Jurnal Gantang IX (1) (2024): 1-7

JURNAL GANTANG

e-ISSN: 2548-5547
p-ISSN: 2503-0671

http://ojs.umrah.ac.id/index.php/gantang/index

Application of problem-based learning on linear program to analysis rationalism value as a mathematics values

Endang Sri Agustini, Nyimas Aisyah*

Universitas Sriwijaya, Palembang, South Sumatra, Indonesia
*Corresponding Author: nyimas.aisyah@fkip.unsri.ac.id

Submission: January 10th, 2024; Accepted: October 24th, 2024; Published: October 31st, 2024
DOI: https://doi.org/10.31629/jg.v9i1.6897

Abstract

Rationalism value is closely related to mathematics because it is based on reason and knowledge. The results of rationalism values develop students' skills in terms of reasoning, expressing and defending their opinions, interpreting data obtained from experiences and attempting to make predictions. Therefore, this study aims to describe student rationalism values in linear program problem-based learning. The research subjects were determined purposively based on the result of summative assessment, teacher recommendation, the diversity of answers, and the willingness to be involved in the research. The selected subject was three students of class X SMA in Indralaya. The data were collected using tests and interviews, which were analyzed descriptively. The Problem-based Learning Model can bring out Rationalism Values in Linear Program material. Students can develop indicators, investigate the truth, and conclude. The indicators that appear most frequently are investigating the truth. Difficulties often predominantly arise when translating problems into mathematical models. The cause of students experiencing errors in concluding is due to errors in understanding mathematical concepts in the form of inequality signs where students mistakenly differentiate between the inequalities "less than" and "less than equal to", one of the reasons for this is because they have not mastered the prerequisite material such as linear inequalities in one variable or two variables.

Keywords: rationalism value; mathematics values; problem-based learning; program linear

How to cite: Agustini, E. S., & Aisyah, N. Aplication of problem-based learning on linear program to analysis rationalism value as a mathematics value. *Jurnal Gantang, 9(1),*1-7. https://doi.org/10.31629/jg.v9i1.6897

I. Introduction

Education plays an important role in facing challenges in the era of disruption, especially in creating a generation with problem-solving skills. That is why education's role is not only to transfer knowledge but also to transfer values. Values are someone's benchmark for choosing or doing something (Nurgiansah, 2021). Teachers can integrate values into all learning, including mathematics learning. Mathematics is a science related to exact knowledge that systematically includes laws and ideas of logical reasoning (Masliah, 2023). Moreover, one of the mathematics materials that students consider difficult is Linear Program material (Fitriani, 2022). Linear programming is closely related to everyday life because it studies how to optimize something with existing constraints or limits.

One of the values in mathematics learning is rationalism values. Mathematics is closely related to rationalism values because it is based on reason and knowledge (Hapsari, 2018). Rationalism values are values related to ideas that depend on reasoning, arguments, explanation and logic (Davis et al., 2019). The value of rationalism consists of making conclusions or providing reasons for the steps taken to solve the problem. It shows deductive logic concerning the truth of the results and explanations. It was also stated by Zhang (2019) that the results of the Value of Rationalism develop students' skills in terms of reasoning, expressing and defending their opinions, interpreting data obtained from experience and attempting to make predictions.

However, Salami's research (2020) argues that mathematics learning, one of the aims of which is to develop rationalism values, has not been realized optimally because the quality of teachers' learning has not improved. When compared with the openness and progress values in Andersson's (2019) research, which used the WIFI (What I Find Important) survey, the Rationalism Value ranked lowest with an average of 1.83 for each indicator in Verifying theories or hypotheses; 1.98 on learning the proofs; and 1.85 on knowing the theoretical aspects of mathematics's proofs. Setiawati (2018) also stated in her problem-based learning research that the only mathematics values that often appear are objectivism and control values, while Rationalism values rarely appear. This is because students rarely draw conclusions and provide reasons for the answers they obtain. Mahmudah (2017) also explained that students often make mistakes when solving problems about linear programs, and factors that cause these mistakes include not being used to writing the final answer or conclusion requested by the question and being in a hurry so they do not check the results of their work again. The process of making conclusions and checking them again requires a proof process contained in the Value of Rationalism.

