UJME 11 (2) 2022: 166-173
UNNES JOURNAL OF MATHEMATICS EDUCATION
https://journal.unnes.ac.id/sju/index.php/ujme/
ISSN: 2252-6927 (print); 2460-5840 (online)

# Mathematical Critical Thinking Ability in DAPIC Problem Solving Learning with Scientific-RME Approach in Students Learning Independent

Yusuf Abdulah[a*], Endang Retno Winarti[a]

[a] *Mathematics Department, Universitas Negeri Semarang, Sekaran Campus Gunungpati, Semarang 50229, Indonesia*

** E-mail address: yusufabdulah94@students.unnes.ac.id*

ARTICLE INFO

*Article history:*
Received 15 June 2022
Received in revised form 31 July 2022
Accepted 9 August 2022

Keywords:
Critical Thinking; DAPIC Problem Solving; Scientific; RME; Learning independent.

Abstract

Mathematical critical thinking ability is an ability that students in learning mathematics must possess. The purpose of this study was to analyze critical thinking ability reviewed from independence tend and to describe students' critical thinking ability on DAPIC Problem Solving in independence tend. The population in the study were all students of class VIII Junior High School 43 Semarang Year 2020/2021. The research method used was a mixed method with a sequential explanatory design. Research results showed that: (1) students' mathematical critical thinking skills in DAPIC Problem Solving learning with the Scientific-RME approach could achieve minimum completeness criteria; (2) students' mathematical critical thinking skills in DAPIC Problem Solving learning with the Scientific-RME approach achieved classical learning completeness; (3) average critical thinking ability in the DAPIC Problem Solving learning with the Scientific-RME approach more than from Problem Based Learning; (4) proportion result test critical thinking ability in the DAPIC Problem Solving learning approach Scientific-RME is better than Problem Based Learning; (5) critical thinking ability with five indicators think critical is in the subject category high, moderate, and low learning independence tend.



## 1. Introduction

Education is a system that is interrelated between components and influences each other, if one part is not considered, it will affect the whole system. In Accordance with Law Number 20 of 2003 concerning the National Education System, education is one of the steps to develop the capacity of human resources who have quality characters. The quality characters expected in the regulation include humans who have personality, intelligence, noble character, and skills needed by themselves, society, nation, and state.

The role of education as a better human being has caused the government to pay special attention to the education system in Indonesia. The government's role in facing the challenges of the times, one of which is by changing the 2006 curriculum to the 2013 curriculum. Based on competence, the curriculum meets suitability and adequacy, accommodates local, national, and international content such as TIMSS, PISA, and PIRLS (Wardono et al., 2018).

According to Widana in Aryanta (2020) explaining the characteristics of 21st century learning including (1) students as learning subjects; (2) student collaboration in the learning process; (3) linkage of learning materials with everyday life; (4) efforts to prepare students to become responsible citizens. It is hoped that the implementation of the 2013 Curriculum will make learning interactive, inspiring, fun, challenging, motivating and inviting students to participate actively (Ayu et al., 2019).

The demands of 21st century learning emphasize skills including communication, collaboration, creativity, and critical thinking (Suh et al., 2021). In addition to the objectives and curriculum that exist in

*To cite this article:*
Abdulah, Y. & Winarti E.R. (2022). Mathematics Critical Thinking Abilyty in DAPIC Problem Solving Learning with Scientific-Realistic Mathematics Education (RME) Approach in Students Learning Independent. *Unnes Journal of Mathematics Education, 11*(2), 166-173. doi: 10.15294/ujme.v11i2.59931

learning mathematics, critical thinking is useful for forming students so that it is not easy to receive information without knowing its origin, and when giving opinions, they are able to defend their opinions or results with clear reasons (Setiana & Purwoko, 2020). Therefore, students' ability to think critically needs to be improved to prevent similar mistakes in the future (Umam & Susandi, 2022).

Based on the results of an interview with one of the mathematics teachers at Junior High School 43 Semarang, it was explained that the tendency of students to solve problems by directly writing the results without writing down systematic steps in solving problems, and there were still many students had difficulties in solving non-routine questions. This is because students still find it difficult to develop their critical thinking skills. It is necessary to improve students' mathematical critical thinking skills.

