

HOTS-oriented Learning Model and Mathematical Reasoning Ability

Dela Ambarwati* and Dadan Dasari
Pendidikan Matematika, Universitas Pendidikan Indonesia
Jl. Dr. Setiabudi No. 229, Kota Bandung, Indonesia
**delaambarwati@upi.edu*

Received: 19 Desember 2022 ; Accepted: 26 Desember 2022 ; Published: 30 Desember 2022

Doi: 10.15575/ja.v8i2.22322

Abstrak

Penelitian primer terkait implementasi model pembelajaran berorientasi HOTS untuk meningkatkan kemampuan penalaran matematis siswa telah banyak dilakukan. Penelitian-penelitian tersebut perlu diidentifikasi, dianalisis perkembangannya, dan ditarik kesimpulan secara umum sehingga dapat dimanfaatkan sebagai saran bagi kemajuan peneliti dan praktisi di bidang pendidikan matematika. Penelitian ini bertujuan untuk melihat tren penelitian dengan mengidentifikasi dan mengklasifikasikan seluruh hasil penelitian yang berkaitan dengan penerapan model pembelajaran berorientasi HOTS untuk meningkatkan kemampuan penalaran matematis siswa di Indonesia pada tahun 2017-2022. Penelitian ini menggunakan metode Systematic Literature Review (SLR). Terdapat 29 artikel terkait yang dianalisis dalam penelitian ini. Hasil SLR ini menunjukkan penelitian implementasi model pembelajaran berorientasi HOTS terhadap kemampuan penalaran matematis siswa Publikasi paling banyak terjadi pada tahun 2018 yang menggunakan model pembelajaran DL/IL dan paling sering diterapkan pada siswa tingkat SMP/MTs di wilayah pulau Jawa. Tren penelitian menggunakan metode kuantitatif dan mengajarkan materi bangun ruang sisi datar. Hasil penelitian ini dapat menjadi pertimbangan bagi para peneliti dalam melakukan penelitian dan bagi guru dalam melaksanakan pembelajaran di kelas.

Kata kunci: Model Pembelajaran berorientasi HOTS, Penalaran Matematis, Systematic Literature Review

Abstract

Related primary research implementation of the HOTS-oriented learning model for increase students' mathematical reasoning ability has many done. Researches the need identified, analyzed development, and pulled conclusion in general so that could utilized as a suggestion for progress researcher and practitioner in the field of math education. This study aim for see research trend with identify and classify whole results related research with application of the HOTS-oriented learning model for increase students' mathematical reasoning ability in Indonesia on 2017-2022 period. This study use method Systematic Literature Review (SLR). There is 29 article related to be analysed in this study. The results of this SLR show implementation of HOTS-oriented learning model to students' mathematical reasoning ability. The most publications occurred in 2018 which used the DL/IL learning model and were most frequently applied to students at the SMP/MTs level on the island of Java. The research trend uses quantitative methods and teaches material on flat sided spaces. This results could becomes consideration for researcher to do research and for internal teachers doing classroom learning.

Keywords: HOTS-oriented Learning Model, Mathematical Reasoning, Systematic Literature Review

1. INTRODUCTION

Talking about learning mathematics, mathematical reasoning ability is one of the important things that must be possessed by students. Mathematical literacy skills tested in PISA include mathematical reasoning abilities (OECD, 2019). According to Kartono & Shora (2020), mathematical reasoning abilities are important to grow so that students are able to understand mathematical concepts well. In addition, according to (Novianda et al., 2021), reasoning in finding patterns and procedures used in mathematics will assist students in developing a deeper understanding of mathematics.

Mathematical reasoning ability can be improved one of them with activity encompassing learning complex or non-routine (Demir et al., 2022). According to Lakin & Kell (2019), reasoning abilities are not static, they can be developed through experience and made easier to do through practice. Furthermore, according to Kaplar et al. (2022) that reasoning ability mathematics level could be studied and complex math skills could be developed. From these several opinions, it can be concluded that mathematical reasoning abilities can be developed through learning complex or non-routine mathematics.

Furthermore, (NCTM, 2000) suggests that reasoning has a certain standard where the standard includes: recognizing reasoning as a fundamental aspect of mathematics, making and investigating mathematical conjectures, developing and evaluating mathematical arguments, selecting and using various types of reasoning. To find out the mathematical reasoning abilities possessed by students, it can be measured by indicators of mathematical reasoning abilities. Reasoning ability indicators are as follows.

