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The Influence of Problem-Based Learning Model Learning Assisted by Science Media Kits on Student Learning Outcomes in Hydrocarbons

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Abstract

This study aimed to determine the effect of the problem-based learning model assisted by Kit IPA media on student learning outcomes in hydrocarbon material in class XI IPA SMA N 6 Palu. The type of research used was Pre-experiment with Alternative Treatment design, Post-Test-Only with nonequivalent Groups Design. Sampling was done using the purposive sampling technique with samples consisting of class XI IPA 4 as experimental class I and class XI IPA 2 as experimental class II. The research instruments were the learning outcomes tests, RPP, and observation sheets previously validated in theory and empirically. Testing student learning outcomes used t-test analysis two (two parties) with a prerequisite test: normality and homogeneity tests, then the t-test hypothesis test (two parties) was applied. Based on the research results and analysis of the research data, the value of student learning outcomes in the post-test of the experimental class I was 65.7 and for the exploratory class II was 59.9, while the standard deviation was 10.4 and 9.7, respectively. The results of the statistical testing of hypothesis testing obtained tcount> ttable or 2.60 > 1.70 so that H_1 was accepted. It means that the learning model of problem-based learning instruction assisted by Kit IPA media affects the learning outcomes of students of SMA Negeri 6 Palu.

Keywords: Problem-based learning, Kit IPA media, learning outcomes, hydrocarbon

Introduction

Chemistry learning is essentially a way of finding out and understanding nature systematically so that chemistry is not taught just by providing an understanding of the notions, facts, concepts, and principles but also a discovery through a search process with action real. It indicates that good chemistry learning is not just enough to be taught in theory but needs an atmosphere that allows students to be directly involved in the learning process to understand better what has been taught (Malihah, 2011).

Chemistry is one of the subjects that are considered problematic by students. Students' difficulty understanding chemistry is marked by their inability to understand chemical concepts correctly (Rogers et al., 2000).

The concepts of chemistry are abstract and interrelated, including hydrocarbons. Hydrocarbons are chemicals that are closely related to everyday life, which helps us learn more chemical concepts. However, the idea of hydrocarbons is comprehensive, abstract such as compounds, molecules, and their particles, and has links between concepts, so that in learning, it needs continuity. It causes the idea of hydrocarbons to be difficult for students to understand; for that reason, studying hydrocarbon material requires a suitable and appropriate learning model to motivate students to learn. In addition, teachers must also be able to create learning conditions that can make students active in constructing or building their knowledge, so that knowledge about hydrocarbons will be remembered longer.

The use of conventional models and the lack of media during the learning process make students think chemistry is complex. Students' difficulty in studying Chemistry can be sourced from problems in understanding terms, in theory, difficulty in understanding concepts, and difficulties in numbers in calculations (Ekawati et al., 2013). One of the appropriate learning models, among others, is a problem-based learning model with the help of the IPA KIT media.

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The problem-based learning model is a learning model aimed at developing student learning motivation, encouraging students to be able to think at higher levels, and students to optimize their metacognitive abilities. Become meaningful learners to encourage students to have increased self-confidence and ability to learn independently (Abidin, 2014). Learning model *problem-based learning* allows students to move towards mastery of information and learn to apply concepts in real-life contexts. This situation becomes the starting point for learning to understand concepts or principles and solve these problems through the process skills students do (Yadav, 2011; Yokhebed, 2012; Trisnawati et al., 2020).

Problem-based learning is not only about solving problems but using the correct problems to increase knowledge and understanding. Awang & Ramly (2008). The use of the IPA KIT itself aims to create a fun, active, creative, and effective science learning atmosphere (Dewi, 2013). The teacher's role is to ask problems, ask questions, and facilitate investigation and dialogue (Wisudawati & Sulistyowati, 2014). Meanwhile, with the help of the IPA KIT media, it is easier for teachers to convey subject matter, and students will more easily understand the concepts being taught (Satria, 2018; Dewi et al., 2021).

It can be in line with the steps in the PBL model, so the researcher intends to integrate the PBL model with the help of the Science KIT media. Learning using PBL (based on problems) will improve students' critical thinking and problem solving skills so that student learning outcomes increase, and the media used can also improve students' memory of the material.

Learning outcomes are changes in student behavior due to learning. These changes are pursued in teaching and learning to achieve educational goals. Changes in behavior are caused by students achieving mastery over several materials provided in the teaching and learning process (Purwanto, 2009). According to (Mappeasse, 2009), learning outcomes are abilities possessed both in terms of knowledge (cognitive), attitudes (affective), and skills (psychomotor), all of which are obtained through the teaching and learning process.

This paper intends to see the effect of the problem-based learning model assisted by KIT Science media on student learning outcomes on hydrocarbon material. With the influence of the problem-based learning model assisted by the KIT Science media, it can help students improve student learning outcomes to understand hydrocarbon material and solve problems and questions.

Methods

The type of research used is pre-experimental research (pre-experimental). Pre-experimental (pre-experimental) is a type of research in which there is no equalization of characteristics and no control variables (Sukmadinata, 2010).

