



Modelling instruction effect with different reasoning ability on physics conceptual understanding by controlling the prior knowledge

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Abstract: Modelling instruction is systematic instructional activity for constructing and applying scientific knowledge in Physics lesson. The purpose of this research is to determine the effect of Modelling instruction with different reasoning abilities on understanding physical concepts by controlling students' prior knowledge. This research used experimental method with 2x2 factorial design with two Modelling instruction classes and two conventional classes with a total of 176 students. The instrument used was reasoning ability test, prior knowledge test, and physics concept test. It used LCTSR (Lawson's Classroom Test of Scientific Reasoning) instrument. Prior knowledge test instruments consisted of 25 problems to identify how deep the students understand the topic before they undergo the learning process and physics concept test consisted of 25 problems. Based on the statistical test using two factor Ancova, it proved that there was a significant difference in students' ability to master the physics concept between using Modelling instruction learning model and using conventional learning model. The result showed that the Modelling instruction increasing conceptual understanding better than conventional learning. There are two important parts in the Modelling instruction that are model development and model deployment. This study also confirms that there are significant differences in understanding the concepts between students of high reasoning ability and low reasoning ability. Students with high reasoning abilities have a better understanding of concepts than students with low reasoning abilities.

Keywords: conceptual understanding; modelling instruction; reasoning ability

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Introduction

Physics lesson in high school is one subject that requires a lot of effort. It does not only focus on the scientific process, but also focuses on the Physics concept in depth to solve diverse Physics problem. Physics lesson instructs the students to establish systematic way of thinking, to study a certain phenomenon logically and mathematically (Gunawan et al., 2018). The integrated materials on Physics requires the students to comprehend one topic completely first before continuing to the next topic. If students cannot understand the Physics concept correctly from the beginning, it will be difficult for them to understand the next topic as well. When students learn Physics lesson, they need to understand both the formula and the concept (Furwati & Zubaidah, 2017). Students are also expected to be able to apply the Physics concept to solve the common Physics problems that they encounter on the basis of everyday life. The purpose of learning Physics will be achieved when a student is able to understand the Physics concept well.

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A constructive theory states that learning is not merely transferring knowledge from the teachers to the students, but it should be more extensive, where it takes into account the process of constructing knowledge by involving required thinking activities and real-life experiences where the students are in a real interaction with the real objects. Mistakes which were made during the learning process in the classroom may result in students' low cognitive development and low understanding of the concept (Simanjuntak, 2012). When a student has mastered the concept, it means that he/she is able to acquire the topics given and transfer it into information which he/she can use to solve and analyze the problems (Silaban & Utari, 2015). A concept enables students to classify various ideas into a certain rule and principle. Mastering the Physics concept means that students understand and comprehend the concept and connect it to other related theories (Riyadi & Mosik, 2014). Teacher, as facilitators, should be able to create a constructive learning model in which students are able to construct their own knowledge by various required thinking activities and real-life experiences where the students are in a real contact with the objects of their study (Firman et al., 2019; Gunawan et al., 2018; Hayes & Kraemer, 2017).

Mastering the Physics concept has been the main problem in Physics lesson which needs to be solved in most of the high schools in Indonesia. In addition, this seemed has been more complicated along with the constantly changed curriculum applied. The lack of this mastering concept has been reported by a number of research (Bao & Koenig, 2019; Fernandez, 2017; Furwati & Zubaidah, 2017; Hayes & Kraemer, 2017; Hulwani et al., 2019; Putri et al., 2018). Most of the research have shown that students only solve Physics problems within low level of cognitive. Students only solve problems based on their basic knowledge without connecting it with any other concepts. Students are not able to interpret the problems they are dealing with, and they tend to do the *plug-and-chug equation* only (Ding et al., 2011). A research by Yolanda et al. (2020) informed how important of mastering the concept is. The research further argues that by mastering the concept more comprehensive and deeper, all Physics problems can be solved straightforwardly. This is also supported by (Putri et al., 2018) which stated that to solve the Physics problems students need to understand comprehensively the concept thoroughly.

