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Effectiveness of Problem Posing Model on Ability of High School Physics Teacher's to Solve HOTS-Based Problems

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ABSTRACT

The importance of the teacher's role in mastering HOTS-based questions greatly influences the learning outcomes achieved by students. So we need an appropriate learning model to guide students to more easily solve HOTS-based problems. This study aims to determine the effectiveness of the Problem Posing model in improving the ability of high school physics teachers to solve HOTS-based problems. The method used in this study was quantitative research that was quasi-experimental with the design of One Group Pretest-Postest Design. This design consists of one group chosen randomly and it was given a pre-test before being given treatment. That group was given a treatment of applying the Problem Posing model and after that, the group was given a post-test to find out whether there was an effect of applying the Problem Posing model to the ability of physics teachers in solving HOTS-based problems. The study population included all physics teachers in Bener Meriah, Central Aceh. The research sample was taken using random sampling techniques. Data were collected from the results of the pretest and posttest done by the physics teacher, namely the Friction Force HOTS-Based Problems. The data is analyzed using two-tailed t-test formula. The results of data analysis obtained tcount> ttable was 2.79> 2.06 which means Ha is accepted and it was obtained an n-gain score of 64.69. Based on these results it could be concluded that the Problem Posing model is quite effectively used to improve the ability of teachers to solve HOTS-based problems.

Keywords: Problem Posing, HOTS, Physics

INTRODUCTION

The National Examination (UN) is one of the references applied by the 2013 curriculum in completing studies at an educational level. Physics is one of the subjects tested in the National Examination at High School level. The National Exam is one form of national-level learning that has been determined by the government to find out student learning outcomes. That serves also as a standard and instrument for evaluating the quality of educational outcomes or learning outcomes at the education unit level. With these standards or instruments, each school is expected to improve its education and learning processes so that they achieve minimal success.

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The results of the National High School Physics Exams in Bener Meriah, Central Aceh for 2019, which were taken by 194 examinees and chose the physics field, showed that of the 40 indicators were tested only 3 (7.5%) indicators of achievement which were above 55% and 37 other indicators below 55% (92.5%). In 2018 followed by 115 participants who chose the field of physics from the same number of indicators, none of which was above 55%, while in 2017 it was followed by 65 participants with the number of indicators is also 40 indicators tested only 2 (5%) indicators of achievement with an absorptive capacity above 55% and 38 other indicators are below 55% (95%). Then in 2016 followed by 1014 participants there were 6 indicators with power the absorption is above 55% (15%) while the 34 indicators of absorption are below 55% (85%) and in 2015 followed by 993 examinees 32 indicators achieved absorption above 55% (80%), while the rest 8 indicators of absorption under 55% (20%) (Puspendik, 2019).

Based on those data, that has become a serious concern among educators due to the low UN results achieved by high school students in Bener Meriah for Physics subjects in the last 5 years since 2015-2019. In addition, no single indicator which is an indicator of HOTS (High Order Thinking Skills), that is included in the absorption capacity above 55%. This becomes a problem that must be immediately found a solution so that the achievements of student learning outcomes can be improved, not only be able to solve indicators based on LOTS (Low Order Thinking Skills), but also including questions based on HOTS.

The role of teachers in guiding their students is very important because teachers are the pioneer in an education system. If the teacher didn't have good competence in guiding their students, the results achieved by their students wouldn't be as expected. Therefore, teacher competence in solving National Examination questions based on LOTS and HOTS is very influential on the achievements of their students on the results of their National Examinations. However, at present HOTS-based questions are a frightening specter for teachers so that they are often ignored in the guidance process for their students. So we need a learning model that can package HOTS-based training questions into questions that are easily understood and solved by teachers and students. In solving HOTS-based questions, a characteristic that is needed is the ability to think at a high level that allows critical students to ask questions and practice questions that are continuous. The learning model that fits the characteristics of the HOTS problem is the Problem Posing model.

In Order to find a solution to improve the achievement of the National Examination outcomes in High School Physics at Bener Meriah, researchers wanted to examine the effectiveness of Problem Posing model on the ability of high school physics teachers in solving HOTS-based problems. We expected that after finding an appropriate learning model in solving HOTS-based problems, there will be no more obstacles for students in solving HOTS-based UN Physics problems and also LOTS-based questions.

Problem of Research

The problem of this research is to find out whether the Problem Posing model is effective in improving the ability of high school physics teachers to solve HOTS-based problems?