- a. draw logical conclusions
- b. provide an explanation of the model, facts, properties, relationships or patterns
- c. estimating the answer and the solution process
- d. use relationship patterns to analyze situations, or make analogies, generalize, and construct conjectures
- e. put forward the opposite example
- f. following the rules of inference, checking the validity of arguments, proving and constructing valid arguments
- g. compile direct proof, indirect proof, and proof using mathematical induction.

Besides seeing ability cognitive, learning mathematics very important so that becomes the right collaboration in learning. With support moment this that is approach scientific, learning could be directed with method *student center*. This could be interpreted that in communicating theory lesson needed practice *High Order Thinking Skills* (HOTS). Kindly general application of HOTS measure ability on realm analyze (C4), evaluate (C5), and create (C6) (Siregar & Nasution, 2019). Based on this, we need an oriented learning model on implementation of HOTS. Implementation of the 2013 curriculum is appropriate Permendikbud Number 22 of 2016 concerning The Process Standard uses 3 learning models including :

- a. *Discovery / Inquiry Learning (DL/IL)*
- b. *Problem-based Learning (PBL)*
- c. *Project-based Learning (PjBL)*

A number of studies have analyzed the increase in mathematical reasoning abilities by applying these three learning models in learning mathematics. Each of these studies is still individual in nature, revealing students' mathematical reasoning abilities after applying these models. On the other hand, there is a need to see progress by identifying, classifying and analyzing these various studies. This can be done with a *Systematic Literature Review* (SLR).

This study aims to see the results of research related to the analysis of students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of various aspects, namely: 1) Year of publication; 2) Journal index level; 3) Category of research subject education; 4) The research method used; and 5) research location. Through several research results that have been extracted, some formulations of the problems that arise in this study include the following.

1. How is the students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of the year of publication?
 2. How is the students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of the educational level of sample?
 3. How is the students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of learning materials?
 4. How is the students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of the research methods used?
 5. How is students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of research location/demography?
- How is students' mathematical reasoning abilities through the application of the HOTS-oriented learning model in terms of research result?

2. METHOD

This study aims to determine the diversity of students' mathematical reasoning abilities in Indonesia. This research was conducted by identifying, reviewing, evaluating and interpreting published articles. The research instrument used was an observation sheet related to the inclusion criteria based on the year of research and the level of research using the *Systematic Literature Review* (SLR) method.

Systematic Literature Review (SLR) method is a research method that synthesizes various research results to present a more comprehensive and balanced fact. All research results with similar topics can be identified, evaluated and interpreted using the SLR (Calderón & Ruiz, 2015). Destination use SLR method is for find and synthesize study in a manner comprehensive with refers on question specific, and managed procedures with good, transparent, and could replicated on every step in the process (Juandi, 2021)

a. Literature Search

Search process literature studies conducted with access google scholar database. Search conducted on database use keyword "mathematical reasoning ability", "Discovery Learning", "Inquiry Learning", "Problem-based Learning", "Project-based Learning".

b. Inclusion Criteria

Literature that has collected filtered return based on criteria inclusion and exclusion. Determination criteria inclusion and exclusion conducted for determine appropriateness literature to be used in SLR research or no (Fitriani & Prahmana, 2021). Compliant article criteria inclusion will included in step research. **Table 1** describe criteria inclusion and exclusions used in this study.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
<i>Discovery/Inquiry Learning, Problem Based Learning or Project Based Learning learning</i>	Interventions other than the application of the <i>Discovery/Inquiry Learning learning</i>

Inclusion Criteria	Exclusion Criteria
models with the observed results being mathematical reasoning abilities.	<i>model, Problem Based Learning or Project Based Learning</i> with the observed results are mathematical reasoning abilities.
Publication in journals/proceedings in 2017-2022	Publication of journals/proceedings before 2017 and after 2022
The primary research subjects were students of SD/MI, SMP/MTs, SMA/SMK/MA.	Primary research subjects are students at tertiary institutions
Research locations in Indonesia	Research locations other than in Indonesia

c. Population and Sample

The population in this study is all research on mathematical reasoning abilities that use the HOTS-oriented learning model and are published in journals. Based on a search using a search engine, found a sample of 35 articles consisting of 29 articles to be analyzed.