The design used in this study is an alternative post-test-only treatment with a nonequivalent groups design, namely research by looking at the post-test between the experimental class 1 and the experimental class 2.

This research activity was carried out at SMA Negeri 6 Palu, in class XI IPA with a sample of 20 students as experimental class 1 (XI IPA 4) and 20 students as experimental class 2 (XI IPA 1). The sample collection technique used is purposive sampling, namely determining the sample considering the student placement system in the classroom and the same study time (Creswell, 2010).

The test instrument that the validator has validated is then tested in the field conducted at SMA Negeri 6 Palu in class XII IPA 1, totaling 20 students. The test results were then analyzed using the AnatesV4 application. AnatesV4 is a computer application program that aims to determine the validity, reliability, distinguishing power, and level of difficulty of each instrument question (Arif, 2014). The results of the analysis of the test instruments obtained from the 40 questions that were tested received 25 questions. Data analysis was carried out using a one-party t-statistical test on the right-hand side.

Results and Discussion

This study aims to determine the effect of the problem-based learning model assisted by science media on student learning outcomes in experimental class 1. While experiment 2 is taught using a problem-based learning model.

Based on the research conducted, the results of normality, homogeneity, and research hypotheses were obtained from the final test data in experimental class 1 and experimental class 2.

Normality test

Normality testing aims to determine whether the data obtained are typically distributed.

a) Experiment Class 1

Calculation results obtained data χ^2_{count} = 3.14 and χ^2_{table} = 5.99. These results meet the criteria for normally distributed data $\chi^2_{count} \leq \chi^2_{table}$ that is 3,14 ≤ 5,99.

b) Experiment Class 2

Calculation results obtained χ^2_{count} = 3.05 and χ^2_{table} = 5.99. These results meet the criteria for normally distributed data $\chi^2_{count} \leq \chi^2_{table,}$ which is 3.05 ≤ 5.99.

Table 1. Description of the test score (posttest) of students' chemistry learning outcomes for experiment 1 and experiment classes 2

Description	Final test (post-test)	
	Experiment class 1	Experiment class 2
Sample	20	20
Lowest value	52	44
The highest score	88	80
Average score	65.7	59.9
Standard deviation	10.4	9.7

Homogeneity test

One of the conditions in the homogeneity test states the difference between the two classes taken as a sample must be homogeneous, namely by conducting an F test (similarity of two variants). The largest variance = 10.4 while the smallest variance = 9.7. Earned value F_{count} = 1.07 and F_{table} = 2.15. Then the data meets the criteria for homogeneous data, namely $F_{count} < F_{table,}$ that is 1.08 < 2.15.

Hypothesis test

This study hypothesizes that the problem based learning model assisted by the KIT IPA media affects student learning outcomes in class XI IPA SMA Negeri 6 Palu. Testing this hypothesis is done by testing-t two parties.

Value $t_{(0.95)}$ with dk = 38 from the distribution list of students is 1.70, the test criteria is if $-t_{table} \leq t_{count} \leq +t_{table}$ $(1 - \alpha)$, $(n_1 + n_2 - 2)$ accept H_0 and H_a rejected. Based on the results obtained, -1.70 ≤ 2.60 ≥ +1.70 clearly in the rejection area H_0. So that H_0 is rejected and H_1 is accepted, it can be concluded that there is an effect on student chemistry learning outcomes using the problem-based learning model assisted by the KIT IPA media in class XI IPA SMA Negeri 6 Palu. In other words, the value of learning outcomes in experimental class 1 is higher than the experimental class 2.

Based n the data above, it is known $t_{count(2.60)} > t_{table(1.70)}$ or $t_{count(-2.60)} < t_{table(-1.70)}$. It means the value of t_{count} is outside the area of acceptance of H_0. Thus H_0 is rejected, and H_1 is accepted. It can be concluded that there is an effect of learning problem-based learning assisted by the KIT Science media on student learning outcomes in class XI science hydrocarbons at SMA Negeri 6 Palu. It means the value of learning outcomes in experimental class 1 is higher than in experimental class 2.

The analysis of student activity competency assessments showed that the average scores for experimental class 1 were 90, 93.1, 96.5, and 96.5%, while in Experiment 2 were 90.5%, 91.3%, 92 .2%, respectively, and 93.1%. The score shows interest and attention to learning, listening to teacher explanations, responding to teacher explanations, dividing groups besides conducting experiments, explaining the results of discussions, and ending the learning process. The observer observed the process directly while applying the problem-based learning model assisted by the KIT IPA media for 4 meetings. It shows that the activity of students in experimental class 1 in each session has increased. On the other hand, experimental class 2 experienced a slight increase in each meeting. The assessment results of student activity competencies in experimental class 1 were compared with the experimental class 2, which had an excellent attitude category with an average score of 91.7%. The effect of the problem-based learning model with the aid of the KIT IPA media positively impacts students in experimental class 1 and experimental class 2.