Research Focus

The focus of this research is the effectiveness of Problem Posing model to improve the ability of high school physics teachers to solve HOTS-based problems.

METHODOLOGY OF RESEARCH

General Background of Research

The method used in this study was a quantitative method that was a quasi-experimental design with the design used in these was One Group Pretest Postest Design. This design consists of one group chosen randomly, then given a pre-test before being treated to determine the initial ability of the group. After being treated in the form of the application of the Problem Posing model, the group was given a post-test to find out whether there was an effect of the application of the Problem Posing model to the ability of the physics teacher in solving HOTS-based problems. The study population included all physics teachers in Bener Meriah, Central Aceh.

Sample of Research

The subject of research was taken using random sampling techniques to examine the effectiveness of the Problem Posing model on the Physics teacher's ability to solve HOTS problems. We obtained 24 physics teachers in Bener Meriah who were sampled in this study.

Instrument and Procedures

That instrument was a HOTS-based type of test instrument developed by researchers based on the taxonomy of Anderson and Kartwohl (2001) which measures the ability in the realm of analysis (analyzing-C4), evaluate (evaluating-C5), and create (creating-C6). These HOTS-based problems were focused on the material of the Friction Force and were given to the sample before the treatment (pretest) and after the treatment (posttest).

Data Analysis

The results of the pretest and posttest were tested for normality using the liliefors test, then data were analyzed using the two-tailed t-test formula to determine the effect of the Physics teacher's ability to solve HOTS-based problems after applying the Problem Posing model. After the effect is known, then the effectiveness of the model is calculated using the n-gain formula.

RESULTS AND DISCUSSION

This research was conducted using the problem-posing model to improve the ability of high school teachers to solve HOTS problems. Data were collected from the results of the physics teacher pretest and posttest in Bener Meriah, Central Aceh. The results of the pre-test and post-test score shown in the picture below:

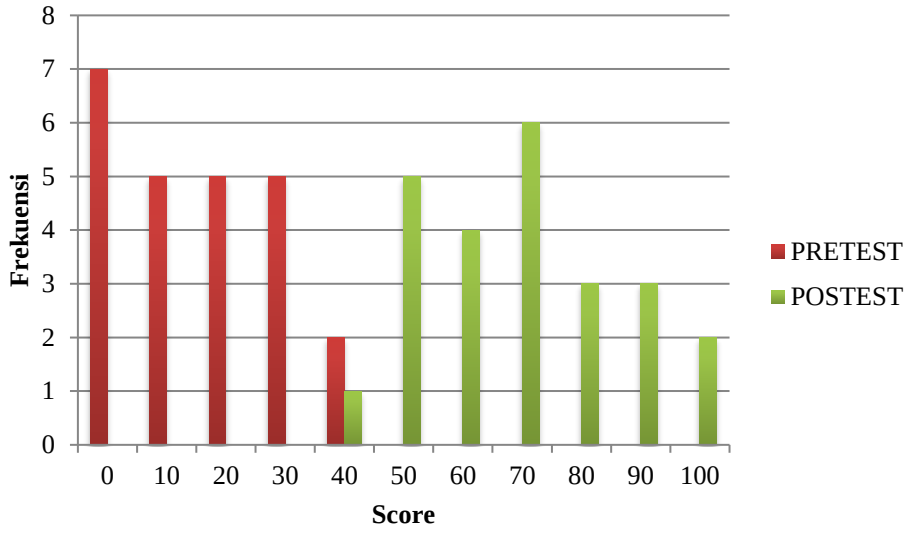

Figure 1. Graph of results the pre-test and post-test score

The data were analyzed using the two-tailed t-test formula and obtained the results of $t_{count} > t_{table}$ is 2.79> 2.06 which means that Ha is accepted. Details of the analysis data shown in the table below:

Table 1. The Result of Analyzed data

Description	***Pretest***	***Postest***
Mean	15.83333333	69.16666667
Variance	181.884058	286.2318841
Observations	24	24
Pearson Correlation	0.670111462	
Hypothesized Mean Difference	0	
Df	23	
	-	
t Stat	20.50783822	
P(T<=t) two-tail	2.79745E-16	
t Critical two-tail	2.06865761	

Those results indicate that have a positive influence on the use of the Problem Posing model on the ability of high school physics teachers to solve HOTS-based problems. Furthermore, data analysis was performed using the n-gain formula to find out how much influence the Problem Posing model was effective at improving the ability of high school physics teachers in solving HOTS-based problems. The detailed calculation data using the n-gain formula is presented in the table below:

Table 2. Presentase n-gain score

Statements	Group	N	Mean	n-gain (%)
Physics Teacher's Ability to solve HOTS Problems	Pretest	24	15.83333333	64.69577
	Postest		69.16666667	

The results of the data above show the n-gain score obtained from the calculation results is 64.69577 which is included in the quite effective category. This proves that the use of the Problem Posing model is quite effective in improving the ability of high school physics teachers in solving HOTS-based problems.

