



Student Practicum Competencies through Lesson Study with the application of Argument Driven Inquiry

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Abstract: This study intends to analyse the student's practicum competencies through Lesson Study activities by applying the Argument Driven Inquiry learning model which was studied using qualitative research with descriptive qualitative analysis techniques. The sample is 13 students in the fourth semester of physics education. Based on students' practicum reports, the percentage of learning outcomes in the first Lesson Study was 70.91, the second Lesson Study was 84.83. The indicators of student practicum competencies include the competencies of synthesis, cooperation, communication and independence, each percentage gain is 41.03%; 47.12%; 54.49%; 45.77% in Lesson Study 1, and 77.56%; 82.69%; 78.85%; 76.92% in Lesson Study 2. Student responses to practicum competencies for each indicator are 80.13%; 83.33%; 82.05%; 78.21%. These show that there is a positive change in student practicum competencies and the reflection's results show that there is an accurate prediction of the final measurement result and knowing how to obtain the right measurement outcome.

Keywords: practicum competencies, lesson study, reflection

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INTRODUCTION

The developed countries have good education quality systems, where they are able to evolve their technology because of their great efforts in the development of science. Improving the quality of education is our collective responsibility (Departemen Pendidikan Nasional, 2009), which means there is a necessity to carry out all efforts to improve the quality of education in order to achieve the purpose of national education in increasing cognitive, affective and psychomotor abilities. This purpose has not been fully achieved. In fact, there are still some students that have not mastered the basic concepts of physics at the school level. Meanwhile, mastering the basic concepts of physics will be able to help increase cognitive and psychomotor competence in advanced physics at the university level. This is in accordance with the 2016 Indonesian Student Competency Assessment (AKSI) conducted by the Ministry of Education and Culture (Kemendikbud) that scientific competence of the students are 73.61% doing poorly, 25.38% doing well and 1.01% doing great (<http://www.gresnews.com>, 2020). Educators might improve the science competence by improving the quality of learning, for example by conducting Lesson Study activities. In Lesson Study activities, educators can observe scientific competencies carefully, such as through student physics practicum competencies during the learning process.

Based on Lesson Study activities that have been carried out online, it is known that there are student weaknesses in collaboration and communication in group discussions. Some students were silent during discussions, one-way conversations and other group mates did not respond, and they worked alone to complete group assignments. Based on this problem, it is necessary to conduct offline lesson study through the process of practicum activities with the hope that students can be more active in group discussions, and have other competencies.

Based on learning outcomes from practicum activities, it can be seen how the ability of knowledge, attitudes and skills in terms of preparation, implementation and the end of the practicum (Koranteng, 2013). Practical activities can make students feel challenged to improve their conceptual knowledge and skills (Doran et al., 2002). In addition, practicum activities can give a positive influence on the development of affective aspects such as discipline, thoroughness, cooperation, responsibility and acceptance (Siswaningsih, 2007). Practicum assessment can be seen from the performance assessment, Permendikbud Number 66 in 2011 explains that performance appraisal should measure all student competencies based on the process and results. The practicum competency assessment from the process aspect includes selecting tools, designing practicum and collecting data, interpreting data, and the outcome aspect is concluding the findings according to the practicum objectives, demonstrating and presenting the findings, and being responsible for the experiment results and accepting other's finding through the discussion. For this reason, in this study, the practicum competencies that we want to know include cognitive aspects including synthesis abilities, affective aspects including cooperation and independency, as well as communication skills.

Improving student practicum competence can be realized through Argument Driven Inquiry (ADI) learning. ADI is a learning model that emphasizes practical activities through inquiry and argumentation. ADI learning is a way to help students

learn how to participate in scientific argumentation and create narratives (Sampson et al., 2011). Through ADI learning, students are expected to be able to make a better narrative of the discussion of the results of their practicum.

The ADI learning model is designed to provide a more argument-centered platform and the role of argument in the social construction of scientific knowledge while conducting inquiry (Walker, 2011). ADI learning is effective in increasing understanding of the concept and competence of discovery (investigation). Discovery activities are scientific activities of a scientist or learner and students to develop knowledge. Thus discovery activities can emerge science practicum competence. Therefore, this study is interested in analyzing "student practicum competence through Lesson Study with the application of ADI learning", and how is student practicum competence through Lesson study with ADI learning? The purpose of this research is to improve the practicum competence of students, and from this learning activity we hope that the scientific character of students will grow, and can improve the pedagogical professionals of researchers and people involved in this research.

