

## Lesson study: Improving the quality of learning through on flipped classroom learning model

Rani Sugiarni<sup>1\*</sup>, Ari Septian<sup>2</sup>, Sarah Inayah<sup>3</sup>

<sup>1</sup>Universitas Suryakencana, Jalan Pasir Gede Raya, Cianjur, Jawa Barat, Indonesia

\*Corresponding author.

Email: rani@unsur.ac.id

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### Abstract

*This research purpose is to improve the quality of learning through the learning model of the flipped classroom in courses Capita Selecta of Math. This research is export research by applying lesson study which consists of three intentions, namely planning, Do, and See. The subjects of this study were students of the Mathematics Education Study Program who took the courses Capita Selecta of Math in Cianjur. Research data collection instruments consisted of observation sheets, tests, and questionnaires. During the lecture process, observations were made of student activities both online and offline (face to face). To see the cognitive abilities given by test students and to see students' responses to the planning and implementation of a questionnaire The quality of learning is seen to increase from the online and offline activities of students and lecturer activities in class that encourage the activeness of the average value and classical absorption, which experiences improvement. Likewise, most of the students' responses were positive to the planning and implementation of learning taking place with the student learning model in offline and online classes in a model of the flipped classroom.*

**Keywords:** *flipped classroom, lesson study, trigonometry*

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## INTRODUCTION

Before the 21st century, it was very difficult for students to gather information in learning. To obtain and collect information, students must go to the library first. Unlike the case with 21st-century students who have the convenience of getting information, and studying anywhere and anytime. Technological progress is unavoidable. Various information can be accessed by students. However, the information provided online does not fully provide valid information. There is some information that has a negative impact and a positive impact. Based on the increasingly rapid development, it is necessary to improve the quality of learning to produce quality graduates. In achieving quality graduates, it is necessary to improve in terms of the quality of learning which leads to the challenges of the 21st century.

The courses Capita Selecta of Math is a compulsory subject in the mathematics education curriculum. This course covers the material or mathematical concepts that exist in school. The provision of the correct concepts in this course and the delivery of the correct concepts are the basic capital that students must have in the future to become high school mathematics teachers in particular. Based on the reality that has existed so far in the Capita Selecta of Math high school lectures in teaching this course in the last three years, there are several problems, especially understanding high school material, especially the concept of trigonometry. The tendency of students' perceptions of being difficult is the beginning of student problems. This is in line with research (Mustamir, 2019; Nurmeidina & Djamilah, 2019; Wulandari & Gusteti, 2019; Gusmania & Agustyaningrum, 2020) Trigonometry is one of the mathematical materials considered difficult by students. students are less able to carry out proofs that involve the relationship between trigonometric concepts (Himmi, 2017), especially in applying trigonometric concepts in everyday life. This is in accordance with the results of research (Mensah, 2017) that trigonometry tends to be disliked by students. Students find it difficult to develop and solve problems related to trigonometry (Azwardi & Sugiarni, 2019; Orhun, 2010; Rohimah & Prabawanto, 2019)

However, not a few students have difficulty in studying this course, as in the research of Rahayu and Ulul (2018). Some students have not been able to explain the interrelationships between concepts and apply concepts or algorithms, accurately, efficiently, and precisely, in teaching them. In addition, students experience difficulties in factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge (Kumalasari & Sugiman, 2015). Problems faced by students in addition to difficulties in understanding trigonometry material, in the implementation of the lecture process the tendency of students based on observations of student activity is low, students only study during the course without studying before lectures

or after lectures. This of course becomes an obstacle to student learning in *Capita Selecta* of Math lectures which results in low final grades for students.

Based on the existing problems, the research team sees the need to overcome student learning problems facing the challenges of the 21st century. Students need to learn by not knowing the learning time-space in the classroom, but students can learn wherever they are by utilizing online technology repeatedly to learn through concept videos from lecturers, in addition to understanding concepts, students need to be trained to think critically in the classroom in order to face the challenges of the 21st century with special cases. In order to overcome this problem, the research team agreed to apply lesson study to improve the quality of learning in the *Capita Selecta* of Math subject.

According to Subadi and Hidayati (2013) Lesson Study is a model of teacher professional development through collaborative teaching and learning (learning assessment) with a cyclical and sustainable system based on the principles of collegiality and mutual learning to build a learning community. Teachers/lecturers in applying collaboratively choose various learning methods/strategies that are appropriate to the situation, conditions, and problems encountered in the classroom.

