the tensions, and the stresses resulting from the monitoring of the teaching were the main difficulties experienced by the participants.

LS has been studied in different parts of the world and used as PD in teaching mathematics and science. It is unquestionable to say that the research on LS in the Philippines is in its infancy in the research subject. Local research on LS focused on Mathematics and Science was started by the University of the Philippines – Los Baños (Cabalo, 2017). However, most studies on LS abroad focused on identifying the compatible or incompatible foci of LS in different countries with their educational system (Lewis et al., 2006; Khokhotva, 2018; Shuilleabhain, 2018). Therefore, it was time to adopt the lesson study approach in teaching research subjects for the first time in Senior High School since many students struggled with this subject.

On the other hand, pedagogical research teaching requires the teacher's expertise and experience. Bottom-up pedagogy connects the students to research, gives immersive research experiences, and promotes reflexivity (Kilburn et al., 2014). Pedagogical approaches are used to make the teaching research meaningful in the eyes of the students, such as connecting the students to research, allowing the students to experience the conduct of research, and various ways of engaging the students in research problems. Hence, active learning, facilitating multiple methodological perspectives, working with data, and learning by doing are standard pedagogical techniques in teaching research methods (Lewthwaite & Nind, 2016).

The paucity of studies in the pedagogical culture of teaching research methods exists across disciplines (Earley, 2014). Research teachers tend to use pedagogies of reliance on peers, knowing the methods, and trial-and-error rather than pedagogical practice informed by research or theory like LS. They are based on pedagogy based on what they think works without any support from the theoretical perspectives of teaching and learning. Hence, LS links the theory into practice, improving teaching practices that develop teachers into better learning facilitators (Huang & Shimizu, 2016). So, it is very timely to conduct LS that promotes bottom-up pedagogies in teaching research methods informed by theory and related studies that will yield better learning outcomes.

1.2. Theoretical and Conceptual Frameworks

This study was anchored on the situated learning theory of Jean Lave & Etienne Wenger, as cited in Kakavelakis and Edwards (2011). They proposed that learning is a social process wherein knowledge is co-constructed individually. In LS, learning occurs when teachers collaborate on lesson development for their actual classroom teaching. Both teachers and students learn better if the lessons are planned by a group of

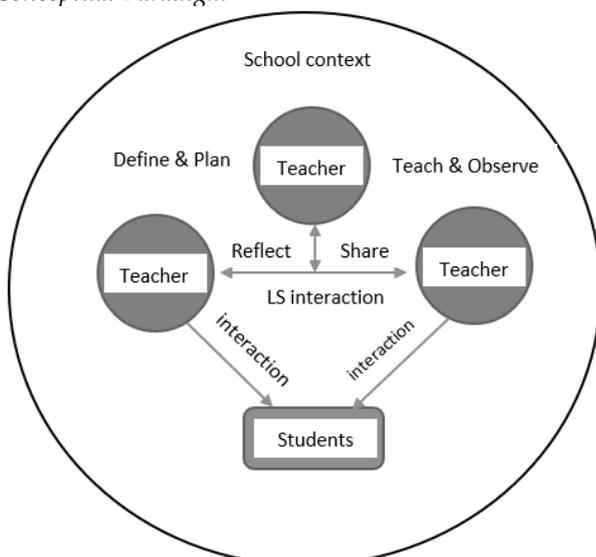
teachers thinking of the same objectives. LS is misinterpreted as focusing primarily on lesson planning. Moreover, it consists of four cyclical activity stages: study, plan, teach, and reflect (Lewis et al., 2019).

In the Philippines, Ronda (2013) investigated teacher learning through LS and concluded that LS provides a phenomenon for teachers to expound their stock of knowledge for teaching the subject matter in collaboration with their co-teachers. However, she argued that few schools and teachers know the LS and how to execute it properly. Another study on LS conducted by de-Hitta-Catalan and Treyes (2013) about diffusion and osmosis revealed that LS is a powerful tool in teaching and learning. On the other hand, Xu and Pedder (2014) listed general difficulties in implementing LS by examining 67 scientific studies conducted in 18 different countries as follows (1) finding time to carry out intensive studies through LS; (2) an extra workload for teachers for the implementation of LS; (3) insufficient support from school administration to guarantee the sustainability of LS practices; (4) the practice of collaboration among teachers was not substantiated; and (5) cost of implementation. The stated difficulties above resulted from meta-analysis, which may hinder the implementation of LS. These were the challenges that need to be faced by researchers who want to conduct LS.