Physics qualitative statement and quantitative calculation are the reasoning skills fundamental for the students to understand the Physics concept. The reasoning ability is one of the skills required in studying Physics in high school (Abdurrahman et al., 2013; Ding, 2018; Ding et al., 2016). While, scientific reasoning is a systematic skill to explore problems, to form and test the hypothesis, perform the test, and evaluate the result (Zimmerman, Olsho, Loverude, & Brahmia, 2020; Zimmerman, Olsho, Brahmia, Loverude, et al., 2020). Furthermore, the improvement of reasoning skill is viewed as progress and development of students' intellectuality to change their initial mindset when they have to encounter new evidences which contradict with certain objects (T. J. Lawson et al., 2003). Scientific reasoning can help students to understand a special knowledge and to construct a new concept (Erlina et al., 2018; A. E. Lawson, 2005). The previous research also showed that there are two factors which affect the conceptual learning and it is measured by FCI (*Force Concept Inventory*). One of the factors is the scientific reasoning skill possessed by the students even before they came to school, and the second is how their perception regarding Physics itself (Ding, 2014). Also, this statement is on the same path with early research which was done by Coletta that has confirmed about the causal effect between the scientific reasoning ability and the students' advantages in Newton Law concept (Coletta et al., 2008, 2012; Coletta & Phillips, 2005; Coletta & Steinert, 2020).

Learning models involving direct and practical activities are clearly needed to improve students' ability to understand the concepts of Physics. This research proposed constructive-based learning model which involves the sensory motor to enhance the improvement of concept acquisition (Bao & Koenig, 2019; Fernandez, 2017; Hayes & Kraemer, 2017; Nisa et al., 2018). One of the constructive-based learning models is Modelling instruction. Modelling instruction is developed by (Halloun & Hestenes, 1987; Hestenes, 1987). The combination of learning cycle with Hestenes' Modelling method produced what called Modelling cycle (Malone, 2008). The Modelling cycle method emphasizes on constructing and applying the Physics conceptual model phenomenon as the central aspect of the learning science. This learning model allow students to express their opinion

and arguments about scientific issues. Some previous research mentioned that the application of the Modelling instruction has showed the improvement of students' ability in science processing, analyzing and problem-solving (Brewer et al., 2018; Brewer & Sawtelle, 2018; Hestenes, 2015; McPadden & Brewer, 2017).

Therefore, the further investigation should arise whether there is a difference of the students' ability in understanding the Physics concept between those who employed the Modelling instruction learning and those who employed the conventional learning method. This study also investigates the level of understanding of students between those who have high reasoning abilities and those who have low reasoning abilities.

Methods

This research employed quantitative approach by using an experimental method. The design of this research aimed at testing the difference of the students' Physics conceptual understanding between those learning with Modelling instruction and conventional models. The design of the research used factorial design 2x2 which there were two factors the learning model and reasoning ability, each factor consisting of two levels. The experimental group were given Modelling instruction learning with Modelling cycle and control group were given conventional learning on the Linear Momentum and Collisions topics. Based on the factorial research design, the research procedure is illustrated in the Table 1.

Table 1. Factorial Research Design Pattern 2x2

Reasoning Ability	Learning model	
	Modelling instruction (A1)	Conventional model (A2)
High (B1)	A1B1	A2B1
Low (B2)	A1B2	A2B2

The population in this research was XI students of SMAN 1 Kedungwaru Tulungagung which consisted of seven classes. The sample was chosen by using cluster sampling method from four classes; they were XI MIA 2, XI MIA 4, XI MIA 5 and XI MIA 7 with total 176 students. Two classes XI MIA 2 and XI MIA 4 totaling 88 students were taught by Modelling instruction and XI MIA 5 and XI MIA 7 totaling 88 students were taught by conventional models. Student who learnt by Modelling instruction were tested for reasoning ability and then ranked based on their reasoning ability from the highest to the lowest. A number of 30 students acquired high reasoning ability and a number of 30 students acquired low reasoning ability. Student who learnt by conventional model were ranked based on their reasoning ability as it was done on the Modelling instruction class. Although each class only took 60 students, all students of XI MIA 2 and XI MIA 4 received the same treatment in Modelling instruction and XI MIA 5 and XI MIA 7 received the same treatment in conventional models.