METHOD

Practicum competency research through Lesson study with the application of ADI learning which was studied using qualitative research. The data collection of student practicum competencies is done through student activity sheets (LKM) to find out the results of student practicum and observations using observation sheets to determine the process of student practicum performance, and questionnaires are used to determine student responses to their practical competence abilities. Then the data is analyzed by presentation and the average score of the LKM results is qualitatively descriptive. Research through Lesson Study (LS) is carried out with a cycle system, including planning (plan), implementation (do) and reflection (see) activities (Sutadji et al., 2015).

Research planning is done by determining the theme of reflection and refraction lesson material. The LKM is made in the form of project assignments through investigations from planning, creating, collecting and presenting data. The LKM offers questions, the answers are found through practicum activities, the LKM does not provide information on how to design the practicum. It is intended that students who dig up information on their own and to find out how the learning process and discussion between them are more intertwined. In addition, LKM also provides a forum for students to review the results of their peers' investigations.

The implementation of Lesson Study is where the teacher applies the lesson design that has been prepared and guides the students to complete the LKM, and the observer observes all the activities of the teachers and students during the learning process. Then the reflection activity discusses the achievement of learning objectives, interactions between teachers and students or between fellow students, the use of learning aids and materials, and discusses students' synthesis, collaboration, independence, and communication skills. Reflection is used as material for improvement of treatment in the second LS.

RESULT AND DISCUSSION

The Lesson Study activities that we did, students' practicum competence were obtained from the score of the practicum report and the presentation of practicum competence assessed directly from observations by the teacher. Student learning outcomes were assessed from the results of the practicum report, and the average score is as shown in Figure 1, the LS-1 score is at the good category, and the LS-2 is above the good category. There appears to be an increase from a score of 70.91 to 84.83, indicating that the communication competence contained in the report is getting better for writing observations, writing appropriate conclusions between the findings and the objectives of the practicum and providing explanations relating to a theory of refraction. Wasilah stated that the indicators of practicum ability can be seen from the conclusions of the practicum results, and the practicum report (Wasilah, 2012).

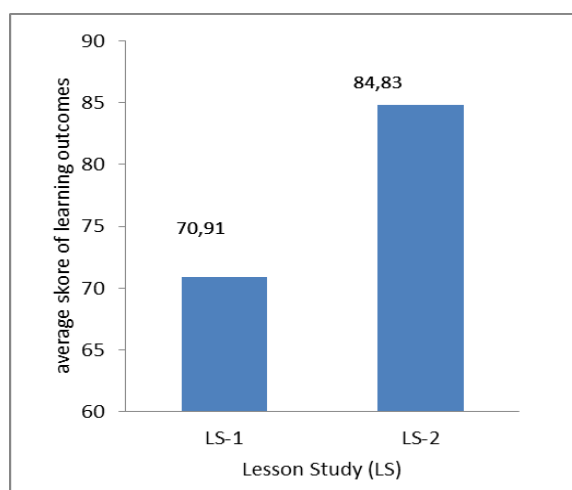


Figure 1. Average score of learning outcomes

Practical competence can be seen from the practicum process and the practicum results found by students. The practicum competencies that have been reviewed include synthesis, collaboration, communication and independence abilities, and the results of the assessment are shown in Table 1 below,

Table 1. Student practicum competency assessment results

Ability	LS-1			LS-2		
	Average Score	category	%	Average Score	catrgory	%
Synthesis	1,69	poor	41,03	3,10	Good	77,56
Cooperation	1,88	poor	47,12	3,31	Good	82,69
Communication	2,15	well	54,49	3,15	Good	78,85
Independency	1,83	poor	45,77	3,08	Good	76,92

description: 1 poor, 2 well, 3 good, and 4 great

There was an increase in the percentage of students' synthesis abilities, including preparing tools and practicum materials, and designing tools, i.e. 41.03% in LS-1 and

77.56% in LS-2. In LS-1, there are doubts in the selection of tools and deficiencies in taking tools. Students move back and forth to pick up tools such as picking pins, they only take 2, while to determine the distance of an object's image on a plane mirror, a minimum of 5 needed. To design a practicum, students still can't read the practicum pictures on the LKM so they immediately ask the teacher and only one group is looking for information from the internet. In taking the horizontal line of the flat mirror base on the paper, it can be seen that the students' inability to measure the angle of incidence and angle of reflection. While in LS-2 they are more prepared for the selection and taking of tools by looking carefully at the practicum design drawings at the LKM and each group seeking information, as well as in designing practicums to determine the nature of the image on a convex lens or with a concave lens, determine the angle of reflection, refraction and internal reflection are perfect.

