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THE IMPACT OF HOTS-ORIENTED REALISTIC MATHEMATICS LEARNING ON LEARNING OUTCOMES IN TERMS OF STUDENT INTEREST

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Abstrak

Rendahnya kemampuan berpikir tingkat tinggi atau HOTS siswa perlu ditingkatkan. Salah satunya dengan meningkatkan kualitas model pembelajaran dan minat belajar siswa. Oleh karena itu penelitian ini bertujuan untuk mengetahui: 1) Apakah Pembelajaran Matematika Realistik berorientasi HOTS mempengaruhi hasil belajar siswa? 2) Apakah minat belajar berdampak pada hasil belajar matematika siswa? dan 3) Apakah minat siswa dalam pembelajaran dan Pembelajaran Matematika Realistik yang berorientasi HOTS berdampak pada pembelajaran matematika? Penelitian ini menggunakan Desain *non-Equivalent Posttest-Only Control Group* dan merupakan penelitian quasi eksperimen. Metode pengambilan *random sampling* digunakan untuk mendapatkan sampel. Kelas XI IPA 1 merupakan kelas eksperimen dalam penelitian ini dengan terapi model PMR dan kelas XI IPA 2 merupakan kelas kontrol dengan model konvensional. Data yang terkumpul kemudian dianalisis menggunakan ANOVA dua jalur. Temuan penelitian yang didasarkan pada analisis pengujian hipotesis, adalah sebagai berikut: 1) Model PMR berorientasi HOTS berdampak pada hasil belajar siswa, dengan sig. $0.000 < 0.05$, 2) Minat belajar berdampak pada hasil belajar matematika siswa, dengan sig. $0.000 < 0.05$ dan 3) Terdapat dampak antara model PMR berorientasi HOTS terhadap hasil belajar jika dilihat dari minat belajar siswa dengan sig. $0,008 < 0,05$.

Kata kunci: hasil belajar; HOTS; minat belajar; pembelajaran matematika realistik.

Abstract

The low level of thinking ability or HOTS of students needs to be improved. One of them is by improving the quality of learning models and students' interest in learning. Therefore this research aimed to determine: 1) Does HOTS-oriented realistic mathematics learning affect student outcomes in mathematics learning? 2) Does learning interest have an impact on how well pupils learn mathematics? and 3) Does student interest in learning and HOTS-oriented realistic mathematics learning have any impact on mathematics learning? This study used a non- Equivalent Posttest-Only Control Group Design and was therefore a quasi experimental study. A straightforward random sampling method was used to obtain the sample. Class XI IPA 1 is the experimental class in this study with PMR model therapy and class XI IPA 2 is the control class with Conventional model. The collected data was then analyzed using Two-Ways ANOVA. The study's finding, which are based on an analysis of hypothesis testing, are as follows: 1) The HOTS-oriented PMR model has an impact on student learning outcomes, with a sig. $0.000 < 0.05$, 2) Learning interests have an impact on students' mathematics learning outcomes, with a sig. $0.000 < 0.05$ and 3) There is an impact between the HOTS-oriented PMR model on learning outcomes when viewed from students' interest in learning with sig. $0.008 < 0.05$.

Keywords: learning outcomes; HOTS; interest in learning; realistic mathematics learning.



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INTRODUCTION

Education is synonymous with the teaching and learning process as a channeler of learning materials with students and teachers as the main actors in this activity. The learning process has elements that need to be considered in its application, including motivation, interest in learning and habits in study. (Rahayu et al., 2020) also said that in the process there is an interaction of students with their environment as teaching. We may infer from the learning process that there is a mental state change in the learner before and after engaging in learning.

One of the teachers at SMAN 14 Tangerang Regency said that the learning carried out in schools still uses conventional learning, making students' interest in learning still lacking. Because they are not given the opportunity to express their thoughts, this has an effect on pupils' learning outcomes, which are not optimum. Additionally, the challenges or concerns presented nevertheless frequently result in rote-shaped queries, necessitating the continued development of the higher order thinking skill, or HOTS (Higher Order Thinking Skill).

As the times progress, it encourages students to improve their understanding and problem-solving skills. One is the level of high-level thinking ability. (Jailani et al., 2017) according to this argument, HOTS can help students connect and apply the knowledge they will acquire to the knowledge they already process. Thus the mindset of students will be honed in solving a problem. In high-level thinking, students are able to relate the concepts learned to concepts outside the material taught (Kusuma et al., 2017).

The learning process does not always run smoothly. The learning

process often experiences obstacles, namely it is not uncommon for students to have difficulties in learning. Students' interest in learning is low as a result of this aspect. One aspect of a person's personality that affect learning is their interest in. Sukada (2013) saying that interest is an aspect in students related to learning achievement. The different interests of students for each individual will have a different effect on their learning outcomes.