The stages of lesson study developed in Japan by Lewis (2002) (in Subadi, T., & Hidayati, E. F., 2013) include 3 (three) stages of activity, namely; plan-do-see, namely: (1) Planning (planning) planning analyzes the problem, chooses a strategy. (2) Implementation (action) or learning and observation. (3) Reflection on the planning and implementation of the learning, in order to improve the quality of learning for the better.

From the findings of Murtiani, Fauzan and Ratnawulan (2012) lesson study can improve the quality of learning. Lesson study was also found by a teacher to try his best in making lesson plans and other accompanying devices, implementing lesson plans that had been made, and obtaining input or clarification on various ambiguities, doubts, and errors that occurred during the making of lesson plans and their implementation through reflection. So starting from the design, implementation, and reflection in collaboration with the Physics teacher, has a big impact on increasing students' physics learning activities and students' physics learning outcomes. If students' learning activities in physics increase and students' learning outcomes increase, the quality of physics learning will automatically increase.

Meanwhile Elvinawati, Sumpono & Hermansyah (2012). Lesson study can also improve the quality of the learning process and help students' character building. Lesson study has a very big role in improving the quality of learning. This is because lesson study is carried out in groups to plan learning strategies, implement strategies, and correct deficiencies during strategy implementation together.

The stages of lesson study that we use in order to improve the quality of learning and increase the role of students or student center learning (SCL), especially the subject of capital selecta mathematics, face the challenges of the 21st century. SCL or often known as a student-centered learning approach is the main capital of the 21st century, The application of SCL in universities for students to learn actively emphasizes learning resources. This develops creative thinking that can improve students' thinking skills, and can improve and construct new knowledge as an effort to improve mastery and good development of lecture material (Dikti, 2004). The SCL approach is adapted to the 21st-century learning model. One alternative that has been discussed collaboratively is adapted to the material, approach, and others, the answer is flipped classroom. The flipped classroom learning model (Damayanti & Sutarna, 2016) is one of the student-centered learning models to improve learning effectiveness.

The flipped classroom learning model utilizes technology that supports additional learning materials for students that can be accessed online or offline whenever and wherever. While learning time in class is used by students to collaborate with project partners, practice skills, and receive feedback about their progress (Damayanti & Sutarna, 2016).

The flipped classroom model guidelines (Rindaningsih, 2018) are (1) online materials should be in the form of modules, books, and online (both sources of articles, journals, and youtube); (2) The teaching style of the lecturer is more on the facilitator; (3) The lecturer deepens the content and evaluates the results of assignments outside the classroom, both in the form of course content and projects carried out according to the learning steps built on the module; (4) Students feel valued and have the freedom to convey what they have obtained without fear or worry of being wrong; (5) Students can report their findings online, either by text, by video or by email; (6) Interaction between students is also established and lecturers facilitate to give time not only in class.

In line with Rindaningsih (2018) guidelines, the team plans to apply this to high school *Capita Selecta* of Math lectures by providing online and offline lectures. Online lectures strengthen the concept of material with learning videos made and uploaded by lecturers, online discussion forums, and learning video comprehension quizzes, while in offline session lectures students are given problems in the form of student worksheets that need to be discussed as a continuation of understanding mathematical concepts in lectures online and then

discussed together. While the Flipped Classroom Model for Capita Selecta of Math Subjects on student connection skills (Mulyana et al., 2021). The application of lesson study through blended learning with the Flipped Model succeeded in increasing student independence and student learning outcomes in courses Capita Selecta of Math on exponential and logarithmic and derivative materials (Baidowi et al., 2021). However, this research is focused on trigonometry because students are often faced with formulas in solving problems. With the existing formulas, students are expected to be able to synthesize existing formulas so that they become new knowledge to produce new solutions. Therefore, this research is focused on improving the quality of learning through the Flipped Classroom Learning model in the courses Capita Selecta of Math.

## METHOD

The method used is lesson study, which can be categorized as action research. Lesson Study is carried out in three stages, namely: Plan (plan), Do (do), and See (reflect) on an ongoing basis. . The subjects of this study were students of the Mathematics Education Study Program who took the courses Capita Selecta of Math many 28 students in one Cianjur University. Research data collection instruments consisted of observation sheets, tests, and questionnaires. During the lecture process, observations were made of student activities both online and offline (face to face). The implementation of the lesson study is carried out in a participatory, collaborative, and collaborative manner among mathematics education lecturers. The implementation of the lesson study lasted for 3 weeks. This research was conducted using an Action Research model as well as in the form of a Lesson Study. The number of action cycles or lesson study cycles is planned for 3 cycles with the SCL model of the Flipped Classroom approach. Planning (plan), implementation (Do), and reflection (See) activities. The data collection techniques used in this study were: observation techniques, field notes, audio, and video techniques, tests, and questionnaires. The data were analyzed descriptively qualitative.

