

## Effect of Problem Based Instruction on Higher Other Thinking Skills

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**Abstract:** This study investigated how the problem based instruction influenced higher other thinking skills. One group pretest-posttest design was used in this study. 36 student from science class participated in this study. Data in this study were collected using essay test. The result of Wilcoxon match pairs Test indicated that there are effects of problem based instruction to higher other thinking skills. This suggest that the Problem Based Instruction had a significant effect on increasing the higher other thinking skills.

**Keywords:** problem based instruction, higher other thinking skills

### INTRODUCTION

Physics as one branch of science focused on efforts for students to think about how science affects in life and use science to solve problems. In the learning process in class, often students be positioned as an empty container to be filled with a variety of science knowledge. This will obstruct the thinking skills of students, because students only as an object in the learning process. Thinking skills should always be applied in the learning process in the class in order to be a good learning process. The thinking skills that should be learned is a higher other thinking, complex thinking, and critical thinking. Thus, efforts to improve the quality of learning, especially in the development of high-level thinking skills of students is needed and applied in every classroom.

Learning physics at the high school level should be able to improve students' thinking skills. This is consistent with the contents of the the purpose science subjects in Permendiknas No 22 Tahun 2006, This is consistent with the contents of the the purpose Permendiknas science subjects. In Permendiknas 22 of 2006, which explain that the purpose of subjects in science and technology in SMA/MA/SMALB intended that students acquire further competences in science and technology as a provision in the universities and in order to cultivate scientific thinking critically, creatively, and independently (Depdiknas, 2006). High other thinking skills of students categorized by cognitive ability to analyze (C4), evaluating (C5) and create (C6) (Krathwohl 2002). Problem based learning is a model appropriate to achieve the objectives of science education. Cause the learning of physics that deals with real life can be understood easily if the student is able to resolve the problems associated with the life of it. Research on the effects of problem based learning in science education has much to do (Treagust & Peterson, 1998; Greenwald, 2000). Some research suggests that problem based learning can improve student learning achievement (Sungur et al., 2006; Polanco et al., 2004). Therefore, this study aimed to determine the effect of Problem Based Instruction to the high other thinking skills.

### METHOD

The method in this research is experimental design with one group pretest posttest design. The sample was 36 students of class X SMA Muhammadiyah 2 Pontianak selected by random cluster. Data were collected by the test essay. Tests validated by experts and have been declared eligible. Also based on the empirical validity are analyzed using the equation Pearson Product Moment obtained 7 of 9 questions that is valid. Using alpha cronbach equation obtained the seventh question has a high reliability. Data analysis was performed to determine the effect of learning model Problem Based Instruction against high order thinking skills of students. First, normality test using the chi-square ( $X^2$ ). Furthermore, to answer the hypothetical use Wilcoxon Match Pairs Test. Analysis of how much influence the Problem Based

Instruction against high order thinking skills of students is used effect size equation based on Sutrisno (Edy 2015).

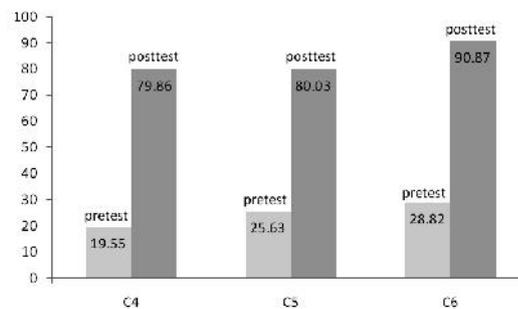
## DISCUSSION

High order thinking skills of students obtained from achievement test which includes cognitive abilities by (Krathwohl 2002) that is analyzes (C4), evaluating (C5) and create (C6). High order thinking skills before being applied to the Problem Based Instruction obtained from pretest score and high order thinking skills after being applied to the Problem Based Instruction obtained from posttest score, are presented in Table 1.

**Tabel 1.** Pretest and posttestes of student achievement

Label	pretest	posttest
Mean	26,44	84,77
Score max	59,15	100
Score min	0	45
standard deviation	17,53	14,03

Based on Table 1 it can be seen that the posttest of high order thinking skills of students is higher than the pretest. This shows that there is an increase in the classical high order thinking skills of students after applied Problem Based Instruction.



**Gambar 1.** Higher order thinking skill based on analyze (C4), evaluating (C5) and create (C6)

In Figure 1 we can see that the posttest on each ability to analyze (C4), evaluating (C5) and create (C6) is higher than the pretest. This suggests that the increase in high order thinking skills of students not only classical but also occurs based on the capability C4, C5 and C6. Descriptively, the increase shows that the learning Problem Based Instruction affect of students' higher order thinking skills.

Statistically, to investigate the influence of Problem Based Instruction against high order thinking skills students then tested the hypothesis. But first normality requirements analysis using Chi-Square ( $X^2$ ). Normality test results can be seen in Table 2.

**Tabel 2.** Normality result

Label	pretest	posttest
$X^2$ hitung	11,11	15,61
$X^2$ tabel	7,81	7,81
Conclusion	Not normally	Not normally

Normality test in Table 2 is done at the level of 95% ( $\alpha = 0.05$ ) with degrees of freedom  $df = 6-3 = 3$ , so that it can be concluded that the data pretest and posttest high order thinking skills students are not normally distributed. Due to hypothesis can be conducted by Wilcoxon Match Pair Test. The results of the test obtained Wilcoxon Match Pair Test with Z value of 1.96. It can be concluded that the hypothesis is accepted

that there is influence of Problem Based Instruction to the high order thinking skills of students. The influence of the learning Problem Based Instruction is known based on the value of the effect size is 3.32. These results indicate that the Problem Based Instruction to give effect to the high criteria of the high-level thinking skills of students.

In the model of Problem Based Instruction students are required to solve the problems through discussions and a real investigation. Thus, students will better understand the concepts being taught. In addition, the retention to the concepts learned last longer, due to learning activities not only listen to lectures and memorizing the content of the material, but more than that. This has become one of the advantages of learning model Problem Based Instruction. Excess is in line with the opinion of Trianto, (2009: 97) states that excess Problem Based as a learning are: realistic to student life, concept according to the needs of students, can be increase inquiry of students, retention concept so strong, and cultivate the ability of problem solving.

Problem Based instruction is a problem based teaching that presents a real problem and a real investigation to obtain information to problem solving, develop skills of inquiry, so it can train students' thinking skills such as applying, analyzing, evaluating and creating (Trianto, 2009). The ability to apply and analyze the students are trained when students analyze the data obtained by the results of the investigation. The ability to evaluate the students are trained to determine when students discuss hypothetical problem solving to a case and answering questions oriented level cognitive domains evaluated and trained to be creative ability when students work in groups to design a simple experiment. Therefore the high order thinking skills that consists of analyzing (C4), evaluating (C5) and create (C6) can be enhanced by Problem Based Instruction. In addition Arends (1997) also stated that the Problem Based Instruction is a model of learning that can train students' ability to solve problems, develop the ability to develop authentic and high rate capability. This is suggest with (Copland 2000) which states that the Problem Based Learning is able to develop a high level understanding. Problem Based Learning can affect students' ability to high order thinking (Wardana, 2012).

## CONCLUSION

Based on the results of this study concluded that the Problem Based Instruction give effect to the high order thinking skills of students. This effect can be seen by an increase in high order thinking skills of students after applied Problem Based Instruction. Therefore, Problem Based Instruction can be used to improve the ability of students' higher order thinking.

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