Stages of learning using the Problem Posing model is one of the problems based learning models. Problem-based learning aims so that students can identify and find solutions to problems both academically and in everyday life (Brookhart, 2010: 5-8). The Problem Posing Model applied in this study trains teachers to explore the concepts they already have by making problems that they find difficult to solve, then analyzing the questions and predicting solutions (Susanto, 2013) so that teachers are trained to think critically, be active in learning, and improve his confidence in solving a problem (Thobroni and Mustofa, 2012).

The ability to think needed here is the ability to think at a higher level where Higher Order Thinking occurs when students engage with what they know in such a way as to change it, meaning that students can change or create the knowledge they know and produce something new (Dini, 2018). Widana (2017: 3) argues that when viewed from the dimension of knowledge, generally the HOTS problems measure the metacognitive dimension, not just measuring the factual, conceptual, or procedural dimensions. Metacognitive dimensions describe the ability to connect several different concepts, interpret, solve problems (problem-solving), choose a problem-solving strategy, find (discovery) new methods, argue (reasoning), and take the right decision. The ability to think at a high level is a factor that can improve the ability of high school physics teachers in Bener Meriah district to solve problems. The knowledge and understanding of the teacher develop so that they are skilled at solving HOTS-based problems about the material being taught namely Friction Force. The results of the above study are in line with the opinion of Suryosubroto (2009: 212) which mentions some of the advantages of the problem-posing model related to the ability to think higher level (HOTS), including Ability to solve problems to be able to find various ways of difficulty faced, develop knowledge and understanding students so students are skilled at solving problems about the material being taught, knowing the process of how students solve

problems and improving the ability to submit questions and a positive attitude towards learning material.

CONCLUSIONS

The results of data analysis obtained from the two-tailed t-test formula is $t_{count} > t_{table}$ (2.79> 2.06) which means that Ha is accepted. Furthermore, calculations using the n-gain formula to find out how effective the application of the problem posing model to improve the ability of physics teachers in solving HOTS-based problems obtained an n-gain score of 64.69 which is quite effective. Based on these results it can be concluded that the Problem Posing model is quite effectively used to improve the ability of teachers to solve HOTS-based problems.

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REFERENCES

Addison, I. (2018). *A Revision of Bloom's Taxonomy of Educational Objectives, Complete Edition*. New York

Anderson, L.W., Krathwohl, D.R. (2001). *A Taxonomy for Learning, Teaching, and Assessing*, Abridged Edition. Boston, MA: Allyn and Bacon

Brookhart, S.M. (2010). *How to Assess Higher-Order Thinking Skills in Your Classrom.* Alexandria : ASDC

Dini, H.N.(2018). *Higher Order Thinking Skills* (HOTS) dan Kaitannya dengan Kemampuan Literasi Matematika. *Prosiding Seminar Nasional Matematika* pp. 170-176, Universitas Negeri Semarang, Semarang.

[Puspendik] Pusat Penelitian Pendidikan, Kementerian Pendidikan dan Kebudayaan]. Laporan Hasil Ujian Nasional. 2019. Tehubung https://hasilun.puspendik.kemdikbud.go.id/#2019!sma!daya_serap!06&11&999!a&04&T&T&1&!1!&. Di akses 29 Desember 2019

Suryosubroto. (2009). *Proses Belajar Mengajar*. Remaja Rosdaskarya. Bandung.

Susanto, A. (2013). *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Prenadamedia Group. Jakarta.

Thobroni, Muhammad dan Arif M. (2012). *Belajar dan Pembelajaran*. Ar Ruzz Media. Yogyakarta.

Widana, I.W. (2017). *Modul Penyusunan Soal Higher Order Thinking Skills (HOTS)*. Jakarta: Direktorat Pembinaan SMA Dirjen Pendidikan Dasar dan Menengah Kemdikbud.