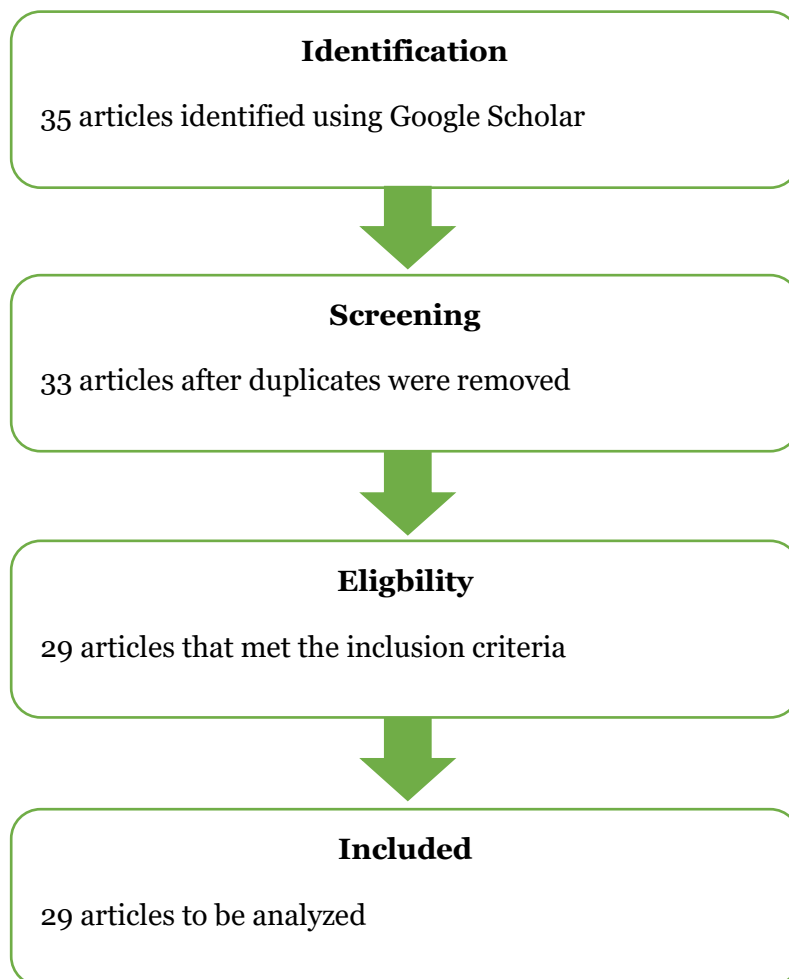


Figure 1. PRISMA Diagram

d. Data Analysis

Articles declared to have met all inclusion criteria were then analyzed further. Each article is identified and classified based on five study characteristics, namely year of publication, level of

education, teaching materials, research methods and research location/demography. Analysis of the year of publication was carried out by grouping articles of year. The characteristics of the study level were analyzed by classifying the research subjects in each article into SD/MI, SMP/MTs, SMA/SMK/MA levels. An analysis of the characteristics of the teaching materials was carried out by grouping the mathematical materials used in research in each article. Furthermore, an analysis of the research methods used in each article is divided into categories of quantitative, qualitative, mixed, development and PTK research. Then an analysis was also carried out on research locations based on regions in Indonesia. Then analysis also done to results study every article so that could concluded how HOTS oriented learning model effect to ability reasoning mathematical student . The results of the analysis of each study characteristic are interpreted and written in the form of reports to answer research questions.

3. RESULT AND DISCUSSION

From the results of a literature search, 29 articles were found that could be included in the analysis stage. Judging from the year of publication of articles about the three HOTS-oriented learning models and mathematical reasoning abilities, the years 2017-2022 presented in **Figure 2**. found that most articles were dominated by research using the DL/IL model in 2018 as many as 6 articles out of the number of articles using DL/IL model of 14 articles. In contrast to those using the PBL and PjBL models which totaled 3 and 0 of 29 articles respectively. The data for the year of publication of the article which is summarized in the figure shows interest in research with topics among the three HOTS-oriented learning models in order to increase student competency in the form of mathematical reasoning abilities which have increased and decreased.