Students' attitudes and character are important aspects that need to be in learning, one of these attitudes is an independent attitude. Learning independent does not mean learning alone without the help of others but has a broader meaning. One form of student learning independence is initiative in learning, being able to overcome obstacles/problems, having self-confidence and being able to work alone without the help of others (Sipayung et al., 2022). In determining this learning, it is hoped that students will no longer rely on material from the teacher, but students must be able to independently find related material from other sources to improve their thinking skills. By applying student learning independence in learning, students can work on all problems with their abilities (Millaty, 2021). On another occasion, the results of interviews with mathematics teachers at Junior High School 43 Semarang stated that student responses in learning were still less enthusiastic and many students submitted assignments less on time, even though teachers prioritized honest student attitudes in learning. With students being able to work on problems independently, they can improve their mathematical abilities (Rodiah, 2020).

Junior High School 43 Semarang is an A-accredited school located on Jl Jempono RT. 01 RW. 01 Bangetayu Kulon, Genuk District, Semarang City. Based on the results of the national exam scores of Junior High School 43 Semarang for the 2018/2019 academic year for mathematics subjects published by the Ministry of Education and Culture, it has an average score of 49.30%. Coherently, the following are the results of the National Examination of Junior High School 43 Semarang with the percentage of students who answered correctly the questions in the scope of mathematics material.

**Table 1.** National Examination Results for Junior High School 43 Semarang year 2018/2019

| Theory | Education Units | City | Province | Nation |
|---|---|---|---|---|
| Number | 44.79 | 51.69 | 43.64 | 39.71 |
| Algebra | 56.83 | 62.40 | 54.96 | 51.24 |
| Geometry and Measurement | 41.51 | 50.78 | 45.23 | 42.27 |
| Statistics and Opportunities | 63.89 | 66.60 | 60.85 | 55.60 |

From the results of the National Examination of Junior High School 43 Semarang for the 2018/2019 academic year, it is seen that there is still a need to improve learning outcomes to be better. One of the mathematics materials for Junior High School, one of which is Cartesian coordinates. Cartesian coordinate is a material that combines algebra and geometry. Where the two materials are material that needs to be improved to make better learning outcomes.

Improvement of mathematics learning needs to be done, apart from the material that needs to be focused on, there are other factors, namely many students find it difficult and boring in learning mathematics to make mathematics a learning that some students avoid (Rahmayanti et al., 2021; Utari et al., 2019). Lack of mastery of concepts, problem solving processes and practice in solving problems is one of the factors that students consider mathematics to be a difficult subject (Agustini & Pujiastuti, 2020; Makur et al., 2021; Putridayani & Chotimah, 2018). One effort that can improve mathematics learning is the use of learning models and approaches that make students the main actors in learning both in terms of identifying problems, solving formulas, and getting to a conclusion.

Scientific is an approach that makes students think scientifically and students are the main actors in every learning process (Liana, 2020). This scientific approach process is designed so that students are able to actively construct concepts through observations, formulate problems, formulate hypotheses, collect

solutions with several techniques, analyse, draw conclusions and communicate the results that have been found (Wardono et al., 2018).

Realistic Mathematics Education (RME) is a learning approach that utilizes activities and environments that students often do to start the development of mathematical concepts, tools and procedures (Do et al., 2021). Realistic Mathematics Education (RME) is a mathematics learning approach that emphasizes students as learning subjects, mathematics is likened to a human activity, so mathematics must be connected in the context of everyday life.

The learning model that can be used to integrate Scientific-RME is a learning model that prioritizes the learning process for students so that they are able to develop mathematical thinking skills and relate them to everyday life. One of them is the DAPIC Problem Solving learning model. The mathematics learning model developed by IMaST provides opportunities for students to work in exploring and solving problems in the learning process. DAPIC is an acronym for the mathematics learning process, how students can determine the problem (Define), assess how big the problem is (Assess), plan problem solving that will be given (Plan), apply problem solving (Implement), and communicate the results obtained (communicate) (Risnanosanti & Ristontowi, 2019; Sumirattana et al., 2017).

This research aims to (1) test individual learning mastery of students' mathematical critical thinking skills in DAPIC Problem-Solving learning with the Scientific-RME approach, (2) test classical learning mastery of students' mathematical critical thinking skills in DAPIC Problem-Solving learning with an approach Scientific-RME, (3) testing the average mathematical critical thinking ability of students in DAPIC Problem Solving learning with the RME approach compared to the average critical thinking ability in PB learning, (4) proportion compeletetness result test mathematical critical thinking skills in DAPIC Problem Solving learning with the RME approach compared to the proportion of critical thinking skills in Problem Based Learning, (5) describe mathematical critical thinking ability in the subject category high, moderate, and low learning independence tend.