In practicum activities, efficiency and effectiveness of activities are needed. Therefore group or team collaboration is needed to carry out practicum activities. Based on the LS activities carried out, it appears that there is a change in the percentage of student collaboration abilities of 47.12% in LS-1 and 82.69% in LS-2. The student's cooperation ability is seen from the interaction between students, the division of tasks, expressing ideas in the practicum group, and the time of completing the practicum. Collaboration between students in groups can make students develop the completion of tasks given by the teacher (Nesi & Purwaningsih, 2021). The percentage of student collaboration in LS-1 is still in the poor category because students are still independent, such as students doing practicum alone, not asking for help or trying to express ideas and ask group mates for their opinions. Wulandari stated that there is an increase in cooperation if there is more interaction between students (in one group) and problem solving activities (Wulandari et al., 2015), working alone in a group makes the LKM completion time longer, while the ability of student collaboration in LS-2 increases students can share tasks, share ideas in the sense that interaction between students is growing so that practicum time is completed faster, this happens because the teacher emphasizes that students are more cooperative in group discussions and pay attention to the practicum time that is notified during LS-2 learning activities.

Communication skills are needed to be able to convey experiences and practicum findings both orally in the argumentation session and in writing the practicum report. Assessment points determine students' communication skills in terms of communication between groups, reports according to observations, making claims/conclusions. The percentage of communication skills in LS-1 is greater (54.49%) than other abilities, and the increase in the percentage of communication skills is lower than other abilities by 24.36% on the LS-2. A small increase in the ability of students to provide arguments and interpretation of data, but the conclusion of the practicum reports is suitable with the practicum results and additional supporting theories to strengthen the findings and explain the practicum procedures are getting better.

Independency is a practicum competency that must be possessed by practitioners, such as self-awareness to clean and return practicum tools, without having to wait for instructions. Student independence is measured by cleaning the tools and practicum tables, returning the practicum tools, in addition to reviewing and revising reports must be carried out by students themselves. The increase in student independence by 31.15% shows that there is an increase in student motivation to be

orderly in practicum of the LS-2, Daulay stated that there is a relationship between motivation and student learning independency (Daulay, 2021). In addition, there was an increase in the ability to review the results of classmates' reports because students had previous review experience in LS-1 and revised practicum reports by providing explanations of their own findings and those of others.

Practicum competency response

Student responses to the practicum competencies they have after going through the 1st and 2nd Lesson studies are carried out as supporting data for the practicum competency assessment carried out by the teacher, the results of obtaining student responses to practicum competencies are shown in Figure 2 below,

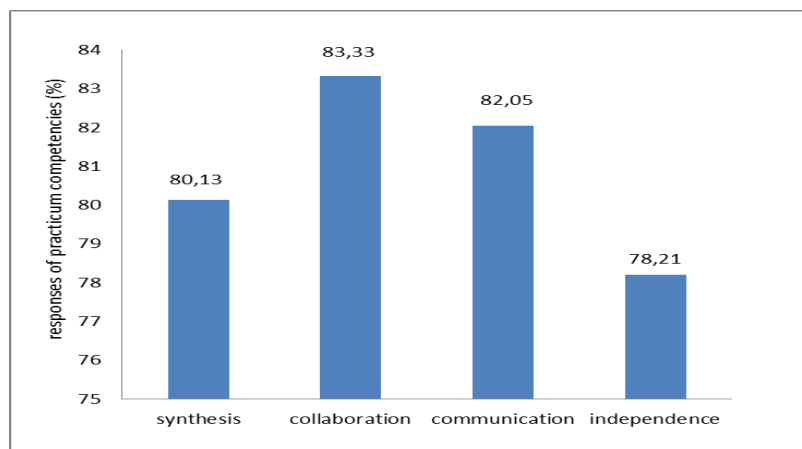


Figure 2. Percentage of student practicum competence

The results of the presentation of student responses show that the highest collaboration ability (83.33%) is the same as the highest gain in direct assessment by the teacher at 82.69%, it appears that group solidity is getting better in dividing tasks and sharing ideas. The ability of independence to get the lowest presentation (78.21%) was due to a lack of confidence to give statements or rebuttals in a friend's report review, his attitude was only to accept without additional explanations for the approval of other classmates' findings, Suraya stated the ability to argue someone because it is influenced by the level of self-confidence (Suraya et al., 2019).