In this study, the teachers used a lesson study approach to deliver twelve research lessons in 3I's. This intervention helped the teachers plan, execute, and revise the lessons. The teaching experiences were considered, and the benefits and challenges they encountered during the separate phases of lesson study through journals and minutes of the weekly meeting. Also, students-observers who were non-TVL students who undergo school-based immersion were one of the study's participants. Meanwhile, students' learning, engagement, and behavior as observed by themselves, and student-observers were considered as evidence of lesson study benefits on the students' part as the study's end goal.

The figure below shows the processes of the lesson study used in this study. The defining process involves identifying the classroom problem in teaching 3I's subject by sharing experiences and analyzing test results. At the same time, planning was the brainstorming of the teachers in crafting research lessons, from planning the lesson to drafting the lesson plan and instructional materials. The lesson content, strategies, and teaching methods were selected in this phase. Twelve lessons were made by following DepEd's daily lesson plan format and considering the curriculum guide. In the teaching and observing phase, one teacher taught the lessons while the others observed the students' engagement, behavior, and learning process using predetermined instruments. Post-conferences were done right after the observation. The teacher was asked to make a journal reflecting on his teaching and lesson learned that day. At the same time, students who failed in formative assessment underwent interviews with student teachers to elicit suggestions on how to improve the lesson. In reflecting and sharing, a weekly meeting was conducted to discuss the lesson learned by the teachers with students' responses from the interview and how the next lesson would be taught appropriately suited to the student's level of understanding. Revisions of lesson plans and instructional materials were done right after the teaching demonstration based on observation, reflection, and students' suggestions.

Figure 1
Conceptual Paradigm



1.3. The Aim

This study aimed to determine how the students appraise their research teachers in delivering the lessons using lesson study. Specifically, it searched to answer the following questions: 1. How do the students perceive their research lessons through lesson study? 2. What are the student observers' perspectives while research classes are going on? 3. What is the effect of lesson study on the mastery of the lessons?

2. Method

2.1. Research Design

The study used practical action research, which considered the experiences of both teachers and students, students' engagement in a lesson study, and performance was described qualitatively. Practical action research is a method to address a specific classroom, school, or community problem (Fraenkel & Wallen, 2010). The problem of how teaching research subjects suited the student's level of understanding has arisen since the senior high school in the Philippines was implemented. This problem called for an intervention that led to positive learning outcomes, a lesson study. This method helped teachers face the challenges in a classroom setting to deliver the research lessons. This intervention appropriately addressed the problem experienced by each teacher in delivering the research lessons through collaboration.

2.2. Participants

The study used one section of Grade 12 Technical-Vocational Livelihood (TVL) students, composed of 35 students, as study participants because these groups usually show poor academic performance in research subjects. It was because their interest does not adhere to the academic aspect but skills development. Moreover, purposive sampling was employed to determine the Grade 12 section as the participants based on the mean per section (MPS) in Practical Research 2 first semester of the school year 2019-2020 and the diagnostic test in 3I's. Therefore, one section under TVL was considered a participant. Five non-TVL students undertaking school-based work immersion were also considered participants in this study.

2.3. Instruments

The data were gathered through observation, semi-structured interviews, surveys, and journals. Research instruments such as interview guide questions, observation guides, reflection sheets, and open-ended questionnaires were formulated by three teachers relevant to the research objectives to elicit necessary data. Three head teachers validated the said instruments to establish content validity. Hence, suggestions were strictly followed for the revision and approval to use. Similarly, research lessons were constructed collaboratively through meetings, including student activities. Below is an example of an LS planning matrix formulated in weekly meetings.