There were two instruments used in this research, treatment instrument and measurement instrument. Treatment instrument contains some learning devices such as Students' working book and lesson plan which have been validated by two lecturers majoring in Physics and two senior high school teachers before the research is done. The measurement instrument consisted of reasoning ability test, prior knowledge test, and Physics concept test. Then, the reasoning test instruments used LCTSR (Lawson's Classroom Test of Scientific Reasoning) which had been translated into Indonesian and validated by Linguists and Physics lecturers. While prior knowledge test instruments consisted of 25 problems to identify how deep the students understand the materials before they undergo the learning process. While, the Physics concept test consisted of 25 problems, which was done after all the learning process finished. The measurement instrument analysis was validated by using content analysis or expert of judgment done by two Physics lecturers. Next, the validation was done for the problem items by testing the instruments empirically to the students. After the trial was done, it followed by measuring the difficulty level, different ability, validity of problem items and items reliability. The test instrument data of student's Physics conceptual understanding and prior knowledge were validated for the problems with Pearson correlations coefficient by SPSS 23.00 for

Windows program. The validation results obtained 25 proper items to test the student's Physics conceptual understanding and their prior knowledge. Based on the reliability test, from the prior knowledge test obtained 0,870 and the Physics conceptual understanding test items obtained 0,877. The items were categorized into high category or very reliable. The results of reliability test from each test are presented in the following Table 2.

Table 2. Reliability Test Result

	Cronbach's Alpha	Number of item
Prior knowledge test	0,870	25
Physics concept test	0,877	25

Before analyzing the data, pre-requisite analysis tests were performed. The pre-requisite tests include normality test, homogeneity test, and linearity test. Normality test was used to ensure that the data was normal, the homogeneity test aimed at ensuring that the data was homogeneous, and the linearity test was used to ensure that data was linear. After satisfying the entire pre-requisite tests, the hypothesis testing was done. The hypothesis testing was done by using two-way ancova statistic method. The ancova test was processed by SPSS 23.00 for Windows program.

Result and Discussion

Before the Modelling instruction-based learning was carried out, students took two tests; prior knowledge test and students' reasoning ability test. Prior knowledge is precondition to learn new knowledge. As the students' score on the prior knowledge is higher before he started the learning, then it will be easier for the students to learn a new knowledge and relate it with his prior knowledge. The score of prior knowledge test of the control class' students is lower comparing to the score of the students' prior knowledge from the experimental class. The data of prior test result can be observed in Table 3. Because this score is not comparable, then this score is used as covariate value when the data analysis is undertaken.

Table 3. Result of Students' Prior Knowledge

Class	N	Score		
		Highest	Lowest	Average
Modelling instruction (A1)	60	18	5	12,22
Conventional model (A2)	60	17	5	11,68

Table 3 shows that the average score of students' prior knowledge from both experimental class and control class are different. It is because each student possesses different level of topic acquisition thus the prior knowledge of the students before coming to class could be diverse. Some previous topics would be a good start for the students for the next new topic to understand. Teacher will not be able to control the prior knowledge score hence the students will get the same result at the end. Identifying how deep the prior knowledge of the students is important because it has significant impact of the students' ability in accepting new Physics concept. In this research, prior knowledge is inevitable to control therefore the score of the prior knowledge test was used as the covariate value.

The result of reasoning ability test from all of the students by using LCTSR as the instrument indicated that the average score of the students' reasoning ability from the control class is higher compared to those of the students from the experimental class. The result of reasoning ability test is presented on Table 4. This test result then was ranked and categorized into group of those with high reasoning ability and low reasoning ability for each class. The result is shown in Table 5.

Table 5 shows that the average score of students' reasoning ability from the experimental class is different from the control class students. It obviously occurred because each student has their own level of ability. The students in control class have higher reasoning ability than the students in experimental class, but the score shows that the students of experimental class are not left behind too far. This research focuses on identifying the impact of the applied learning model to students' ability in mastering concept since each of them has different reasoning ability. Second, this research also

attempts to see how close the relationship is between the students' reasoning ability and students' ability in understanding the Physics concept. The result, referring to the grouping technique done previously where it was found that there are control and experimental student class with high and low reasoning ability, is quite diverse. Every student have different reasoning ability correspond to the thinking development. Indeed, teachers will find it difficult to control students' reasoning ability thus they will obtain the same score at the end. However, the main duty of the teacher is to facilitate their students to keep enhancing their reasoning ability.