Integrating rationalism's values requires an appropriate learning model, one of which is problem-based Learning. Problem-based learning uses real-world problems as a context for students to learn how to think critically, solve problems, and gain knowledge and concepts from the subject matter. It is also related to rationalism's values.

Previous research on the value of rationalism was carried out by Safura (2018) on Linear Equations in Three Variables material using non-routine questions, and Krismawati (2018) on Building a Curved Side Space material showed that problem-based learning can give rise to Mathematical Value. In this research, researchers will apply the Problem-Based Learning Model to the Linear Program material at "Kurikulum Merdeka, "focusing only on rationalism values. Based on the explanation above, this research is entitled "The Value of Student Rationalism in the Problem-Based Learning Model in Linear Program Material in High School".

II. Research Method

This research is a descriptive study with a qualitative approach. This study analyses reanalyzing value as a mathematics value in problem-based learning in linear program lessons. The research subjects were determined purposively based on the result of summative assessment, teacher recommendation, the diversity of answers, and the willingness to be involved in the research. The subjects selected were class X public high school students in SMAN 1 Indralaya academic year 2023-2024, as many as 3 peopl, consisting of 3 categories (high, medium, and low). The three students were chosen because they have a variety of values related to rationalism. The data were collected using tests and interviews, which were analyzed descriptively analyzed results of tests taken and analyzed the results analyzed interviews. The results of student interviews.

Table 1. Indicators of rationalism value

Indicator	Descriptor
Students investigate the truth of steps in solving mathematics problem	Students investigate the truth or have reasons in the steps to solving mathematical problems.
Conclude.	Students conclude from solving mathematical problems.

In the implementation, the researcher teaches 40 students through their answers on LKPD (student worksheet). LKPD, which contains problems with the material of the linear program, is given for 3 meetings to guide students to having rationalism values. Then, a written test was given with 2 problem questions about linear program material to class X high school students in Indralaya. In working on the test questions, students were given a time limit of 70 minutes. Researchers have validated the questions used by a validator consisting of Mrs Novita Sari, M.Pd, as a Mathematics Education Sriwijaya University lecturer and Mrs Rina Meilani, S.Pd, as a High School of 1 Indralaya. After doing a test, the researcher began to conduct interviews. The purpose of interviews is to obtain deeper information about students' rationalism values from test data. As for this study, interviews were conducted for each subject.

III. Results and Discussion

The selected subjects include high ability in subject F, moderate ability in subject A, and low ability in subject R. The three criteria researchers considered were students' academic abilities, teacher recommendations, and researchers' considerations based on test results. The complete results of the data analysis are also supported by the interviews presented below.

Indicators of rationalism values appear in the answers of subject F as a high-ability subject in problem number one. As the answer to the F subject in Figure 1 shows, the student can create a mathematics model to solve the problem.

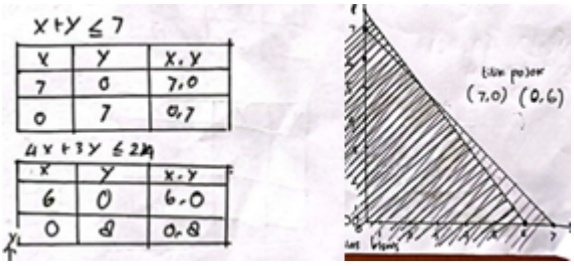

Figure 1. The answer to the high-ability subject

Subject F can develop indicators of Rationalism Values by investigating the truth of the steps in solving the problem. Figure 2 below shows that the subject can choose the corner point and its optimum value.

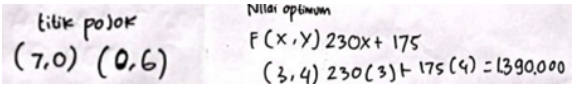

Figure 2. The answer of the high-ability subject to the indicator investigating the truth

Subject F can also develop indicators of Rationalism Values in the form of a conclusion, as shown in Figure 3 below.