According to Kartika (2014) Interest in learning is also defined as an interest in learning. Students pay attention to a subject and have a desire to know, learn, prove it by actively participating during learning activities. Interest in learning also has a great contribution for improving student learning outcomes (Sumiyati et al., 2017). So it is hoped that student achievement will be better if they have a great interest in learning (Komariyah et al., 2018)

According to Lestari dan Yudhanegara (2017), Parameters of interest in learning are as follows: 1) Students feel happy during the learning process, 2) Have an interest in learning, 3) Students pay attention while studying, 4) Students has a role during the learning process. Aligned with opinions Friantini dan Winata (2019) regarding parameters of interest in learning, namely 1) happy during learning, 2) mind and attention are focused on learning, 3) have a desire to learn, 4) students are actively participating in learning, 5) there are efforts to realize the desire to learn. Based on the references presented, the indicators of interest in learning used in this study are 1) feelings of pleasure, 2) student interest, 3) student attention, and 4) student engagement.

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Judging from the unstable student interests, it also affects learning outcomes. Student learning outcomes demonstrate the caliber and aptitude of pupils throughout the educational process. In order to discover effective learning strategies and enhance student learning outcomes, student learning outcomes can also be employed as an evaluation tool.

Supardi (2012) noted that incorrect learning model chosen by instructors to be used in classrooms is one of the factors contributing to the deterioration in student quality and learning outcomes. The learning approach is still conventional so that many students are not involved in the learning process.

According to Caryono et al. (2013) Students' interest in learning is one of the factors causing difficulty solving mathematical problems. So, one way to foster student interest or interest and improve learning results is to create a pleasant learning atmosphere. The learning atmosphere can be created through the learning model applied by the teacher.

Realistic Mathematics Learning Model (PMR) is a new idea to improve students' critical thinking skills that affect learning results and student learning interests (Setyaningsih et al., 2021). Hadi (2005) reveals that the characteristics and principles possessed by PMR can support students to develop optimally, one of which is that students are given the freedom to express opinions and there are contextual problems in relation to life.

As for according to Gravemeijer (1994) the main principles in PMR are as follows: 1) Guided re-invention, students rediscover mathematical concepts by undergoing the same research process; 2) Didactical

phenomenology, Realistic Mathematics Learning to introduce mathematical concepts to students in contextual problems; 3) Self-developed model, students can develop their own model in problem solving.

There have been many studies that examine the impact of realistic mathematics learning on the sustainability of the learning process. Among them, there is the impact of PMR on the type of ability categorized as HOTS level, namely reasoning ability (Wibowo, 2017; Putri, 2013; Zaini & Marsigit, 2014), critical thinking skills (Setyaningsih et al., 2021), creative thinking skills (Sukirwan & Dedi Muhtadi, 2017) Marni & Pasaribu, 2021), and troubleshooting capabilities (Herdiansyah & Purwanto, 2022). The above research is still focused on 4 separate HOTS domains, not yet reviewing the overall HOTS level.

Research from Wibowo (2017) also links realistic mathematics learning to learning interests. In addition, there are also Catrining dan Widana (2018); Herzamzam (2018) but not studied in the cognitive level of HOTS

Based on the explanation above, it is necessary to conduct experiments to find out whether there is a relationship between realistic mathematics learning, interest in learning, and student learning outcomes with the following problem formulation: 1) Does HOTS-oriented realistic mathematics learning affect student results in mathematics learning? 2) Does learning interest have an impact on the result of mathematics learning? and 3) Does student interest in learning and HOTS-oriented realistic mathematics learning have any impact on mathematics learning?

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METHODS

The type of research used is quantitative research. This research is a quasi-experimental research and Non-Equivalent Posttest-Only Control Group Design as the research design.

The population in this study was 104 students of class XI IPA SMA Negeri 14 Tangerang Regency. Random sampling techniques are used to take samples. This research takes an experimental class, namely class XI IPA 1 which will be given learning with the PMR model. Then XI IPA 2 as a control class that will be given learning with a

conventional model. There were 34 and 35 students, respectively.

Students' learning interests are grouped into three levels, namely high, medium and low based on the results of the questionnaire obtained with the help of Microsoft Excel using grouping techniques according to Sudijono (2016) as in Table 1.

Table.1. Learning Interest Grouping

Grouping Criteria	Levels
Value \geq Average + SD	High
Average - SD \leq Value < Average + SD	Moderate
Value < Average - SD	Low

Table 2. Research Design

	Experimental Class	Control Class
Interest in Learning	PMR Model(A ₁)	Conventional Models (A ₂)
High (B ₁)	A ₁ B ₁	A ₂ B ₁
Moderate (B ₂)	A ₁ B ₂	A ₂ B ₂
Low (B ₃)	A ₁ B ₃	A ₂ B ₃

Information:

A₁B₁ : PMR model with a high level of interest in learning.