Tabel 4. The result of Students' Reasoning Ability

Class	Score			
	Highest	Lowest	Average	SD
Modelling instruction (A1)	21	7	15,12	4,00
Conventional model (A2)	22	5	15,27	4,79

Tabel 5. The Grouping Result of Students' Reasoning Ability

Class	N	Maximum	Minimum	Average	SD
High reasoning ability with Modelling instruction	30	21	17	18,63	1,40
Low reasoning ability with Modelling instruction	30	14	7	11,60	2,25
High reasoning ability with conventional model	30	22	17	19,47	1,48
Low reasoning ability with conventional model	30	13	5	11,07	2,83

The conceptual mastery test given to the students after all the treatments were done thoroughly. The score of the results of conceptual mastery test both to control class students and experimental class students are presented in Table 8. The experimental class students' average score was 18, 43 with maximum score achieved was 24 and the minimum score achieved was 11. While the control class students' average score was 16, 97 with maximum score achieved was 23 and the minimum score achieved was 11. The maximum and minimum score was from score range of 0 – 25. Based on the data, the experimental class has higher average score than the control class. Nonetheless, if it is viewed from different perspective, from the students' prior knowledge, the experimental class has lower score than the control class. In addition, according to the conceptual mastery score, the experimental class obtained higher score compared to control class.

The Physics conceptual understanding score of experimental and control classes are summarized in Table 6. The experimental class with high reasoning ability students' average score was 19, 43, while the students with low reasoning ability scored only 17, 43. This students' average score shows that the students' with high reasoning ability has higher mastering concept score as well comparing to the students who have lower score in reasoning ability. The control class with high reasoning ability students' average score was 17, 67, while the students with low reasoning ability scored only 16, 27. The average score on this control class shows that students with high reasoning ability on the control class have higher score in master concept as well than the students with lower reasoning ability.

Tabel 6. The Result of Students' Physics Concept Score

Class	N	Score			
		Maximum	Minimum	Average	SD
Modelling instruction (A1)	60	24	11	18,43	2,68
Conventional model (A2)	60	23	11	16,97	2,96

Tabel 7. The Result of Students' Physics Concept Score Based on Reasoning Ability

Class	N	Maximum	Minimum	Average	SD
Modelling instruction with high reasoning ability	30	24	11	19,43	2,68
Modelling instruction with low reasoning ability	30	21	13	17,43	2,68
Conventional model with high reasoning ability	30	23	11	17,67	3,21
Conventional model with low reasoning ability	30	21	12	16,27	2,54

Tabel 8. Ancova Test Results Learning Models and Reasoning Ability on Students' Physics Concept

Source	Type III Sum of Squares	Df	MeanSquare	F	Sig.
Corrected Model	716.698 ^a	4	179.175	71.920	.000
Intercept	408.929	1	408.929	164.141	.000
Pretest	562.765	1	562.765	225.890	.000
Bernalar	13.921	1	12.921	5.588	.020
Kelas	32.470	1	32.470	13.033	.000
Bernalar*Kelas	.054	1	.054	.022	.884
Error	286.502	115	2.491		
Total	38598.000	120			
Corretd Total	1003.200	119			

R Squared=.714 (Adjusted Rsquared=.704)

Data analysis through inferensial statistics with two-way ancova test was carried out to test the hypothesis using reasoning ability, prior knowledge and Physics concept test data assisted by SPSS 23.00 for windows program. In the analysis, the prior knowledge data played a role as a covariate. According to the pe-requisite data tests performed initially (normality test, homogeneity test between classes, and the linearity test) to check assumption of ancova, it indicated that the data were completely satisfied and the ancova test could be performed. The result of hypothesis test in Table 8 show that the significance value of F calculated learning model was 0.000. This value was smaller than alpha (0.05). This means that hypothesis (H_0) which state there is no difference of students' physics concept between students taught with Modelling instruction and conventional models was rejected. Accordingly, there is a significant difference in students' physics concepts between students who using Modelling instruction and using conventional model after controlling students' prior knowledge.

The statistical analysis showed that there was a significant difference in the Physics concept understanding between the students who learnt using Modelling instruction and students who learnt with conventional learning model with control the students' prior knowledge. The treatment given for students with Modelling instruction has shown better result comparing to the students from conventional class. It was occurred because Modelling instruction consists of several stages, beginning with the development of model in which students build the model then evaluate it with empirical evidence and discuss it to present their conclusions. The students gain their understanding by constructing their own knowledge and using model that they set to describe, explain, predict and control the Physics phenomenon (Dye et al., 2013; Hestenes, 2015) The Modelling learning model emphasizes on the basic scientific principle thus it can help to construct knowledge as the students as the center of the learning (Dye et al., 2013; Sujarwanto et al., 2014; Weber & Wilhelm, 2020). This is also supported by the statement from Kusairi et al. (2019) which said that Physics lesson allows students to be more focus and active in the learning process. The Modelling learning emphasizes on the model and focuses on the students' investigation to acquire understanding (Jackson et al., 2008; Weber & Wilhelm, 2020).