Table 1

Example of a Lesson Study Planning Matrix

<i>Research Lesson</i>	<i>Teacher Action</i>	<i>Student Action</i>	<i>Evaluation</i>
IMRD format	Tell the students to brainstorm about the different parts of the research paper they learned for Practical Research 1 and 2	Students will read the sample research article and identify the parts of a research paper under IMRD format.	Paper-pencil test

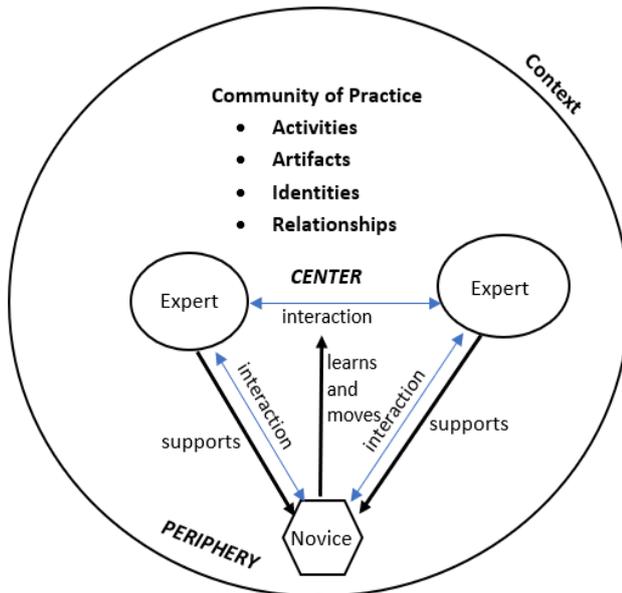
The table above tells how the research lesson was crafted and implemented. First, the identification of the lesson was based on the curriculum guide. Next, brainstorming among the three research teachers was made to decide the possible teacher and students' activity, including the assessment. Finally, the lesson plan was crafted following the DepEd format and a PowerPoint presentation for instructional materials.

2.4. Data Collection Procedure

The processes of the lesson study based on the situated learning theory used in this study are shown below. The community of practices was studied collaboratively by the three teachers by observing classes and analyzing learning outcomes such as learning interactions, activities, assessment results, outputs, and reflections in the classroom context. Three research teachers act as experts and regularly interact with LS processes. The teachers produced twelve research lessons as the product of intellectual interaction that aims to bring quality delivery of instruction. The teachers secured that classroom interaction became more evident

during the teaching and learning process. The classroom context served as the learning environment for the students (novice) wherein one teacher taught while the two teachers with student-teachers were observing and taking notes. Hence, the results of the formative assessment were considered evidence of learning and the basis of choosing students' interviews to refine each research lesson. Also, through interaction, the teachers support the students to move from the community peripheral to the center when they participate actively and gain expertise (Lave & Wenger, 1991 as cited in Catalano, 2015).

Figure 2
Operational Framework



Each research lesson was crafted based on the curriculum guide with 80 minutes because the subject covers two daily periods for two months with 100 minutes per day. They used the scheme of 3 day-lessons and 2-day flexible learning activities where the students were free to conduct or draft their research work with little guidance from teachers. The 3-day lessons served as the time for the teaching and observing phase, while the 2-day lessons were left for the students to work independently to work at their own pace in doing their research paper. The remaining 20 minutes were used for the teacher's reflections and the students' interviews. Moreover, pilot testing of the lesson study was conducted on Grade 12 non-participants students for two weeks. Data collected from observations, interviews, and journals were considered in revising the research lessons.

Teachers found ways to increase the students' passion and interest in learning research through lesson study. Three research teachers met weekly to actively discuss the problem in teaching the subject 3I's in the classroom, collaboratively developing a lesson plan and reflecting on the teaching practices. Regular communication through chat on weekends was done to discuss teaching strategies, methods, and assessments in research lessons.