## 2. Methods

The research method used in this study is a mix of methods research. The method of collecting data in this research in the form of tests, questionnaires and interviews with the research design is explanatory design. The population of this study is class VIII students of Junior High School 43 Semarang for the 2021/2022 academic year. There were two groups, each of which was chosen randomly, namely the first group was given the treatment of applying DAPIC Problem Solving learning in a scientific approach-RME which was hereinafter referred to as the experimental group and the second group was given Problem Based Learning, hereinafter referred to as the control group.

Quantitative research uses posttest-only control design experiment design. The posttest questions are in the form of a description with a total of 4 questions that are used to measure students' mathematical critical thinking skills that previously the test instruments had been tested in the trial class. The questionnaire method is used to measure student learning independence. the results of the questionnaire score analysis are used to select the subject of the study. The quantitative research design that will be used in this study is as follows

**Table 2.** Posttest-Only Control Design

| Class | Treatment | Test |
|---|---|---|
| Experiment | $X$ | $O_1$ |
| Control | - | $O_2$ |

Information :

$X$ : Class was treated with DAPIC Problem Solving With a Scientific-RME approach

$O_1$: the result of the mathematical critical thinking skills in experimental class

$O_2$: the result of the mathematical critical thinking skills in control class

The qualitative research subjects in this study used purposive sampling techniques. Purposive sampling is a sample determination technique by determining the criteria from the test results of critical thinking ability, attitudes during mathematics learning, and suggestions from class teachers. The subjects of the

study consisted of 2 students with high learning independence, 2 students with moderate learning independence, and 2 students with low learning independence.

The results of the critical thinking ability test are assessed by giving scores on critical thinking indicators, namely interpreting, analysing, applying solutions, evaluating, and summing up the results with evidence. Quantitative data analysis is analysed through prerequisite tests, namely normality tests and quantitative data homogeneity tests and continued to test research hypotheses.

The statistics used for hypothesis testing in this study are one-party average tests and proportion tests are used to test learning completion. The two-average similarity test and the two-proportion similarity test were used to test the difference in critical thinking ability of students who obtained DAPIC Problem Solving learning with a Scientific-RME approach and students who obtained Problem Based Learning. Qualitative data analysis in this study was carried out to describe mathematical critical thinking skills in each category of learning independence. Qualitative analysis is carried out with stages: data reduction, data presentation, as well as drawing conclusions and verification.

## 3. Results & Discussions

The research was conducted from August 19 to September 19, 2021 at Junior High School 43 Semarang located at Jl. Jempono, Bangetayu Kulon, Genuk, Semarang City. After carrying out learning and assessment of critical thinking ability in students, data on mathematical critical thinking ability were obtained in students with DAPIC Problem Solving learning and Problem Based Learning with a total sample of 56 students. Data on the ability to think critically mathematically are then tested to find out whether the data is normally distributed and homogeneous.

To test the data from a population that is normally distributed or not, the Shapiro Wilk Normality test was carried out. To find out whether the data has a homogeneous variance or not, the Leneve test is carried out. Both tests were conducted using the help of SPSS 20.0. The following are the results of the normality test and homogeneity test analysis presented in table 3.

**Table 3.** Normality and Homogeneity Test Results

| Test | Sig Value | Conclusion |
|---|---|---|
| Normality Test | 0.576 | The experimental class students' critical thinking ability test data came from a normally distributed population |
| Homogeneity Test | 0.699 | There is a significant difference between the variance of the mathematical critical thinking ability test of students in the experimental class and the control class |

### *3.1 Individual Completeness Test*

The individual completion test is carried out to find out whether the average value of students' mathematical critical thinking ability using the DAPIC Problem Solving learning model with the Scientific-RME approach achieves this completeness, which is to reach a score of 69 or not. The test used is a one-party average test (right side test). Based on the average test results obtained $t_{count} = 3.026 \geq 1.714 = t_{1-\alpha}$, then the $H_0$ rejected. This means that the ability to think critically on the DAPIC Problem Solving learning model with a Scientific-RME approach is more than 69.

### *3.2 Classical Completeness Test*

Classical due diligence was conducted to determine whether the proposed mathematical critical thinking ability of students in learning DAPIC Problem Solving with a Scientific-RME approach is less than or equal to 75%. The test used is a one-party proportion test (right) using the z test. The hypothesis testing criterion is to reject $H_0$ $if$ $z \geq z_{0.5-\propto}$, and in other respects $H_0$ received. Based on the results of the right party proportion test, $z_{count} = 1.79 > 1.64 = z_{table}$ was obtained. As a result, the null hypothesis was rejected, so that the proportion of students' mathematical critical thinking ability in the DAPIC Problem Solving learning model of more than 75% has reached classical completion.

