

## Problem-Solving Ability in Four Models of Learning

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### Abstract

The demands of the 21st century and curriculum 2013 is mastered various skills one problem-solving. 2013 curriculum gives a model learning using PBL, PjBL, and DL in exercising a high-level way of thinking that is problem-solving, moreover in the model can give influence on the learning outcomes of students. This research aims to: a) know the difference or not on the ability of problem-solving learning model in four, b) knowing the effectiveness of PBL learning model, the PjBL, DL, and DI against the ability of problem-solving. The research method used was a quasi-experimental design with a posttest-only control group design. The design of this study uses four groups of experiments. The research population was 224 students. Samples taken in cluster random sampling amounted to 128 students. Problem-solving ability data drawn from tests given to students in the form of multiple choice reasoned with the amount of 20 items. The results showed that a) there may be differences in the problem-solving ability of four models of learning are shown with PBL enough (59%), the PjBL of enough (55%), DL enough (51%), and DI enough (50%), b) effectiveness of four models of learning seen from the highest value on every dimension of problem-solving with the results: 1) the model PBL, PjBL, DL, including both categories and models DI categories include enough on solving dimension of meaning or the identification of problems, 2) PBL model including both categories, while the model PJBL, DL, and DI enough categories in dimension using concrete measures to address the problem or design and manage projects, 3) PBL model, PJBL, DL, and DI including sufficient dimensions category acquires, process, interpret, and analyze information to make a decision, 4), PBL, PjBL, DL, and DI including sufficient dimensions involved in the process of investigation solve, and 5), model PBL, PjBL, DL, and DI including sufficient dimensions make connections and transfer learning from one the situation to the other. Thus, the model of PBL, PjBL, and DL is good enough to measure problem-solving ability, but teachers are expected to minimize the use of the model DI this model is still centered on teachers so that students are less than optimal in developing problem-solving abilities.

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## INTRODUCTION

The era of globalization gives ample impact in various aspects of life, including the demands in education. One of the real challenges is that education should be able to produce human resources competencies, known by the competence of the 21st century. Education in the 21st-century places emphasis on intellectual development. Intellectual development is about solving real-world problems on a contextual or immerse yourself in a variety of way to know and learn.

According to Zubaidah (2016), problem-solving cannot be removed from critical thinking skills because critical thinking skills is a fundamental skill in solving problems. Students should also be able to apply the right tools and techniques effectively and efficiently to resolve issues. It is supported by Ellison (2009) states that the ability of problem-solving is one of the important aspects of the independent learning and help move to didactic teaching.

Based on the publication of the IEA results relating to the TIMSS result in the 2015 Indonesia ranked 45 of 48 with a score of 397. This was supported by the results of the 2009 PISA survey (OECD, 2010:131), as many as 49.7% of Indonesia students were able to solve routine problems whose context was still general and 15.5% students are able to application procedures and strategies in problem-solving. Meanwhile, 6.6% of students can connect with real-life problems and 2.3% of the students are able to complete a complicated issue and is able to formulate and communicate the results of its findings. Thus, we can conclude that the student's problem-solving capabilities of Indonesia are still less than optimal. Lack of

## METHODS

This research is used Research and Development by steps are: 1) preface study, 2) first research product, 3) small group experiment, 4) observational experiment product, 5) product revision , 6) finished product after revision. Research process and

problem-solving skills these students can cope with train students in order to enhance the skills of solving the problem. The increase in the problem-solving skills of students can be done by providing various innovation methods and models.

Science learning in the curriculum 2013 has provided the reference in the selection of appropriate learning model with a scientific approach (Wiyanto et al., 2017). The intended learning models include Problem Based Learning (PBL), Project Based Learning (the PjBL), or Discovery Learning. Arends (2008) stated the PBL helps students to develop skills and thinking skills to resolve problems. Research on the application of the Priyayi et al. (2017) the PjBL in learning science from research results can enhance cognitive learning results from students in the study of biology. It is supported by Pangaribowo et al. (2017) and Supliyadi et al. (2017), a model of Discovery Learning can improve student learning outcomes, to train students to become skilled, active, and independent. In addition, the students' curiosity about the matter so high that will assist students in improving learning outcomes. Therefore, models of learning based on the curriculum reference 2013 include Problem Based Learning, Project Based Learning, and Discovery Learning are expected to make students play an active role in their learning and develop the capability of solving the problems of students.