## RESULTS AND DISCUSSION

### Implementation of Lesson Study Cycle I

#### Planning (Plan)

The planning stage of the lesson study cycle I was held on September 16-18, 2019 in the Capita Selecta of Math subject for 3rd-semester students of the Mathematics Education Study Program at the University in Cianjur. On the 16th, a discussion was held involving the lesson study team of the mathematics education study program. This discussion aims to uncover problems in Capita Selecta of Math lectures in high school.

One of the problems revealed is that the ability of students to understand high school math concepts is very low because some students have not been taught at all in high school or some are not majoring in high school, so when this course students just understand, the impact of not understanding school math concepts is medium, namely the unskilled students in solving mathematical problems in the form of questions that require critical thinking. Then the next problem is that lecturers are less skilled at carrying out active and fun learning for students. After analyzing the RPS according to the KKNI-based curriculum, it was determined that the middle school focused on the material that dominated students' difficulties in understanding the concepts and problems of high school mathematics, namely trigonometry. The planned approach is based on SCL with a flipped classroom learning model, namely, lectures are carried out both online and offline. Online activities are not limited by space and time, namely, students can freely learn through learning videos that have been prepared by lecturers. Meanwhile, offline students start understanding concepts from learning videos on cases or questions that require critical thinking.

The next step is to arrange the learning steps outlined in the carton by paying attention to the steps of the lecturer's activity and the possible responses of students to the activities of the lecturer. The steps of learning are adjusted to the rate of ups and downs of student responses. Then the team selects a model lecturer and prepares media, student worksheets, and evaluation tools (tests).

Before the implementation of the learning was carried out on September 18, 2019. The research team first explained the learning steps, observation guidelines, and observation rules to the observers who would observe the online and offline learning processes.

#### Implementation (Do)

The observers were introduced to students by explaining the purpose of attending class and sitting at the back of the class. The learning process that takes place is as follows.

Online activities

1. The lecturer provides the online learning account code and learning objectives in the online session.
2. Students are given learning videos about the concept of trigonometric comparisons.

3. After the students watched the video, they then commented on the discussion forum about the difficulties of students in understanding the concept of the material together.
4. Students fill out online quizzes to test their understanding of the material that has been witnessed in the video.

#### Offline activities

1. The lecturer performs apperception by greeting, absent student attendance online and offline, and motivating students related to the material.
2. Lecturers ask students questions related to problems or difficulties that have not been understood in the learning video.
3. Lecturers and students together conclude the concepts that have been learned in the learning video.
4. The lecturer divides the students in the class into 7 groups of 3-4 people each. Then the lecturer gives the students' worksheets to each group to work on.
5. Lecturers monitor group discussion activities, respond to and guide student discussion activities.
6. The lecturer provides direction for group representatives who are finished and ready for presentations related to the problem cases in the student worksheets.
7. The lecturer asks students questions regarding the results of the presentations that have been solved for other groups to support or add.
8. Lecturer straightens students' worksheet answers together
9. Lecturers give rewards to students who have the best scores on quizzes and are actively involved in online and offline sessions.
10. The lecturer concludes the learning outcomes before finally closing the learning activities.

## Implementation of Lesson Study Cycle II

### Planning (Plan)

The planning stage of the Lesson Study Cycle II was carried out on September 20, 2019 in the Capita Selecta of Math for Middle School Students in the 3rd Semester of the Mathematics Education Study Program at Suryakencana University. On September 20, 2019, in conjunction with the reflection of the first cycle and planning for the second cycle, was carried out based on the problem and alternative determinants of the problem. Finally, the problems are revealed to determine the focus of learning. In planning, the approach used is still the same based on SCL with the flipped classroom learning model, namely lectures are carried out online and offline. It's just that offline, the teacher provokes students to be actively involved so that when dividing groups of students, students look for partners according to the answers on the question sheets that have been provided. The plan written on the observation sheet has been adjusted to the suggestions in cycle I.

### Implementation (Do)

The learning implementation was carried out on September 24 for 3 credits; 1 online credit and 2 offline credits. The learning process that takes place is as follows.