2.5. Ethical Considerations

The researchers asked permission from the school heads to conduct the study by writing a formal letter noted by head teachers. Consent for the parents and assent for the students were secured before the start of the study. The researchers assured the confidentiality of the identity and information about the students. In addition, classroom observations were conducted to see the actual teaching and learning process. At the same time, teachers' daily reflections and the result of the periodical examination were also considered through the analysis as supporting documents. All documents and results were stored on the researchers' computer for three years, and then all were deleted. Hence, pseudonyms were used to replace the name of the participants as part of confidentiality.

2.6. Data Analysis

Qualitative data from observation, interview, and reflection were analyzed through a thematic analysis where the transcripts were written into papers, and related codes were identified. Thematic analysis was utilized to formulate categories into themes derived from codes (Guest et al., 2011). Thematic analysis

reduces qualitative data to identify patterns of experience to describe the data as themes (Given, 2008). Researchers read and reread the transcript and highlighted the important words to see the codes. The codes were collected to form themes. After the data analysis, member checking was considered by consulting the participants about the accuracy and completeness of their ideas included in this study. Suggestions from the participants were also considered to make this study more comprehensible. Percentages were measured to support the qualitative findings of this study.

3. Results

The students' perception of LS can be summarized using four points. This section focuses on each of these points.

The students' understanding varies from their perspective. The students can understand the lessons in 3I's by considering the student-factor and teacher-factor. Based on one observer teacher's interview, some students wanted the lesson and requested the teacher to make lively lessons. They were disinterested in the lesson and distracted by their devices. As the teachers observed, the students were using cell phones during class. They requested the teacher to confiscate those devices from the students for a brief time during the class. One student requested the teacher to be strict in using the devices to pay attention and become interested. Some students were sleeping in class. Fortunately, a more significant percentage of the students interested in the teacher kept listening to him. There were lessons in which students were interested, but not all lessons. If the students were interested, they were quiet in the class. However, the teacher was still the leading player in the lesson study. The students observed the attitude of the teacher, then his content knowledge. They recommended the teacher to give unexpected seat works, be on time, and create non-stress lessons. They also encountered some issues regarding instructional time. There were some sessions where the teacher came late to class; hence, they requested the teacher not to rush the lesson.

The students knew that the teacher was doing his best by giving consideration. That was relating the lesson to the situation of the students. One student said that he observed that the teacher was very patient in transferring knowledge to students. The students identified that if the teacher was knowledgeable, then he/she executed clear teaching, and he/she maximized the learning materials that he/she had. The student partly understood the lesson due to being sleepy, late, or requesting more examples. The class was noisy if they were not interested in the lesson. Some students were not listening and kept talking with each other. Some students were late for class, and the discussion was interrupted. One of the interviewees suggested that the teacher should be strict with latecomers. Another interviewee said she could not understand the lesson because it was given at a single pace instead of self-paced. They forgot the previous lesson and were not listening and focusing on learning the topic. They have many things to do and forget to listen to their teachers. The students forgot everything about their past lessons. They failed to know the terms. The students become disinterested in the lesson if the teacher does his lesson at a fast pace. Some students were not listening; they were having their own business.

The teacher-observers gave assessments and individual recitations. As the class went on, the students answered in chorus; the teacher failed to identify the active student in the class. The teacher should roam around the room, teach correctly, and lessen the time for storytelling so that the teacher can finish the lesson on time. The students were asked to observe the lesson's time limit and start the class with an energizer, especially for the afternoon class. The student answered in the open-ended question that the teacher should encourage the students toward his/her studies through a home visit and let his/her students understand the lesson. The students can understand the lesson through the teacher's appraisal of the high score and giving incentives. Several students said that the teacher was good at teaching and not dull. For the student factor, the students read and listen to the teacher.

The students have some recommendations for lesson study. The students requested that the team for more motivation for the students. The students also requested the teacher to do their best to change their attitude. The students also have recommendations for the change in preparation, execution, assessment, and classroom discipline. For preparation, the teacher must focus on the student's activities. The teacher may add some activities for the students not to be bored in class. Do some activities for the student not be bored and sleepy.