A₂B₁ : Conventional learning models with a high level of learning interest.

A₁B₂ : PMR model with moderate interest in learning.

A₂B₂ : Conventional learning models with moderate interest in learning.

A₁B₃ : PMR model with a low level of interest in learning.

A₂B₃ : Conventional learning model with low-level interest in learning

The data collection techniques used in this study are test methods and questionnaire methods. According to (Arikunto, 2013) tests are used to know or measure something. The test is used to collect data on student learning outcomes after the study is carried out. The test used is 10 multiple-choice questions with indeterminate integral material with a HOTS level. The test is presented in the form of a contextual problem and there are solutions related to other materials.

The questionnaire was tested to measure students' interest in learning using a likert scale. The initial stage is instrument trials, namely validity tests

using Pearson Korelation and reliability tests using Cronbach Alpha. A reliability value of 0.925 was obtained for the learning interest questionnaire. This indicates that the questionnaire of interest in learning has a high reliability. As for the posttest question, a reliability value of 0.742 was obtained.

Then a statistical prerequisite test was carried out, namely a normality test using Shapiro-Wilk and a homogeneity test using the Levene test with the help of the SPSS 21.0 application for Windows. After the prerequisite test is met, an analysis is carried out using a two-way ANOVA test. H₁ is accepted

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when a significant value of <0.05 . The significance level used is 5%

In accordance with the description of the formulation of the problem, the hypothesis of the research to be carried out can be taken as follows:

Hypothesis 1

$H_0 =$	There is no impact between the HOTS-oriented PMR model on students' math learning outcomes.
$H_1 =$	There is an impact between HOTS-oriented PMR models on students' math learning outcomes.

Hypothesis 2 :

$H_0 =$	There is no impact between the interest in learning mathematics on students' mathematics learning outcomes.
$H_1 =$	There is an impact between the interest in learning mathematics on student learning outcomes.

Hypothesis 3 :

$H_0 =$	There is no impact between the HOTS-oriented PMR model when viewed from the student's interest in learning.
$H_1 =$	There is an impact between the HOTS-oriented PMR model when viewed from the student's interest in learning.

RESULTS & DISCUSSION

The data used in this study were the results of a questionnaire of interest in learning and test results that showed student learning outcomes after being given treatment. The distribution of learning interest levels in experimental classes and control classes was 29 students with a high level of interest in learning, 26 students with a moderate level of interest in learning, and 14 students with a low level of interest in learning.

Realistic mathematics learning begins with the presentation of problems found in life. Then from these problems will be born mathematical concepts or models that are in accordance with the learning objectives. Classroom learning is interactive and students respond to each other's opinions.

Before the ANOVA test or hypothesis test, a normality test and a homogeneity test are carried out. The normality test used the Shapiro-Wilk Test with a significant value of $0.069 > 0.05$ and the homogeneity test used the Levene Test with a significant value of $0.059 > 0.05$. this shows that the distribution of data is normally distributed and comes from the same population.

The hypothesis was analyzed using a two-path ANOVA with results as in Table 3.

Table 3. Results of analysis of the influence between variables (dependent variable: learning outcomes)

Source	Sig. Value	Information
Corrected Model	.000	Influence of variables simultaneously
Intercept	.000	Dependent variables without being influenced by independent variables
Interest in learning	.000	The influence of interest in learning
Learning Model	.000	The influence of learning models
Interest in Learning * Learning Model	.008	Interaction between interest in learning and learning models

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Table.4. Recapitulation of average learning outcomes with the influence of one variable

Variabel Independen	Grouping	Average Learning Outcomes	Information
Learning Model	PMR	59.306	PMR is better then conventional
	Conventional	50.487	
Interest in Learning	High	73.382	High interest in learning has better average learning outcomes
	Moderate	52.308	
	Low	39.000	

Dependent Variable: Learning Outcomes

Tabel5. Recapitulation of average learning outcomes with the influence of two variables (dependent variable: learning outcomes)

Interest in Learning	Learning Model	Mean
High	PMR	81.765
	Conventional	65.000
Moderate	PMR	56.154
	Conventional	48.462
Low	PMR	40.000
	Conventional	38.000

On the analysis of hypothesis I test through Table 3, a significance value of $0.000 < 0.05$ was obtained, then H_0 was rejected. This means that there is an impact between the PMR models on learning outcomes. The results of the description analysis in Table 4 also showed that the group of students with the PMR model had an average score of learning outcomes of 59,306 higher than the group of students with conventional learning models who had an average learning outcome of 50,487.