*3.3 Two-Average Similarity Test*

The similarity test of the two averages is intended to prove whether the average mathematical critical thinking ability using DAPIC Problem Solving learning is better or the same as the average mathematical critical thinking ability using Problem Based Learning.

The hypotheses used are as follows:

$H_0$: $\mu_1 \leq \mu_2$ (the average mathematical critical thinking ability of experimental class students is less than or equal to that of the control class)

$H_1$ : $\mu_1 > \mu_2$ (the average mathematical critical thinking ability of the experimental class is better than that of the control class)

The hypothesis testing criterion is to accept $H_0$ if $t < t_{1-a}$ where $t_{1-a}$ is obtained from the distribution list t with $df = (n_1 + n_2 - 2)$ and opportunity $(1-\propto)$. Based on the results of the calculation of the average similarity test two obtained $t_{count} = 4.66 > t_{table} = 1.6791$ then the $H_0$ rejected. This means that the average critical thinking ability in the DAPIC Problem Solving learning model with the RME approach is higher than the average critical thinking ability through the Problem Based Learning.

*3.4 Classical Completeness Test*

Test the similarity of two proportions. The two proportions similarity test was used to determine the achievement of students' mathematical critical thinking ability in learning DAPIC Problem Solving higher than the proportion of achievement of critical thinking ability with Problem Based Learning.

The hypotheses used are as follows

$H_0$: $\pi_1 \leq \pi_2$ (the proportion of mathematical critical thinking ability in the experimental class is less than or equal to the control class).

$H_1$: $\pi_1 > \pi_2$ (the proportion of mathematical critical thinking ability in the experimental class is more than the control class)

The test criteria $H_0$ rejected if $z \geq z_{(0.5-\propto)}$ with $\propto = 5\%$. Based on the calculation results with a significant level of 5% obtained $z = 2.95 \geq 1.64 = z_{table}$, then the $H_0$ rejected. So the proportion of critical thinking ability in the DAPIC Problem Solving learning more than 75% has reached classical completeness.

*3.5 Analysis of Mathematical Critical Thinking Ability Based on Students Learning Independent Level*

Determination of the subject of the study based on the category of learning independence. Students fill out a learning independence questionnaire after the mathematical critical thinking ability test is carried out. After obtaining the results of the questionnaire score, learning independence.

Based on the picture above, it is obtained that there are students who occupy each category of learning independence. 3 students (13%) who have a high learning independence category, 16 students (66%) with a moderate learning independence category, and 6 students (21%) with a low learning independence category. Two students were selected in each category to be the subject of research to analyse critical thinking skills in depth during the learning process can be seen in the following table 4.

**Table 4.** Selection of Research Subjects Based on student learning independence

| Learning Independence Category | Subject Code | Critical Thinking Mathematics |
|---|---|---|
| High | TE 9 | 92 |
| | TE 19 | 82 |
| Medium | SE 4 | 82 |
| | SE 21 | 77 |
| Low | RE 16 | 75 |
| | RE 17 | 70 |

The selection of subjects was carried out with the aim of showing significant differences between the three categories of learning independence in solving mathematical critical thinking abilities. Both subjects with high learning independence had mathematical critical thinking ability test scores of 92 and 82. The subject of medium learning independence has grades 82 and 77. Subjects of low learning independence have mathematical critical thinking ability scores of 75 and 70.

*3.5.1 Subjects' Mathematical Critical Thinking Ability with High Learning Independent*

The results showed that subjects of TE-9 and TE-19, both of which were able to meet the five indicators of mathematical critical thinking ability, namely, being able to interpret problems, being able to analyse problems, being able to apply solutions, being able to evaluate solutions, and being able to conclude results.

Based on the results of learning independence data, it shows that TE-9 and TE-19 subjects are able to learn independently without dependence on others, having confidence in doing problems, being disciplined by being present on time in learning or collecting assignments. In learning, students from the high learning independence group tend to be active in discussions and questions in learning, these students are also more disciplined in doing assignments and following learning well. So it can be said that students in the high learning independence group have high critical thinking ability. This is in line with the results of Asmar & Delyana (2020) research in this study which concluded that learning independence has a positive effect on critical thinking ability.