The teacher and students are the leading players in conducting lesson study. The teacher's attitude, knowledge, and learning materials were excellent factors in learning using lesson study. The teacher was doing his best by giving consideration. The teacher related the lesson to the student's lives. They knew the teacher was

knowledgeable because he gave clear teaching and could organize his teaching ideas. One student said the teacher was very patient in transferring knowledge to students.

Moreover, learning from the lesson study can be applied in other subjects and develop critical thinking. The students believed that lesson study helps them understand the lesson related to a topic, and their learning could be applied to other subjects. A lesson study can develop critical thinking (Hervas, 2021). The students applied it, making their outputs. Hence, the topics in 3Is can help them understand other subjects.

On the other hand, the student-observer perceived the research lessons based on what they observed during the classes. The student-observer said that LS gave them experience in their future job. They can foresee it and become aware of the situations inside the classroom. It sums up all the things they need to do when they enter the world of the teaching profession. The observations that they made produced several suggestions for LS. It serves as a revelation in students' attitudes. Sometimes, the students made fun of the subject, and the teacher encountered uncontrolled events that they considered challenging. During the meetings, student observers were shy and afraid with their comments to the research teachers, but they were curious about the things that the teachers were talking about, and they knew that it was crucial. Those student observers were now taking up education as a course in college. LS strengthened their dream of being a teacher and helped them pursue the course. Of course, other factors affect their choice, such as their role while playing during their younger age and teacher influences them from elementary.

One research teacher said that the student-observers suggested the activity of instance in conceptual framework discussion should be created in the classroom. She also added that TVL students were not serious about taking 3I's subject. In this connection, the research teacher should be strict in TVL classes. The teacher also suggested not to do groupings in the class instead of using individual activities. However, LS made it realize for the student-observer that students were not serious about the subject. In individual activities, the teacher can focus on the students, and he can respond appropriately to the output of the students.

Table 2 shows the effect of LS on the student's mastery level in twelve research lessons as a result of formative assessment after the teaching and learning process. Formative assessments were used to measure the acquired competencies of the students after the teaching and observing phase of LS. Those students who failed to pass the formative assessment underwent interviews with the student observers to elicit reasons and suggestions to improve the teaching of the research lesson. Based on the Table 2, the writing problem, topic, and title is the research lesson with the highest number of students who failed to get the mastery level followed by writing a review of related literature. However, all participants obtained a mastery level for the research lesson on scope and delimitation, followed by the significance of the study and the definition of terms. An average of 12.67% of students did not reach mastery. It implies that LS provides a meaningful understanding of the research lesson, similar to the findings of Leong et al. (2016).

Table 2

LS Lessons and Percentage of the Student who Obtained Less than 75% Mastery of the Lesson

<i>LS Lessons</i>	<i>% of Students</i>
IMRD format	10%
Research Problem, Topic, and Title	39%
Writing an Introduction to a Research Paper	11%
Scope and Delimitation, Significance of the Study, Definition of Terms	0%
Writing Review of Related Literature	29%
Review of Related Studies and Synthesis	14%
Research Methods	20%
Data Collection Methods and Ethics in Research	6%
Data Presentation and Analysis of Quantitative Data	12%
Data Presentation and Analysis of Qualitative Data	5%
Conceptual Framework of Qualitative Research	4%
Writing Summary of Findings, Conclusions, and Recommendations	2%
Average	12.67%

The findings are similar to those of Slingerland et al. (2021), who considered the students who obtained 75% slightest understanding of the lesson based on the formative assessment. It also reveals a gradual decrease in the number of students as time moves on due to the difficulties addressed through meetings and constant communication of the teachers, which was a good indicator of LS. According to Slingerland et al. (2021), LS is designed not to have a perfect lesson. However, it is used to discuss the problematic aspect of

teaching through the team, reducing professional isolation. In this connection, the researchers planned for information dissemination in line with this paper. It enabled the teachers to tap ideas and share knowledge from colleagues.