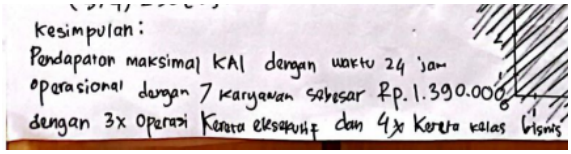

Figure 3. The answer of the high-ability subject to the indicator makes a conclusion

Subject A is a student with moderate abilities. From the results of data analysis, it was found that the subject gave rise to 2 values of Rationalism, namely investigating the truth of the steps and drawing conclusions. Another indicator, namely creating a mathematics model to solve problems, does not appear because students have difficulty representing them in mathematical models that use variables. Interestingly, students use problem-solving strategies like trial and error and working backwards.

JURNAL GANTANG. October 2024; IX(1): 1 – 7
p-ISSN. 2503-0671
e-ISSN. 2548-5547

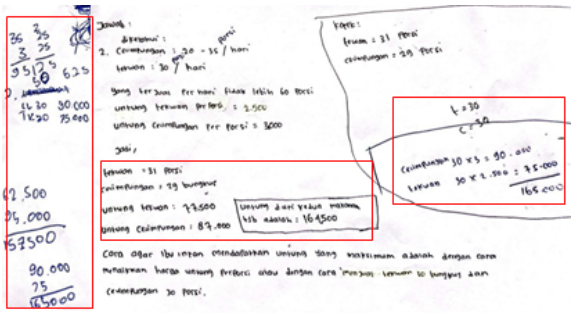

Figure 4. The answer to moderate-ability subject

The inconsistency of the student's answers above, who have two different answers, is caused by students' misconceptions about the concept of inequality between < and ≤. This is based on an interview with student AZ, who stated, "Initially, I answered 30 tekwan and 30 celimpungan. "But because the question states that there are no less than 30 tekwan sold, I made it 31. However, when I calculated it again, the profit would be more profitable if there were 30 tekwan and celimpungan, so the conclusion was made of 30 each".

In addition, the non-appearance of indicators in problem number 1 is because the AQ subjects did not work on the problem; this is because the AQ subjects entered late so that the duration of the work is less, and the AQ subjects are in a hurry to work so that there is less concentration. This was also supported during an interview where the AQ subject stated, "Number 1 was not worked on because time was limited, and the number that seemed quick and easy to complete was number 2".

Subjects R are subjects with low ability. As for the indicators of the value of rationalism, all of them appear in the R subjects while working on the test problem, i.e. Indicators investigate the truth and conclude. However, there was a conceptual error at the time of the student's work because the student was not correctly formulating the right symbols. This can be seen from the student's answer in the following image.

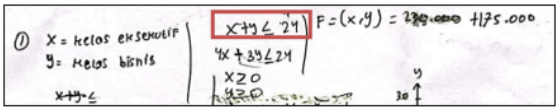

Figure 5. The answer to the low-ability subject

Errors when formulating such constraint functions result in procedural errors when making the next step: creating a settlement area on the graph, investigating the optimum value, and making a conclusion. This can be seen in the next finishing image in the following figure.

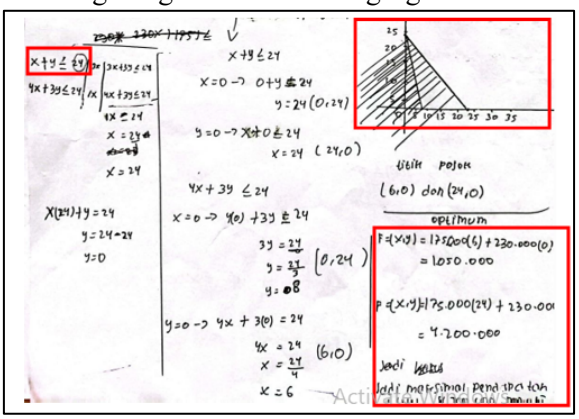

Figure 6 The Answer to Subject R

In problem number 2, the indicator investigating the truth and making conclusions did not appear because the subject had difficulty understanding the problem related to inequality, so the solution was not completed; this was supported during the interview where the RR subject stated that "His difficulty was in the problem stating no less than 20 portions and no more than 35 portions. It is difficult to proceed with the next step because it is confusing to create its mathematical model, so the graph is made only from one equation". Based on the results of the tests and interviews of the RR subjects, the RR Subject has not brought up indicators of the value of rationalism when investigating the truth and making conclusions. This is due to a concept error when creating a constraint function that results in a procedure error, so the results obtained are not exact.