*3.5.2 Subjects' Mathematical Critical Thinking Ability with Medium Learning Independent*

The results showed that SE-4 subjects were able to meet two indicators of critical thinking ability, namely interpreting problems and analysing problems and SE-21 subjects were able to meet three indicators of critical thinking ability, namely interpreting problems, analysing problems and applying solutions.

Subject of SE-4 does not have a dependence on learning towards others, has confidence in doing math problems, behaves disciplined in learning, sometimes students lack discipline in learning one of them sometimes doing other activities at the time of learning, students lack initiatives to learn. Meanwhile, SE-21 subjects will sometimes ask friends if they can't do math problems, sometimes feel unsure of their own work, often late in collecting assignments, always ask friends for help if there are difficult questions, often do not focus on paying attention to learning. The attitude that students have with moderate learning independence is suspected to be one of the factors that result in students having moderate critical thinking skills according to the description of the achievement of critical thinking ability indicators that have been previously described.

Subject of SE-4 and subject of SE-21 based on the results of the learning independence questionnaire can be said that both subjects meet the indicators of learning independence, namely, non-dependence on others, have self-confidence, behave on their own initiative, have a sense of responsibility, exercise self-control in learning mathematics. lack of discipline in learning and the tasks at hand.

*3.5.3 Subjects' Mathematical Critical Thinking Ability with Low Learning Independent*

The results showed that subjects of RE-16 and RE-23, both met two indicators of five indicators of critical thinking ability, namely interpreting and analysing problems. Based on the results of the learning independence questionnaire, RE-16 subjects often study with friends when there are tasks, will ask friends if they can't do math problems, are not sure of their own work, sometimes are late in collecting assignments, ask friends for help if there are difficult questions, often do not focus on paying attention to learning, and sometimes summarize the material. While subject of RE-23 sometimes learns mathematics even though there are no friends, sometimes will ask friends if they can't do math problems, are not sure of their own work, sometimes they are late in learning or collecting assignments, sometimes ask friends for help if there are difficult problems, often do not focus on paying attention to learning, and sometimes do other activities at the time of learning, ask parents if they find difficulties and sometimes summarize the material and will change the learning strategy if they get bad grades. This is in line with the results of hypothesis 3 testing in this study which concluded that learning independence has a positive effect on students' mathematical critical thinking ability.

On learning, students from low learning independence groups are less active in group discussions and rarely do students take the initiative to ask questions about the lesson. Based on the questionnaire that was filled out by students in the low learning independence group, this group sometimes studied mathematics, and paid less attention to when learning. The attitude and behaviour of students with low learning independent is one of the factors that causes these students to have the ability to think critically which has not been maximized with previous health checks.

## 4. Conclusion

Based on the results of research and discussion on critical abilities in DAPIC Problem Solving learning with the RME approach developed to be independent, it is obtained as follows, (1) the ability to think critically in DAPIC Problem Solving learning with the Scientific-RME approach reaches more than the minimum completeness criteria of 69, (2) students' mathematical critical thinking skills in terms of learning independence in DAPIC Problem Solving learning with the Scientific-RME approach achieve classical completeness, namely more than 75% of students who have completed the educational range, (3) average mathematical critical thinking skills in DAPIC Problem learning Solving with the Scientific-RME approach is better than the average critical thinking ability in Problem Based Learning, (4) the proportion of mathematical critical thinking skills in DAPIC Problem Solving with the Scientific-RME approach is better than the proportion of critical thinking skills in Problem Based Learning, (5) Description of subjects with high learning independence tend to meet the indicators of interpreting problems, analysing problems, implementing solutions, evaluating and concluding results with evidence; the subject of moderate learning independence tends to meet the indicators of interpreting problems, analysing problems, and implementing solutions; and the subject of low learning independence tends to meet the indicators of interpreting problems and analysing problems

## References


Agustini, D., & Pujiastuti, H. (2020). Analisis Kesulitan Siswa Berdasarkan Kemampuan Pemahaman Matematis dalam Menyelesaikan Soal Cerita Pada Materi SPLDV. *Media Pendidikan Matematika*, *8*(1), 18. https://doi.org/10.33394/mpm.v8i1.2568

Aryanta, I. K. D. (2020). Implementasi Aplikasi UKBM berorientasi STEM untuk meningkatkan hasil belajar fisika siswa. *Indonesian Journal of Educational Development, 1*(3), 357-365.