4. Discussion

The study aimed to see how the students make sense of the research lessons through LS. Various students' perceptions have arrived on the conduct of lesson study. Students see that the teachers are doing their best to deliver the research lessons despite being distracted by the devices at hand and losing interest. Also, student observers notice that the teacher tolerates the students' attitudes even though some are disengaged in classroom discussions. However, LS develops students' mastery of the lesson to some extent. Students perceived the research lesson as relevant to their learning needs. Hence, student observers suggested having an energizer at the start of the lesson, throwing open-ended questions that encourage the students to brainstorm, and giving incentives or appraisals to motivate the students.

Students have recommendations to make the LS meaningful, like changing the execution, assessment, and classroom discipline to sustain the learning passion and interest. Hence, the teacher must add activities that capture the student's interests, and learning needs to make the class lively. However, the teacher is knowledgeable and passionate about transferring knowledge to the students, very considerate in understanding the students' situation and contextualizing the lesson. Through LS, students believe they can understand the research lesson and integrate their learning with other subjects that develop their critical thinking. Critical thinking is developed by LS (Hervas, 2021). Hence, LS allows the teacher to deliver research lessons that open the minds of the students to the relevance of their lessons to practical lives.

On the teacher's side using situated learning theory, LS allows collaboration in planning, executing, and evaluating teaching practices. Through collaboration, teachers improve teaching strategies, writing a lesson plan, classroom management, and attitude in teaching (Ogegbo et al., 2019). Teachers have time to share their experiences and reflect on their practices to arrive at better education delivery. LS allows teachers to cooperate, reflect, and develop professionally (Kanellopoulou & Darra, 2019). Both teachers and students learn better in collaborative lesson implementation. LS helps the teachers become reflective thinkers of their practices (Bayram & Bıkmaz, 2021), allowing them to see multiple perspectives on delivering the lessons. Also, the teacher's pedagogical knowledge is enhanced in the conduct of LS because of working collaboratively with others. Hence, the interaction of teacher and students in the community of practice provides the students to construct knowledge embedded in the classroom context.

5. Conclusion and Recommendations

Considering all the students' responses and suggestions toward LS, the research teachers show appreciation for the honesty and genuine comments of the teacher-observer, student-observers, research teachers, and of course, the students. This activity executed the curriculum to the bottom-up, where all positive and negative comments were gathered from the field. Students learned the research lesson in 3I's better, even if the students observed some disengagements. On the part of teachers, they benefited from the brainstorming of teaching practices, sharing teaching materials, and reflecting on their practices. However, challenges arose regarding sustaining the students' interest in conducting school-based research. Since action research is iterative, the researchers were dreaming of continuing this approach, especially in this pandemic. The collaborative nature of LS helped the teachers to deliver the instruction meaningfully and the students to understand the research process. Hence, future research should be implemented using this approach, and future studies can also consider developing online materials using LS. This activity was fruitful but challenging, where younger teachers should be experienced.

The study was limited to a face-to-face set-up at the onset of the pandemic. Therefore, the quantitative side of the study was not presented. It is advised that future researchers have a quantitative study regarding LS in teaching and learning in a public-school context. LS is an excellent tool for utilizing both top-down and bottom-up curriculum implementation. Future researchers should try using LS in distance learning as part of multi-modal instruction. Develop material for distance learning using the LS principles. The lesson learned by the researchers was to accept and think of solutions to any problematic situation inside the classroom. LS can empower the teachers by considering a planned schedule for the students.

Author contributions: All authors are agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Declaration of interest: No conflict of interest is declared by author.