The data is processed based on indicators of the value of rationalism proposed

by Zhang (2019) and Setiawati (2018), namely (1) Creating a mathematics model, (2) Investigating the truth with logical reasons, and (3) Drawing conclusions. These indicators often appear with the Problem-Based Learning Model in Linear Program Material.

Creating Mathematics Model

The first indicator is creating a mathematical model. The results of this research show that subjects will make mathematical models if they can translate problems with the constraint function into mathematical sentences; this is because the first step in making a graph is to create intersection points obtained from the constraint function. Nuriza et al. (2020) research also states that the most difficult thing students tend to experience is creating mathematical models. For subjects who find it difficult to translate problems in linear programs into mathematical sentences, subjects solve existing problems using problem-solving strategies, working backwards and Guess and Test strategies. This is the opinion of Lahinda (2015), who stated that compared to the strategy of using formulas, the Guess and test strategy is more often used by students with medium and low academic abilities, with a presentation of 80% in questions with competence in solving mathematical models of problems related to linear equations and inequalities. Constraint factors influencing subjects in eliciting indicators may also be due to limited execution time (Faturrahman, 2022).

Investigating the Truth

The second indicator is the indicator of investigating the truth. In this step, students are expected to be able to provide reasons for the answers they get. The research results show that students with high abilities get results by testing corner points obtained from the Completion Result Area graph to get optimum scores, likewise with moderate ability students who provide reasons and steps for the conclusions given. This shows that the Problem-Based Learning Model applied to Linear Program Material can give rise to Rationalism Values. This is the opinion of Fauziah (2023) that the Problem-Based Learning Model can develop skills in the investigation. PBL learning invites students to investigate a problem critically, logically and systematically by using various sources to find their solution to the problem.

Making Conclusions

The third indicator is making conclusions. In this indicator, students are expected to come up with solutions to existing problems after carrying out the problem-solving process. The research results show that students can make conclusions; there are 2 ways for students to make conclusions. First, it is done at the end after getting a solution of the optimum value; secondly, it is done by writing the conclusion at the beginning because solving the problem uses a strategy of working backwards, followed by a proof process through logical reasons and ideas. The error often occurs when students try to conclude using a trial and error strategy by Subject A is the occurrence of misconceptions or mistakes because they cannot differentiate between the inequality signs "less than" and "less than equal to". Utami (2022) supports the idea that these difficulties can be caused by students not fully understanding. Thus, it shows that the PBL model brings out the value of rationalism by concluding. This is in line with the opinion of Abidah et al. (2021), who believes that the PBL model makes students actively involved, one of which is through concluding.

IV. Conclusion

The research concluded that the Problem-Based Learning Model could bring out Rationalism Values in Linear Program material. Students can develop indicators, make tables/graphs, investigate the truth, and draw conclusions. The indicators that appear most frequently are investigating the truth and concluding. Difficulties often predominantly arise when translating problems into mathematical models. The cause of students experiencing errors in concluding is due to errors in understanding mathematical concepts in the form of inequality signs where students mistakenly differentiate between the inequalities "less than" and "less than equal to", one of things The reason for this is

because they have not mastered the prerequisite material such as linear inequalities in one variable or two variables. Constraint factors influencing subjects in eliciting indicators may also be due to limited execution time.

Reference

Abidah, N., Hakim, L. El, & Wijayanti, D. A. (2021). Upaya meningkatkan kemampuan penalaran matematis siswa melalui model problem based learning pada materi aritmetika sosial. *Jurnal Riset Pendidikan Matematika Jakarta*, *3*(1), 58–66.

Andersson, A., & Österling, L. (2019). Democratic actions in school mathematics and the dilemma of conflicting values. *Values and valuing in mathematics education: Scanning and scoping the territory*, 69-88.

Davis, E. K., Carr, M. E., & Ampadu, E. (2019). Valuing in mathematics learning amongst Ghanaian students: What does it look like across grade levels? *Values and valuing in mathematics education: Scanning and scoping the territory*, 89-102.