development begins by preface study including literature study and observational experiment. The researcher do literature study by material research and bibliography about learning models that used in curriculum of 2013, study some books about density material and study about

The research method used was a quasi-experimental design research with posttest-only control group design. Research design using four

of the group. Each group is given a post-test at the end of learning. The population in this research is grade VII SMP Negeri 6 Petarukan school year totaled 224 2018/2019 who consists of in 7 groups of study. The sample in this research was 128 students as many as four grades namely first class implement the learning Problem-Based Learning, the second class implementing the Learning Project Based Learning, the third class implements the learning Discovery Learning the fourth class, and implement the learning Direct Instruction. The technique of determining the number of samples taken using cluster random sampling, random sampling techniques on condition that the population has the same characteristics and were taught by the same teacher. The object that is examined is the ability of problem-solving students 7th grade four class. Data obtained from test results of students complete a multiple choice question reasoned amounted to 20 items tailored to indicators of problem-solving.

Data collection techniques used are observation, tests, and documentation. The technique of data analysis after a post-test is:

**Data problem-solving Ability Difference Score against four models of learning**

The score in may be based on right or whether the answers. If the answers and reasons true then get score 4, answer wrong and right reasons got a score of 3, the answer is right and the wrong reasons got a score of 2, answer and wrong reasons got a score of 1, if no answer at all gets a score of 0. Data were analyzed with the test scores to determine each student's average, then the value of each student analyzed statistical basis using one-way analysis of variance test (One Way ANOVA) and when there is a difference on the One Way ANOVA test then tested further use the Post Hoc test.

**Data Score the effectiveness of four models of learning problem-solving Ability against Students**

The effectiveness of four models of learning seen from the highest value of each dimension of the problem solving is analyzed in

a descriptive percentage. When one of the learning models occupy the highest value are considered then the model is superior or better against one of the dimensions of the problem solving is measured and vice versa.

$$N1 = \frac{\text{value derived}}{128} \times 100\%$$

$$N2 = \frac{\text{value derived}}{4}$$

Description:

- N1 = the average value of each problem.
- 128 = maximum value for every problem (4) x number of students (32)
- N2 = average value of one dimension of the problem solving

**RESULTS AND DISCUSSION**

**The Results of The Learning Ability of Students ' Problem Solving on Four Models of Learning**

Data results learn problem-solving ability is obtained from the multiple choice test is grounded with a total of 20 items based on the dimensions of the problem solving on ecosystem material presented in Table 1.

**Table 1.** The Results of The Learning Ability of Students ' Problem Solving

No	Aspects	PBL	PjBL	DL	DI
1	Many students	32	32	32	32
2	The average value of	58,63	54,94	51,31	50,44
3	The maximum value	75	68	66	74
4	The minimum value	49	43	38	35
5	The variance	34,37	46,19	54,54	75,74
6	Standard deviation	5,86	6,79	7,38	8,70

Based on Table 1, it is shown that the maximum value of the descending in the LBC, is

a model of ordered in, the PjBL of, and DL. Whereas the minimum value from the smallest to the large is ordered i.e. models on, DL, PjBL, and LBC. The variance value indicates how far a number of dispersed, high variance indicates that the data points are very scattered around the average and from each other. While the standard deviation of the data sets equal to zero indicates that all values in the set are the same. Larger deviation value would give the meaning that the individual data points are far from the average value.

The problem-solving ability of the data obtained from the results of students complete multiple choice tests is reasoned with 20 items on four classes with different study treatment. The results of the analysis of problem-solving ability in learning model are presented in Table 2.

Based on table 2, demonstrated that the ability of problem-solving students including enough on the model of PBL (59%), PjBL (55%), DL (51%), and in (50%).

On the dimensions of identification, meaning or solving a model of PBL, the PjBL, and the DL including a good, whereas in the model including less. The indicator used is to find, collect, and describes various information about the interpretation of the problem and in both aspects distinguish includes selecting, sorting, and focusing the irrelevant information and information relevant problem-based learning is designed to help learners develop their thinking skills, solve problems, and his intellectual skills through a variety of real situations or situations are simulated, be students who are independent, and autonomous.