References

- Bayram, İ., & Bıkmaz, F. (2021). Implications of lesson study for tertiary-level EFL teachers' professional development: a case study from Turkey. *SAGE Open*, 11(2), 215824402110237. <https://doi.org/10.1177/21582440211023771>
- Bütün, M. (2019). Mathematics teachers' early lesson study experiences in Turkey: Challenges and advantages. *World Journal of Education*, 9(5), 51. <https://doi.org/10.5430/wje.v9n5p51>
- Cabalo, J. M. S. (2017). In the realm of Mathematics Teaching: Lesson study for Mathematics teaching development in the Philippines. Retrieved November 12, 2022 from <https://www.academia.edu/33160134>
- Catalano, A. (2015). The effect of a situated learning environment in a distance education information literacy course. *The Journal of Academic Librarianship*, 41(5), 653-659. <https://doi.org/10.1016/j.acalib.2015.06.008>
- DepEd Order 35. (2016). *The learning action cell as a k to 12 basic education program school-based continuing professional development strategy for the improvement of teaching and learning*. Retrieved November 15, 2022 from <https://www.deped.gov.ph/2016/06/07/do-35-s-2016>
- DM No. 165. (2018). *Capacity Building for lesson study implementation in Grade 3 and Grade 7 mathematics*. Division memo in Naga. Retrieved November 10, 2022 from [http://www.depednaga.ph/wp-content/uploads/Memos/DM%20No.%20158,%20s.%202018%](http://www.depednaga.ph/wp-content/uploads/Memos/DM%20No.%20158,%20s.%202018%20)
- de Hitta-Catalan, M. H. S. & Treyes, R. T. (2013). Uncovering alternative conceptions of diffusion and osmosis through lesson study. In Ulep, S. A., Punzalan, A. E., Reyes, R. L., & Ferido, M. B. (Eds.), *Lesson Study: Planning together, learning together* (pp. 1-17). UPNISMED.
- Dudley, P. (2015). *Lesson study: Professional learning for our time*. Routledge.
- Earley, M. (2014) A synthesis of the literature on research methods education. *Teaching in Higher Education*, 19(3), 242-253. <https://doi.org/10.1080/13562517.2013.860105>
- Elipane, L. E. (2011). Incorporating lesson study in pre-service Mathematics Teacher Education. *35th Conference of the International Group for the Psychology of Mathematics Education*, 2(1994), 305-312.
- Elliott, J. (2012). Developing a science of teaching through lesson study. *International Journal for Lesson and Learning Studies*, 1(2), 108-125. <https://doi.org/10.1108/20468251211224163>
- Fraenkel, J. R., & Wallen, N. E. (2010). *How to design and evaluate research in education*. McGraw Hill.
- Given, L. (2008). *The Sage encyclopedia of qualitative research methods*. Sage.
- Guest, G., MacQueen, K. M., & Namey, E. E. (2011). *Applied thematic analysis*. Sage.
- Hervas, G. (2021). Lesson Study as a faculty development initiative in Higher Education: A systematic review. *AERA Open*, 7(1), 1-19. <https://doi.org/10.1177/2332858420982564>
- Huang, R. & Shimizu, Y. (2016). Improving teaching, developing teachers and teacher educators, and linking theory and practice through lesson study in mathematics: An international perspective. *ZDM Mathematics Education*, 48(4), 393-409. <https://doi.org/10.1007/s11858-016-0795-7>
- Kakavelakis, K., & Edwards, T. (2011). Situated learning theory and agentic orientation: A relational sociology approach. *Management Learning*, 43(5), 475-494. <https://doi.org/10.1177/1350507611427233>
- Kanellopoulou, E. M. D., & Darra, M. (2019). Benefits, difficulties, and conditions of lesson study implementation in basic teacher education: A review. *International Journal of Higher Education*, 8(4), 18-35. <https://doi.org/10.5430/ijhe.v8n4p18>
- Khokhotva, O. (2018). Lesson study in Kazakhstan: Case study of benefits and barriers for teachers. *International Journal for Lesson and Learning Studies*, 7(4), 250-262. <https://doi.org/10.1108/IJLLS-04-2018-0021>
- Kilburn, D., Nind, M. & Wiles, R. (2014) Learning as researchers and teachers: the development of a pedagogical culture for social science research methods? *British Journal of Educational Studies*, 62(2), 191-207. <https://doi.org/10.1080/00071005.2014.918576>
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Lawal, R., A Deneye, O. & A. Awofala (2019). Effect of lesson study on senior secondary school students' achievement in mathematics. *Journal of Science, Technology, Mathematics and Education*, 15(3), 49-65. <https://ir.unilag.edu.ng/handle/123456789/10143>
- Lee, V., & Madden, M. (2019). We're in This Together": Principals and Teachers as Partners and Learners in Lesson Study. *NASSP Bulletin*, 019263651982671. <https://doi.org/10.1177/0192636519826717>
- Leong, S. S. M., Mohd Said, H., Shahrill, M., & Perera, J. S. H. Q. (2016). Using lesson study to enhance meaningful understanding on the topic of pressure. *International Journal of Environmental and Science Education*, 11(15), 8425-8435.