#### Online activities

1. The lecturer provides a new account code for online learning and learning objectives in the previous 2 online sessions.
2. Students are given learning videos about trigonometric relations.
3. After the students watched the video, they then commented on the discussion forum about how to easily memorize trigonometric formulas.
4. Students fill out online quizzes to test students' understanding of the material that has been witnessed in the video (no time limit).

#### Offline activities

1. The lecturer performs apperception by greeting, absent student attendance online and offline, reminding the previous material, and motivating students related to the material
2. Lecturers ask students questions related to problems or difficulties that have not been understood in the learning video.
3. Lecturers and students together conclude the concepts that have been learned in the learning video.
4. Lecturer distributes paper to students to fill in
5. After students answer, the lecturer invites students to find friends who have the same answer.
6. Students sit in groups with friends who have the same answer.
7. The lecturer gives students worksheets to work on.
8. Lecturers monitor group discussion activities, respond to and guide student discussion activities.
9. The lecturer gives directions for group representatives who are finished and ready for presentations related to cases of questions on student worksheets.

10. The lecturer asks students questions regarding the results of the presentations that have been solved for other groups to support or add
11. Lecturer straightens students' worksheet answers together
12. Lecturers give rewards to students who have the best scores on quizzes and are actively involved in online and offline sessions.
13. The lecturer concludes the learning outcomes before finally closing the learning activities.

### **Reflection (See)**

The following is a summary of some of the reflections and recommendations.

1. During the online session, students have network difficulties while studying online at their respective homes.
2. Only 90% of students study online due to poor signal where they are.
3. When looking for a friend who dances with the same answer, students have difficulty because there is one group that has the same members because of the wrong answer.
4. Time in working on student worksheets is still insufficient and less effective.
5. The MFI is too much, so it takes time to do it.
6. Pay attention to the time allocation

Based on the results of the reflection, through the discussion, several recommendations were made as follows.

1. Lecturers often motivate students to study independently and try to study independently at home.
2. Monitoring student online processes in the campus area
3. Lecturers often provide feedback related to the concepts that have been explained in the learning video.
4. The material is adjusted according to the allocation and important cases.
5. Collaboration in groups is more effective by dividing tasks among each member.
6. Group presentation Only a few groups come forward because it takes time.
7. Lecturers always pay attention to time allocation.

### **Implementation of Lesson Study Cycle III**

#### **Planning (Plan)**

The planning stage of the lesson study cycle III was carried out on September 24, 2019 in the Capita Selecta of Math subject for middle school students in the 3rd semester of the Suryakencana University mathematics education study program. On September 24, 2019 at the same time as the reflection of the second cycle, planning for the third cycle was carried out based on the problem and the alternative determinants of the problem. Finally, the problems are revealed to determine the focus of learning. In planning, the approach used is still the same based on SCL with the flipped classroom learning model, namely lectures are carried out online and offline. It's just that offline, the lecturer gives limited cases to only 2-3 cases and pays attention to the time allocation.

#### **Implementation (Do)**

The learning implementation was carried out on October 1 for 3 credits; 1 online credit and 2 offline credits. The learning process that takes place is as follows.

##### Online activities

1. The lecturer gives an appeal for students to open an account and study for meeting 3 on the same account code as meeting 2
2. Students are given a video lesson about the sine and cosine rules.
3. After the students watched the video, they then commented on the discussion forum.
4. Students fill out online quizzes to test students' understanding of the material that has been witnessed in the video (no time limit)

##### Offline activities

1. The lecturer performs apperception by greeting, absent student attendance online and offline, reminding the previous material, and motivating students related to the material
2. Lecturers ask students questions related to problems or difficulties that have not been understood in the learning video.
3. Lecturers and students together conclude the concepts that have been learned in the learning video.
4. Students are divided into 7 groups based on the initial group.
5. Students sit in groups with friends or
6. The lecturer gives students worksheets to work on in each group.
7. The lecturer monitors group discussion activities, responds to and guides student discussion activities.

8. The lecturer gives directions for group representatives who are finished and ready for presentations related to cases of questions on student worksheets.
9. The lecturer asks students questions regarding the results of the presentations that have been solved for other groups to support or add.
10. Lecturer straightens students' worksheet answers together
11. Lecturers give rewards to students who have the best scores on quizzes and are actively involved in online and offline sessions.
12. The lecturer concludes the learning outcomes before finally closing the learning activities.

Reflection (See)

The following is a summary of some of the reflections and recommendations.