Asmar, A., & Delyana, H. (2020). HUBUNGAN KEMANDIRIAN BELAJAR TERHADAP KEMAMPUAN BERPIKIR KRITIS MELALUI PENGGUNAAN SOFTWARE GEOGEBRA. *Jurnal Program Studi Pendidikan Matematika, 9*(2), 221–230.

Ayu, O., Dewi, S., & Winarti, E. R. (2019). *Students ' creative thinking ability in solving problems with double loop problem solving model*. *8*(2), 111–118. https://doi.org/10.15294/ujme.v8i2.31718

Do, T. T., Hoang, K. C., Do, T., Trinh, T. P. T., Nguyen, D. N., Tran, T., ... & Nguyen, T. T. (2021). Factors Influencing Teachers' Intentions to Use Realistic Mathematics Education in Vietnam: An Extension of the Theory of Planned Behavior. *Journal on Mathematics Education, 12*(2), 331-348.

Liana, D. (2020). Berpikir Kritis Melalui Pendekatan Saintifik. *Mitra PGMI, 6*(1), 15-27.

Makur, A. P., Jehadus, E., Fedi, S., Jelatu, S., Murni, V., & Raga, P. (2021). Kemandirian Belajar Mahasiswa dalam Pembelajaran Jarak Jauh Selama Masa Pandemi. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(1), 1-12.

Millaty, V. N. (2021). Pengaruh Kemandirian Belajar terhadap Kemampuan Koneksi Matematis Siswa pada Materi Segiempat. *Jurnal Didactical Mathematics*, 3(1), 33-40.

Putridayani, I. B., & Chotimah, S. (2018). Analisis Kesulitan Belajar Siswa Dalam Menyelesaikan Soal. *Jurnal IKIP Siliwangi*, *7*(May), 57–62.

Rahmayanti, N., Yonanda, D. A., & Kurino, Y. D. (2021, September). Penggunaan Media Papan Musi (Multifungsi) Untuk Meningkatkan Hasil Belajar Siswa Dalam Mata Pelajaran Matematika. In *Prosiding Seminar Nasional Pendidikan* (Vol. 3, pp. 118-122).

Risnanosanti, & Ristontowi. (2019). Developing students ' mathematical literacy through DAPIC problem solving process. *Journal of Physics: Conference Series*, 6–11. https://doi.org/10.1088/1742-6596/1321/2/022125

Rodiah, A. (2020). *KEMAMPUAN PEMECAHAN MASALAH MATEMATIS PADA PROJECT BASED LEARNING BERBANTUAN LEARNING LOG DITINJAU DARI KEMANDIRIAN BELAJAR SISWA.* Under Graduates thesis, UNNES.

Setiana, D. S., & Purwoko, R. Y. (2020). Analisis kemampuan berpikir kritis ditinjau dari gaya belajar matematika siswa. *Jurnal Riset Pendidikan Matematika*, *7*(2), 163–177. Retrieved from https://journal.uny.ac.id/index.php/jrpm/article/view/34290

Sipayung, T. N., Imelda, Siswono, T. Y. E., & Masriyah. (2022). An analysis of students learning independence in mathematics based on google classroom. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/2157/1/012037

Suh, J., Matson, K., Seshaiyer, P., Jamieson, S., & Tate, H. (2021). Mathematical modeling as a catalyst for equitable mathematics instruction: Preparing teachers and young learners with 21st century skills. *Mathematics*, 9(2), 162.

Sumirattana, S., Makanong, A., & Thipkong, S. (2017). Using realistic mathematics education and the DAPIC problem-solving process to enhance secondary school students' mathematical literacy. *Kasetsart Journal of Social Sciences*, *38*(3), 307–315. https://doi.org/10.1016/j.kjss.2016.06.001

Umam, K., & Susandi, A. D. (2022). Critical Thinking Skills: Error Identifications on Students' with APOS Theory. *International Journal of Evaluation and Research in Education, 11*(1), 182-192.

Utari, D. R., Wardana, M. Y. S., & Damayani, A. T. (2019). Analisis Kesulitan Belajar Matematika dalam Menyelesaikan Soal Cerita. *Jurnal Ilmiah Sekolah Dasar*, *3*(4), 545. https://doi.org/10.23887/jisd.v3i4.22311

Wardono, W., Mariani, S., Rahayuningsih, R. T., & Winarti, E. R. (2018). Mathematical literacy ability of 9th grade students according to learning styles in Problem Based Learning-Realistic approach with Edmodo. *Unnes Journal of Mathematics Education*, *7*(1), 48-56.