On the analysis of hypothesis II test can be seen in Table 3 obtained a significance value of $0.000 < 0.05$ then H_0 is rejected which means that there is an impact of a desire to learn on learning results. Then the results of the analysis of the description of learning interests in Table 4 showed that students with a high level of a desire to learn had an average learning outcome of 73,382. Students with a moderate level of a

desire to learn have an average learning outcome of 52,308. Meanwhile, students with low interest in learning have an average learning results of 39,000. It can be seen that students with a high a desire to learn have greater learning outcomes than students with moderate and low a desire to learn.

Then the results of the Hypothesis III test obtained a significance value of $0.008 < 0.05$ from Table 3, then H_0 was rejected. This means that there is an impact of the PMR model when viewed from the student's a desire to learn. Judging from the test results, there is an interaction between the learning model and the desire to learn about student learning outcomes. Judging from the results of the analysis of the description of learning interests and learning models in Table 5 that the average a desire to learn and learning outcomes in students who get the PMR model is higher than the average a desire to learn and learning results in students who get conventional learning models.

a. The Effect of HOTS-Oriented PMR on Learning Outcomes

On the analysis of hypothesis I test show that there is a significant impact of learning models on learning results with a significance value of $0.000 < 0.05$. The average learning outcomes of students with PMR are higher than students with conventional models. Judging from the result shows

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that PMR has an impact on improving learning outcomes by developing thinking skills, especially in the HOTS category.

These result are not in line with the research from (Putri, 2013; Zaini & Marsigit, 2014; Marni & Pasaribu, 2021) that PMR is not effective for improving students' reasoning abilities, creative thinking skill and then these results are in line with research from (Wibowo, 2017; Setyaningsih et al., 2021; Herdiansyah & Purwanto, 2022) that PMR is influential and more effective for improving students' mathematical abilities, troubleshooting capabilities and learning achievement. Then also the research results of the Yulianty (2019) that students taught with PMR are superior in their understanding of mathematical concepts when compared to students taught with conventional learning. PMR is very strongly related to the development of students' mathematical abilities, including problem-solving and reasoning skills. Supported by research (Rosyidah et al., 2021) PMR can help students in the process of solving HOTS problems, namely with reasoning skills. According to (Amalia & Hadi, 2020) reasoning and problem-solving capabilities fall into the HOTS category. This is reinforced from (Mailani et al., 2022) that students' high-level thinking skill can also be encouraged through PMR. PMR has a very positive impact on improving students' thinking ability which can also affect learning outcomes (Afsari et al., 2021).

b. The Effect of Interest on Learning Outcomes

On the analysis of hypothesis II testing with a significance value of $0.000 < 0.05$ which means that there is a significant impact between the interest

in learning and student learning outcomes. Supported by research (Sirait, 2016) that there is a very strong implication of interest in learning to improve learning outcomes. Judging from the results of the analysis of learning interests has a very significant difference in the average value between high, medium and low levels. Interest in learning as an external factor that greatly impacts learning outcomes. If the student has a desire to learn, then the enthusiasm in the student will grow, so that things that become obstacles during learning will easily pass. (Lestari, 2015).

c. The Effect of HOTS-Oriented PMR and Learning Interest on Learning Outcomes

On the analysis of hypothesis III test obtained a significant value of $0.008 < 0.05$ which means that there is a significant impact of learning models and interest in learning. So that in this PMR model, it will affect students' interest in learning. So, in this research have an impact between the HOTS-Oriented PMR model on the interests and learning outcomes. These results are in line with research from Catrining dan Widana (2018); Wibowo (2017). Although the study did not use HOTS as a benchmark for student ability.

The findings of this study are that realistic mathematics learning is able to improve students' high-level thinking ability and interest in learning, so that it can encourage to improve the quality of student learning outcomes. Realistic Mathematics Learning (PMR) has a good effect on student interests and learning outcomes so as to make students' interest and learning outcomes increase. This is because learning with the PMR model can provide opportunities for students as the main

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axis or starting point to develop and channel the results of their thinking so as to create an active, efficient and not boring learning atmosphere so that students can be active and become more enthusiastic in learning through this PMR. In addition, with students involved in the problem-solving process, it will increase students' attention to focusing on the given problem. PMR can be a forum in increasing interest in learning from learning steps and honing reasoning skills in problem solving.

The advantage of this research is that it combines several aspects to improve student learning outcomes. Starting from realistic mathematics learning as a learning model, HOTS cognitive level which is used as a benchmark for their abilities, and interest in learning as a supporting factor. However, this research also has the disadvantage of focusing on integral material and high school education levels.

CONCLUSION AND SUGGESTION

Based on the results and discussion, the following conclusions were obtained that realistic mathematics learning is considered effective to be used to hone and improve students' high-level abilities. Then it can be used as an effort to increase interest in learning, which if both have been owned by students, maximum learning outcomes will be created.

Suggestions for further research can be developed into other mathematics learning materials. In addition, it can also look for methods or media that can support the success of realistic mathematics learning in supporting high-level thinking skills and creating student interest in learning so that student learning outcomes also increase.

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