Dimension use concrete measures to address the problem or design and manage projects, good PjBL, including LBC, DL, and included enough. The indicator used is designing or planning strategies in solving a problem, determine goals handle is to resolve problems, and systematic or elaborate on the problem in an orderly and logical relationship forming an integrated system. In addition the students enough in formulating a solution that includes making a hypothesis or make the causal

result of the problem, consider time in resolving the problem in order to generate the proper verdict, and concluded or mention by formulating a problem with the final award. One alternative for improving critical thinking students is to encourage questions that can stimulate the thinking processes (Afcariono, 2008). With critical thinking can improve learning outcomes (Adnyana, 2012). While according to Wardhani (2008) application of problem-based learning can improve the ability to solve problems and results of student learning.

The third, fourth dimension learning model includes enough. This is because students quite deep linking aspects include associate or associate are in completing the multi representative variable, mixing and structure or resolve the issue programmatically. In addition the students enough in applying inter alia apply the results of the plan into a solution based on data issues, implement or interpret the information into the interpretation of the problem in order to produce a final verdict, and operate or run strategy in resolving the problem. Slameto (2003) States that the result of factors influenced student learning in students and the factors that come from outside the student or environmental factors.

The fourth dimension, the four models including enough. The indicator used is the Organization of the data in the form of diagrams (tables, graphs, and charts, represent or draw something that could represent a problem solving, and process data in order to be more perfect. In addition, the students in both the test include connecting between variables, analyze or conduct an investigation into the problems, and draw conclusions. This is in line with the draft Handayani & Sopandi (2017) investigation groups in PBL successfully motivate each member contributes to the group that is visible in the data collection, provides the tools to understand the completeness of tasks to solve the problem.

The fifth dimension, the four models including enough, this is due to detect, test or examine the feasibility of the solutions created and read the question again and ask ourselves

about the feasibility of the solutions being made, students enough in aspects critiquing include assessing assumptions related solutions that are solving problems enriches the knowledge of learners. This finding is in accordance with the opinion of the Sanjaya (2014) that the problems presented in the LBC are a matter that is open

According to Satrianingsih et al. (2017), problem-based learning model can improve the

created, see the other settlement alternatives, and consider or examine the logical or not a solution is created. Alternative knowledge in attitude toward science are social implications regarding science, attitude to scientific inquiry, and an interest in the IPA.

**Table 2.** Problem-Solving Ability in Four Models of Learning

No	Dimensions	Learning (%)			
		PBL	PjBL	DL	DI
1	Solve the meaning or the identification	74	67	62	59
2	Use concrete measures to address the problem or design and manage project	66	59	56	54
3	The acquisition, process, interpret and analyze information for decision	46	44	42	40
4	Engage in the process of investigation solve	58	60	51	53
5	Making connections and transfer learning from one situation to the other	49	44	46	46
	Average	59	55	51	50
	Category	Enough	Enough	Enough	Enough

**The Effectiveness of Four Models of Learning Towards Problem-Solving Ability**

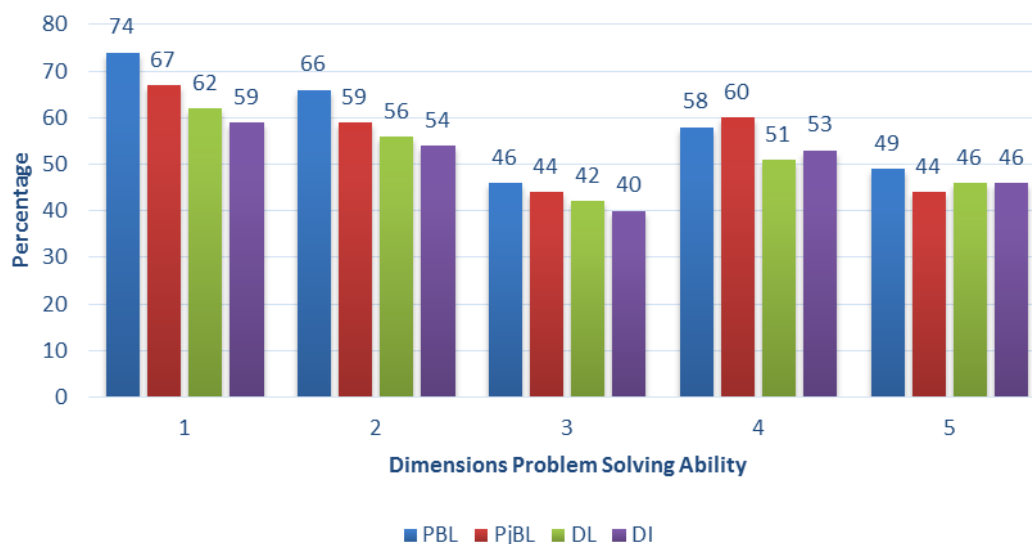
Effectiveness in this regard is the successor the circumstances of the affected models of learning in the dimension of the problem-solving. Based on Figure 1. shown that the model curriculum 2013 as LBC, PjBL, and DL is superior in dimensions of problem-solving i.e. solving the meaning or identify. This can be due to a matter of routine or setup worked with reserved found in everyday learning allowing students answered correctly. On the dimension of resolving the meaning or identification, students already well in identifying aspects, among others, students discover, collect and describes various information into the interpretation of the problem. While the model of learning in dimension less than optimal acquisition, process, interpret and analyze information for made decisions. There are two aspects to of this dimension includes the connect and apply. Aspects of connecting, students are