The following treatment tests for normality and homogeneity, a prerequisite test for the right-hand t-test statistic using parametric statistics, require that the data for each variable to be analyzed must be distributed and homogeneous before hypothesis testing is carried out. Based on the post-test results, students on the normality test for experimental class 1 obtained a value of 3.14 < 5.99, and for experimental class 2, a value of 3.05 <5.99. It proves that the two classes have normally distributed data. It shows that the data obtained are evenly distributed among students who get low,

medium, and high scores. The post-test results of students based on the homogeneity test were 1.08 < 2.15 with a significant value of 0.05. It shows no variance difference between experimental class 1 and experimental class 2, so the data is homogeneous. These data indicate that the ability level between the two treatment classes selected as the sample is relatively the same. So it can be concluded that the two data obtained are typically distributed and homogeneous.

The next test is hypothesis testing; the purpose of this test is to see whether the formulated hypothesis is supported by the data that has been collected. Based on the results of the hypothesis obtained from the two classes, for the experimental class 1 and the experimental class 2, the t_{count} value is 2.60 while the t_{table} value is 1.70, so H_0 is rejected. The hypothesis test results show that the problem-based learning model assisted by the KIT Science media has an effect on student learning outcomes.

It follows research conducted by Hidayat (2011), who concluded that the test of learning outcomes in the experimental class obtained a mean post-test score of 70.17, and the control class had a mean post-test score of 63.33. These results proved that the score of student learning outcomes taught using the problem based learning (PBL) learning model is higher than that of students taught using the conventional learning model. The results of calculating the post-test hypothesis by going through the t-test at a significance level of 0.05, that is, the results obtained are $t_{count} > t_{table}$, namely 2.228 > 2.048. Handoko (2016) concluded that there is a positive and significant relationship between the use of the Science KIT media and students' interest in learning science subjects for grade IV Public Elementary Schools in the Pengasih Kulonprogo III cluster. It can be proven by the correlation test results, which show that r_{count} is more significant than the r_{table}, namely 0.560 > 0.215. The calculated r value of 0.560 is close to 1, so it can be stated to be positively related. Then the significance test shows a significance value of 0.000 <0.05, so it can be noted that the study results are significant. Furthermore, Hastuti et al. (2016) found that the problem-based learning model assisted by virtual media affected students' mastery of physics concepts. The hypothesis test results in the final test obtained the value of t arithmetic > t table, which is 3.27 > 2.00 at a significant level of 5%, indicating a significant difference in concept mastery between the experimental class and the control class. This effect is shown by the average value of the experimental class, which is higher than the experimental class control. The highest increase in the experimental class value was found in the momentum and impulse sub-materials, namely 56%. The highest increase in the control class value was found in the sub-impact material, which was 25%. The results of research conducted by Jauhari et al. (2016) found that the problem-based learning model assisted by the PhET media had an effect on the physics learning outcomes of class X students of SMAN 1 Gunungsari in the 2015/2016 academic year. The fiber of research conducted by Indayani (2015), the use of the Science KIT Media is beneficial because it can improve students' learning achievement, both those with high achievement motivation and those with low achievement motivation. Good use of media will increase motivation in learning. Learning media can also help teachers make teaching and learning more effective and efficient. KBM will be effective and efficient if the teacher has prepared all the needs, including the media to be used before it is implemented. Media use in teaching and learning will be helpful and successful if the teacher can choose suitable media. The presentation of learning materials can utilize various types of media according to the school environment's goals, needs, and conditions. In addition, other studies mention Nurqomariah et al. (2015), The application of the problem-based learning model with the experimental method has a positive effect on the learning outcomes of Physics Science students in class VII SMP Negeri 19 Mataram in the 2014/2015 academic year. In addition, the experimental class with the problem-based learning model with the experimental method showed a higher increase in physics science learning outcomes than the control class with the conventional learning model. The application of the problem-based learning model with the experimental method showed a significant increase in the concept mastery sub-material, while the mathematical equation solving sub-material to determine a value did not significantly increase. As well as research conducted by Desriyanti & Lazulva (2016), it was concluded that (1) There was an effect of applying the Problem Based Learning model on the learning outcomes of class XI students of SMA Negeri 4 Pekanbaru on salt hydrolysis material. It can be seen from the value

of $t_{count} > t_{table}$, where t_{count} = 2.55 while the value of t_{table} at a significant level of 5% = 2.00. The average post-test value of the experimental class is 83.75, while the average post-test value of the control class is 79.545, (2) The effect of the Problem Based Learning model on the learning outcomes of class XI students of SMA Negeri 4 Pekanbaru on the subject of salt hydrolysis in the experimental class has to influence of 9.35%

Conclusions

Based on the results of the data analysis carried out, it can be concluded that there is an influence of the Science Kit media on student chemistry learning outcomes on hydrocarbon material. It can be seen from the results of statistical data analysis using the t-test of two parties on post-test obtained a value of $t_{count} > t_{tabel}$ or 2.60 > 1.70 so that H_1 is accepted, with a significant level = 0.05 and a degree of freedom, dk = 38. That is an influence of the problem-based learning model assisted by the science kit media.

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