Faturrahman, Muhammad Adjie. (2022). Kemampuan Pemecahan Masalah Peserta Didik Melalui Implementasi Blended Learning Pada Materi Program Linear Dua Variabel di Kelas XI. *Skripsi*. Indralaya : FKIP UNSRI

Fauziah, Indah Ayu, (2023) *Perbandingan Peningkatan* Hasil *Belajar Siswa Menggunakan Model Pembelajaran Problem Based Learning Dan Discovery Learning. Skripsi*, FKIP UNPAS

Fitriani, A. N., & Hidayati, N. (2022). Analisis Kemampuan Komunikasi Matematis Siswa Sma Pada Materi Program Linier. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *5*(4), 1033-1040.

Hapsari, T. (2018, March). Nilai-Nilai dalam Matematika. In *Prosiding Seminar Nasional Matematika dan Pendidikan Matematika (SNMPM)* (Vol. 2, No. 1, pp. 123-131).

Krismawati, A. (2018). *Nilai-Nilai Matematika (Mathematical Values) Pada Pembelajaran Pemecahan Masalah Materi Bangun Ruang Sisi Lengkung Ditinjau Dari Kemampuan Matematika Peserta Didik Kelas Ix Smp N 3 Gresik* (Doctoral dissertation, Universitas Muhammadiyah Gresik).

Lahinda, Y., & Jailani, J. (2015). Analisis proses pemecahan masalah matematika siswa sekolah menengah pertama. *Jurnal Riset Pendidikan Matematika*, *2*(1), 148-161.

Mahmudah, I. D., & Sutarni, S. (2017). Kesalahan siswa dalam menyelesaikan soal program linier bentuk cerita berbasis Newman di MAN Salatiga.

Masliah, L., Nirmala, S. D., & Sugilar, S. (2023). Keefektifan Model Pembelajaran *Problem Based Learning* (PBL) terhadap Kemampuan Literasi dan Numerasi Peserta Didik di Sekolah Dasar. *Jurnal Basicedu*, *7*(1), 1-10

Nuriza, I., Yusmin, E., & Bistari, B. (2020). Analisis kesulitan siswa menyelesaikan soal cerita materi program linear berdasarkan gaya belajar siswa sma. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa (JPPK)*, *9*(7).

Nurgiansah, T. H. (2021). The Role of Citizenship Education in Building Bantul Community Political Participation in The Pandemic Covid 19. Prosiding Seminar Nasional Pendidikan Jurnal Kewarganegaraan Vol. 5 No.1 Juni 2021 P-ISSN: 1978-0184 E-ISSN: 2723-2328 Yohana.R.U.Sianturi & Dinie Anggraeni D – Universitas Pendidikan Indonesia 231 Dan Kewirausahaan, 4(1), 1–4.

Safura N.A. (2018). Nilai Matematika (Mathematical Value) Siswa pada Pembelajaran Matematika Menggunakan Soal Non Rutin di SMA Negeri 5 Palembang. *Skripsi.* Indralaya : FKIP UNSRI

Salami, M. (2020). Model Pembelajaran Matematika Berbasis Karakter. *Jurnal Ilmiah Mahasiswa Raushan Fikr*, *9*(2), 98-111.

Setiawati, R.Y. (2018). Analisis Nilai Matematika (Mathematical Values) Siswa Pada Pembelajaran Pemecahan Masalah di SMA Negeri 1 Indralaya. *Skripsi.* Indralaya : FKIP UNSRI

Utami, L. W., & Hidayanto, E. (2022). Kesulitan peserta didik dalam menyelesaikan soal program linear pada pembelajaran daring. *Mosharafa: Jurnal Pendidikan*

Matematika, *11*(2), 257-268.

Zhang, Q. (2019). Values in Mathematics Learning: Perspectives of Chinese Mainland Primary and Secondary Students. In P. Clarkson, W. Seah, & J. Pang, AKSIOMA: Jurnal Program Studi PendidikanMatematika ISSN 2089-8703 (Print) Volume 10, No. 4, 2021, 2093-2106 ISSN 2442-5419 sujaValuing in Mathematics Education, ICME Monographs (pp. 185–195). New York: Springer