The Modelling cycle consists of two important stages, they are model development and model deployment. Model development stage allows students to develop model by only employing the simplest hint in the learning. After building a model, students evaluate it with empirical evidences and discuss to present their conclusion. After stating their conclusion, teacher give the students another problem in different situation. The same model is still be used and the students use the models that they have developed before to solve the problem. This stage is called model deployment. There are many stages in building and using the model such as collecting the data, organizing it into a model then evaluating its effectiveness, explaining the data and then convincing other students by giving arguments and the evidences that they have done before. The interesting Modelling activity is when the students use whiteboard during the discussion. Students present their conclusion on the whiteboard available for each group. The whiteboard is going to be a good way of flexible communication and becoming a forum for each group to have a discussion.

Model is the main concern, but Modelling is an important process. The teacher's task is to function as facilitator, making it possible for the scientific activity to last. This is in line with result of Lucas and Lewis (2019) research that importance of the use of various representations on the real learning practices such as pictures, diagrams, written explanation and mathematic expressions to enhance students' ability to solve problems. The representations created by students in the form of models has given reason why the Modelling instruction has been successfully applied at school by emphasizing the active construction of conceptual model and mathematics in the interactive learning community through the use activities focusing on building process, validating and spreading the models (Brewer et al., 2009). The ability to build, use and revise the models is important experimental physics skill (Dounas-Frazer & Lewandowski, 2018). The importance of Modelling in supporting the learning process is inevitably will elevate students' understanding concept ability. In the comparative analyses of inventory concept test score (FCI), it is shown that the students whom are taught by teachers who use Modelling method, have higher average score and higher FCI post test score comparing to the students who only receive traditional treatment during the physics learning process (Coletta et al., 2012; Coletta & Steinert, 2020; Jackson et al., 2008).

Students participating in development, validation, deployment and conclusion models are literally involved in authentic science practices. Brewer and Sawtelle (2018) has analyzed the development of conceptual model in physics classes starting from developing the first scientific conceptual models in a small group, then for the whole class. Modelling instruction gives main concern in giving students chances to develop conceptual model and get involved directly into practices to do physics. Conceptual model made by students does not always work. Some students still found difficulties in making conceptual model especially at the early week during the research was being conducted. Some students even cannot write the model that they make well, and even they focus more on the formula writing. The habit of using the formula without knowing or understanding the meaning and the purpose of the formula itself has made the students' understanding about Physics phenomenon is merely about the theory and formula. The students are lack of reasoning ability and they only try to solve the problems by using mathematics equations.

The result of hypothesis test show that the significance value F calculated reasoning ability was 0.020. This value was smaller than alpha ($0.020 < 0.05$). This means that hypothesis (H_0) which there is no difference of students' physics concept between students who have high reasoning ability and low reasoning ability was rejected. It means there is a significant difference in students' physics concept between those who have reasoning ability and those who have lower reasoning ability, and this result is also controlled by students' prior knowledge as well.

The data analysis result shows that there is a significant difference between students' ability in mastering the concept between those who have high reasoning ability and those who have lower reasoning ability which is controlled by students' prior knowledge. In the experimental class, Students who have high reasoning ability have higher conceptual mastery score than students who have lower reasoning ability. The same thing happened to control class. In the control class, Students who have high reasoning ability have higher mastering concept ability score than students who have lower reasoning ability. From the result of ANCOVA, it is impossible to ignore the students' reasoning ability. This ability will help students' process of thinking so that they can arrive at the correct Physics concept. The high reasoning ability of students will help them to think well than those who have lower reasoning ability.