Reflection and Analysis

Based on the Lesson Study activities by applying ADI learning, it has given a better impact on the practicum competence of students. This happens because of the influence of Lesson Study, a collaborative activity that examines learning that has been carried out for analysis which then becomes material for improvement and development of further learning activities. The initial stage of LS-1 is carried out by planning (plan) determining contextual material, making lesson designs and LKM that have been validated by the validator, and implementation (do) is carried out three times each meeting 2x50 minutes and observation process, then a reflection activity (see) is carried out to find out the learning process and how the student practicum competencies are, if

the learning objectives have not been achieved, it is necessary to improve planning in the LS-2 cycle.

The implementation of LS-1 learning begins with apperception. This apperception provides basic questions about identify the nature of the image in the mirror, and determining the angle of reflection. This apperception is expected to have an enthusiastic impact on students, but none of them can answer correctly. After being given a briefing, then there are those who can answer close to the right, then make of the discussion groups to do practicum. According observer is still lacking in literacy about LKM, it can be seen that there is a shortage of practicum tools and confusion in designing practicums. In the investigation of image distance, there is an error in the position of the view that is not parallel to the image of the object in the mirror. In addition, in terms of interaction between students, it appears that there is still minimal cooperation. In the argumentation session there was no intensive interaction between students but only listening and not arguing.

Reflection activities can affect one to another Lesson Study so as to provide the development of the learning process (Komalia et al., 2014), from a series of practicum activities that have been carried out by students, it shows that the learning objectives have been achieved, because from the questions in the LKM students have answered correctly all. Physics problems and it is experienced by students can increase students' interest and enthusiasm for learning (Eka Pratiwi et al., 2019). The learning strategies and media used inspire observers to carry out this learning in their classrooms. The review of student activities in learning shows the weakness of basic theoretical knowledge regarding practical so that students do not dare and do not make the right decisions to complete the LKM practicum assignments, do not search for information indicating poor learning independence. Low cooperation between students shows that they are not used to experiencing group discussion activities and do not believe in the abilities of their group mates. There are still students who are less responsible in completing joint assignments. The argumentation session also has not been carried out well, it can be seen from the students who are less enthusiastic because students are tired of the long duration of practicum and are bored to hear the presentation of other group, Rahayu stated the students feel bored to hear when the presentation (Rahayu et al., 2007). Based on the results of these reflections, it becomes material for improvements in learning planning in LS-2, from the results of the learning analysis it is important data in order to find suitable learning for students (Supriatna, 2018).

LS-2 lesson planning was carried out in two meetings by adjusting the tasks of the LKM to be simpler in order for cooperation and argumentation sessions to be carried out optimally. LS-2 reflections were obtained that the implementation of practicum was shorter than LS-1, independence and cooperation in groups are good so motivate the students, according to Rahayu's research results, that through LS activities with learning models can motivate everyone group members to work together responsibly on the task (Rahayu et al., 2007). Communication skills are getting better than Sumiyati found no relationship between student performance on practicum with communication skill (Sumiyati et al., 2019) because in research using ADI models. Student activities during learning are getting better even though they are not optimal, in contrast to the results of research by Monawati and Yamin that student activities are very good through Lesson study activities up to three times (Monawati & Yamin, 2016), along with the number of

LS made to make students more active in learning. The increase in student practicum competence can be seen from the emergence of correct predictions regarding the final measurement results, and knowing how to practice in order to obtain the right measurement results. This LS activity provides benefits for teachers and observers in professional improvement of educators. Farida stated that LS provides benefits for increasing knowledge and suitable learning analysis for students, improving the quality of learning and lecturer performance (Farida, 2016).

CONCLUSION

The practicum competence of students is increasing along with the increase in Lesson Study activities with the application of ADI learning, in which the percentage score of learning outcomes and practicum competence has increased. The improvement in cooperation and communication skills is better than the previous Lesson Study, as well as the ability to synthesis and increase independence. LS activities provide benefits for both the team and observers in improving the professional educators.

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