asked to associate or associate variables in finishing in multi represents, mixing and structure or resolve the issue programmatically. Applying aspect includes applying the results of the plan into a solution based on data issues, implement or interpret the information into the interpretation of the problem in order to produce a final verdict, and operate or run strategy in resolving the problem. It is similar to research Ridlo & Irsadi (2012), that there is the development of a conservation-based character education values can range from simple things that occur in the process of active learning and effective.

In this case, four models to find out students' problem-solving abilities including effective enough and the teacher should begin to reduce or even do not use the model in the learning process. This is supported by the research of Gagne in Wena (2009) that the learning problem-solving strategies can improve the results of systematic learning IPA learners,

since learning of this systematic problem-solving strategies provide an opportunity to the learners to learn to solve problems systematically. the best way you can help students in problem-solving is solving problems step by step by using certain rules. Research Ayuningrum & Susilowati (2015) mentioned that the activities of the discussion on emerging issues in the

community can have an effect on students' critical thinking skills to solve problems. According to Usman et al. (2017) in addition, the group discussion model teachers can bring up the different arguments of each student, so that an atmosphere of learning to be more interesting and fun.



**Figure 1.** Chart The Effectiveness of Four Models of Learning on The Ability of Problem-Solving

Description:

- 1 : Solve the meaning or identification
- 2 : Use concrete measures to address the problem or design and manage projects
- 3 : Acquire, process, interpret and analyze information for decision
- 4 : Get involved in the process of investigation solve
- 5 : Making a connection and transfer learning from one situation to the other

Criteria (Widoyoko, 2013):

- ≤ 20 % : Very less
- >20%-40% : Less
- >40%-60% : Enough
- >60% - 80% : Good
- >80% : Very good

Susilowati & Anam (2017) asserts that learning biology in MA (Madrasah Aliyah) Typical Kempek still dominated by teachers with student involvement is low. The results showed that an increase in the problem-solving

ability was 63.40% for XI MIA 3, 61.67% for XI MIA 4, and is classified in the category of being. Simple regression tests find the linear correlation between students' scientific reasoning and problem-solving abilities. This research confirms that the necessary reasoning abilities in problem-solving. In addition to competency in teaching, teachers should also have a good mastery of the learning material. Sukaesih et al. (2017) stated that the PCK (Pedagogical Content Knowledge) need to be optimized in some aspects of content and pedagogy. Needs to be improved in aspect mastery (content), the ability of teachers to manage classes that are effective, and harnessing the media learning that encourages active learning students.

### CONCLUSION

Problem-solving ability against four learning models has a different average. There are similarities and differences in the problem-

solving ability of four models of learning are used. The results of the equation-solving ability only on models DL and in, while PBL, PjBL, and DL have significant differences with the results: a) PBL model is better than PjBL, b) PjBL model better than DL and c) model PBL better than DL. It can be concluded that a good learning model in measuring the ability to is PBL, PjBL, DL, and DI.

Effectiveness of four models of learning seen from the highest value on every dimension of problem-solving with the results: a) model PBL, PjBL, and DL models in categories include enough on solving dimension of meaning or the identification of a problem, b) PBL models include both categories, whereas PjBL, DL, and DI enough categories in dimension using concrete measures to address the problem or design and manage projects, c) model of PBL, PjBL, DL, and DI categories include enough on dimensions acquire, process, interpret and analyze information for made decisions, d) model of PBL, PjBL, DL, and DI including sufficient dimensions involved in the inquiry process to solve, and e) PBL model, PjBL, DL, DI including sufficient dimensions make connection and transfer learning from one situation to another.

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