1. During the online session, students have network difficulties while studying online at their respective homes.
2. Only 95% of students study online due to poor signal where they are.
3. Students are used to working on critical thinking questions.
4. Students have the readiness to learn because they already have a concept stock that they previously opened at home or outside of class hours.
5. Group presentation has been effective.
6. The time allocation is arranged according to the plan.
7. Based on the results of the reflection, the following recommendations were made through the discussion:
8. Lecturers often motivate students to study independently and try to study independently at home.
9. Monitor students' online processes in the campus area.
10. Lecturers often provide feedback related to the concepts that have been explained in the learning videos.

In the implementation of lesson study, the learning flow is described as SCL, or student-centered using the flipped classroom learning model every cycle. This can be seen from student activities that are used to self-study in online sessions, which allow for low student understanding to be repeated through videos that have been given each cycle, while during offline sessions, student activities are active with group friends or classmates in asking, answering, and solving problems. material problems and presentations in class. While the cognitive abilities of students after the implementation of learning are given a test each cycle in Table 1.

**Table 1. Student cognitive test scores in each cycle**

	cycle 1	cycle II	cycle III
high score	90	100	100
Low score	20	30	20
Average	62	79	81
Classical absorption	72	81	89

Table 1 shows an increase in each cycle in terms of cognitive quality. This increase can be seen from the average value of the first cycle, which is 62, increasing in cycle II, which is 79; and again increasing in cycle III, with an average value of 81. Apart from the average value, the increase in classical absorption has increased the success, namely, cycle 1 by 72%, cycle II by 10%, and cycle III also increased by 8%, namely the acquisition of classical absorption of 89%. In line with the research of Rochayati and Zakaria (2010), there is an increase in cognition as evidenced by the test each cycle has increased using lesson study-based digital learning.

In line with research using lesson study can improve cognitive research Susanto (2012). The result is that the validator's assessment concluded that learning with the developed device is effective, which is marked by the success of increasing the achievement of student learning activities with the result of increasing student learning outcomes with a gain score of 0.34.

In addition to seeing from lesson study activities ranging from planning, implementation, and planning as well as cognitive ability tests in each cycle. Student responses to the planning and implementation that have been carried out have provided a positive response for students. This can be seen in the student answers given after the implementation was completed, which were disseminated online in Table 2.

**Table 2. Student response**

No	Indicator	response	response conclusion
1	online learning	3.17	Positive
2	Tutorial video	3.65	Positive
3	online quiz	4.73	Positive
3	online discussion	3.47	Positive
4	Learning Model	2.95	Positive
5	Reward	4.39	Positive
6	Student Worksheet	3.62	Positive
7	group discussion	4.49	Positive
Total number of responses		4.35	Positive

From Table 2, student responses are calculated as a whole based on indicators. If the result is  $< 2.5$ , it gets a negative response and vice versa  $> 2.5$  shows a positive response. Based on the Table 2, the overall response is based on the indicators that have been determined, first for online-based learning, the student response is 3.17, indicating a positive student response. Likewise, the response to learning videos is 3.65 which shows positive, student responses in doing online quizzes get 4.73 with a positive response, online discussions get a response of 3.47, which shows positive, offline flipped classroom online learning model gets a response of 2.95 which shows positive, appreciation of the activeness of online and offline students 4.39 shows positive. The group worksheet is given 3.62 shows positive and discussion with groups in class 4.35 shows positive.

In line with student responses from the research results of Chandra and Nugroho (2017). In learning using the Flipped Classroom method, students like the video tutorial because they can see it over and over again. This is the positive impact of student responses to student-centered flipped classroom learning. In this case, from the research of Damayanti & Utama (2016). Flipped classroom learning is effective for increasing creative attitudes, responsibility, and learning skills, as evidenced by the positive response in online and offline learning that students feel. From the results of the research, students in the planning and implementation stages of a flipped classroom learning model centered on students showing a positive attitude.

## CONCLUSION

The improvement in the quality of learning can be seen in the increase in online and offline activities of students and activities of lecturers in the classroom, which trigger student activity from the results of reflection in each cycle. Apart from student and lecturer activities, the increase is also seen in the cognitive abilities of students in each cycle, where the average value and absorption capacity can be seen. Classics are on the rise. Likewise, most of the students' responses were positive towards the planning and implementation of the learning taking place with the student-centered flipped classroom model. This model becomes a recommendation for other material in courses *Capita Selecta* of Math on the enhancement of the quality of learning in university.

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