There are some reasons why some students have low score in conceptual mastery. The students' mechanism in learning is strongly related to their reasoning ability and it is suggested critically that brain activity during the Physics reasoning should be a serious concern (Brewer & Sawtelle, 2018). Students with low reasoning ability will have limitation in understanding the whole learning well at beginning of the learning process. This research result is supported by the research of Coletta and Phillips (2005) which stated that when comparing two approaches of learning on different classes, the students' background from each class should be taken into consideration. It indicates that the researchers should pay attention to several reasons instead of the applied learning model only. Other research has mentioned that reasoning ability is a hidden variable that affects students' ability in

mastering the concept (Meltzer, 2002). All students will show the same improvement of understanding if the interactive model learning is applied, but the study result will be determined mainly by each student's prior knowledge. This statement is strengthened by Ding's research (Ding, 2014) which mentioned about the relationship between the reasoning ability and mastering concept score. The students' reasoning ability has a strong relationship with mastering concept score gaining.

This research shows that there is a difference of conceptual mastery between the students who have high reasoning ability and the students who have lower reasoning ability. This is in line with the result of Shayer's study that students' reasoning ability has long impact on students' academic achievement in the future (Adey & Shayer, 1994). The reasoning ability has a strong bound with critical way of thinking and involvement in investigation process so that an argument, concept modification and theory about science are built (Bao et al., 2018; Stender et al., 2018; Zimmerman, Olsho, Brahmia, Loverude, et al., 2020; Zimmerman, Olsho, Loverude, & Brahmia, 2020). In addition, research correlation has found that scientific reasoning ability correlates positively with students' achievement (Frosch & Simms, 2015; A. E. Lawson et al., 2007) and performances on concept test (Coletta et al., 2007, 2008, 2012). Scientific reasoning is the ability to think about the characteristics of formal development to master concepts and solve physics problems (Erlina et al., 2018). This result would motivate to actively improve the education environment, not only on the physics contents aspect, but also more to the improvement of students' reasoning ability (Bao et al., 2018).

Students' reasoning ability strongly related to students' critical thinking. The initial research shows that scientific reasoning ability can be developed by training and it can be transferred to support the learning process at school. Students who have high reasoning ability show that they have higher ability as well in conceptual mastery. Training for reasoning ability is needed because it has long term impact on the students' academic achievements.

The result of hypothesis test show that the significance value F calculated interaction learning model and reasoning ability was 0,884. This value was greater than alpha (0,05). This means that hypothesis (H_0) which state there no interaction between learning model and reasoning ability on students' Physics concept accepted. Therefore, it can be concluded that Modelling instruction was shown to be superior in both low and high reasoning ability, and high reasoning ability were superior to low reasoning ability for both methods. Hence no interaction effect is present between the learning model with reasoning ability to see the value of the main effect becomes very useful.

Students who study Physics using Modelling instruction are better than students who study Physics using conventional learning method. The research done by McPadden and Brewe (2017) and Kusairi et al. (2019) showed that learning model by using Modelling instruction has significant impact to students in representing answers, thus students will understand the concept deeper. Students need more time to adapt well with the Modelling instruction-based learning model than to adapt with the conventional model that they had been carried out previously.

The important part of the Modelling instruction learning model is involving students in practicing and doing the Physics experiment. It is further believed that the importance of students' thinking process is being developed and validating scientific conceptual model. It is observed that the students are thinking about it. It is also seen that a group of students involved in the process of negotiation by taking and giving meaning from the representation they made to help them understand the certain phenomenon. Several students compare two specific models developed by two different groups. They focused on the model itself and the way it is established; and it motivated them to develop their understanding about what is important in Physics. It is much bigger from the concept they understood or even the developed skill to solve the problems.

Conclusion

This research concludes that the conceptual understanding between student who were taught by Modelling instruction and conventional learning methods by controlling students' prior knowledge. The second-grade students of senior high school who study Physics using Modelling instruction has higher conceptual mastery than students who study Physics using conventional method

of learning. Students with high reasoning skill and students with lower reasoning skill also have different ability in mastering the concept. Students with high reasoning ability have higher conceptual understanding compared to students with lower reasoning ability.

In Modelling instruction, teachers take role as the physicist and use his/her expertise in selecting activities, observing and guiding the discussion, and motivating the students to participate in Physics experiment. We invite instructors and researchers who are interested to reproduce the positive results from Modelling instruction learning environment (Modelling cycle) to successfully make students focus in doing the Physics experiment. We hope to see further exploration on various problems such as instructors' roles in learning environment, and how students learn. We do not claim that Modelling instruction is the only perfect approach to be applied in the Physics lesson activities, but we propose that this research has shown positive results.

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