- Lewthwaite, S., & Nind, M. (2016). Teaching Research Methods in the Social Sciences: Expert Perspectives on Pedagogy and Practice. *British Journal of Educational Studies*, 64(4), 413–430. <https://doi.org/10.1080/00071005.2016.1197882>
- Lewis C., Friedkin S., Emerson K., Henn L., Goldsmith L. (2019) How does lesson study work? toward a theory of lesson study process and impact. In Huang R., Takahashi A., da Ponte J. (Eds.), *Theory and Practice of Lesson Study in Mathematics: Advances in Mathematics Education* (pp.13-37). Springer. https://doi.org/10.1007/978-3-030-04031-4_2
- Lewis, C. & Lee, C. (2017). The global spread of lesson study: Contextualization and adaptations. In M. Akiba & G. Letendre (Eds.), *International handbook of teacher quality and policy* (pp.185–203). <https://doi.org/10.4324/9781315710068-13>
- Lewis, C., Perry, R., & Murata, A. (2006). How should research contribute to instructional improvement? The case of lesson study. *Educational Researcher*, 35(2), 3–14. <https://doi.org/10.3102/0013189X035003003>
- Ogegbo, A. A., Gaigher, E., & Salagaram, T. (2019). Benefits and challenges of lesson study: A case of teaching physical sciences in South Africa. *South African Journal of Education*, 39(1), 1–9. <https://doi.org/10.15700/saje.v39n1a1680>
- Roberts, C. A., Benedict, A. E., Kim, S. Y., & Tandy, J. (2017). Using lesson study to prepare preservice special educators. *Intervention in School and Clinic*, 53(4), 237–244. <https://doi.org/10.1177/1053451217712974>
- Ronda, E. R. (2013). Scaffolding teacher learning through lesson study. In Ulep. S. A., Punzalan, A. E., Reyes, R. L., & Ferido, M. B. (Eds.), *Lesson Study: Planning together, learning together* (pp. 195-216). UPNISMED.
- Shuilleabhain, A. N. (2018). Enacting curriculum reform through lesson study in the Irish post-primary mathematics classroom. In M. Quaresma, C. Winslow, S. Clivaz, J. P. da Ponte, A. N. Shuilleabhain, & A. Takahashi (Eds.), *Mathematics lesson study around the world* (pp. 65–85). https://doi.org/10.1007/978-3-319-75696-7_4
- Slingerland, M., Borghouts, L., Laurijssens, S., Eijck, B., Remmers, T., & Weeldenburg, G. (2021). Teachers' perceptions of a lesson study intervention as professional development in physical education. *European Physical Education Review*, 27(4) 1–20. <https://doi.org/10.1177/1356336X21997858>
- Sumaila, J., Ankoma-Sey, V. R., Asamoah, D. & Quansah, F. (2020). Conducting research work as a requirement for university undergraduate studies: Challenges of distance education students in Ghana. *Open Education Studies*, 2(1), 149–158. <https://doi.org/10.1515/edu-2020-0112>
- Wagner, C., Garner, M. & Kawulich, B. (2011) The state of the art of teaching research methods in the social sciences: towards a pedagogical culture. *Studies in Higher Education*, 36(1), 75–88. <https://doi.org/10.1080/03075070903452594>
- Xu, H., & Pedder, D. (2014). Lesson study: An international review of the research. In P. Dudley (Ed.), *Lesson study: Professional learning for our time* (pp. 29–58). <https://doi.org/10.4324/9780203795538-2>