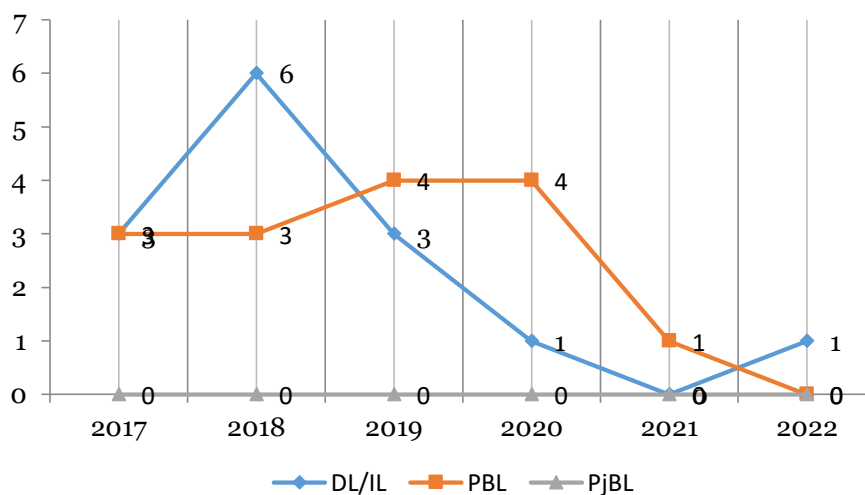


Figure 2. Total of Articles by Year of publication

The HOTS-oriented learning model is applied to students at various levels of education as an effort to improve mathematical reasoning abilities. The number of articles at each level is presented in **Figure 3**. In the last 5 years it was found that the implementation of the HOTS-oriented learning model was dominated by efforts to improve students' mathematical reasoning abilities at the SMP/MTS level, namely 16 articles out of 29 articles. Furthermore, 11 articles examined this topic for SMA/SMK/MA students and only 2 articles for SD/MI students.

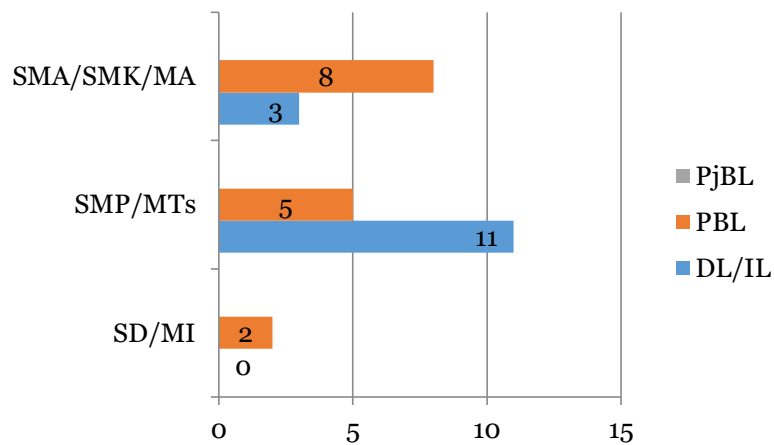


Figure 3. Total of Articles Based on the Educational Level of the Sample

Learning materials are things that need to be considered in implementing a learning model. In the 29 articles analyzed, learning materials were found to be quite diverse, but several articles did not mention the material being taught. The learning materials for each article are presented in **Figure 4.**

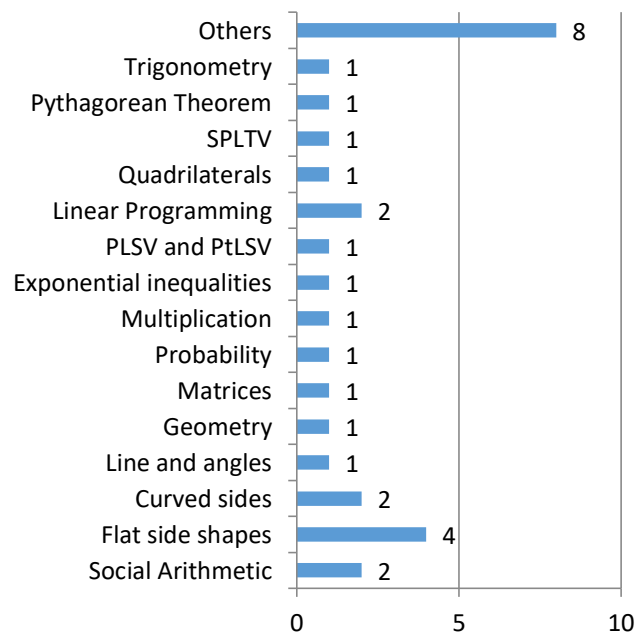


Figure 4. Total of Articles Based on Learning Materials

Based on the analysis carried out, the material for flat side shapes is mostly taught in the implementation of research. Other types of learning materials used include social arithmetic, curved sides, lines and angles, geometry and measurement, matrices, probability, multiplication, exponential inequalities, PLSV and PtLSV, linear programming, quadrilaterals, SPLTV, Pythagorean Theorem, and Trigonometry . Meanwhile, articles that do not include what material is taught during the research process are categorized as others material.

Article classification was also carried out based on the research method used. Article grouping is divided into 4 categories, namely qualitative, quantitative, mixed, development and PTK research. The distribution of articles for each category of research methods is presented in **Figure 5**.

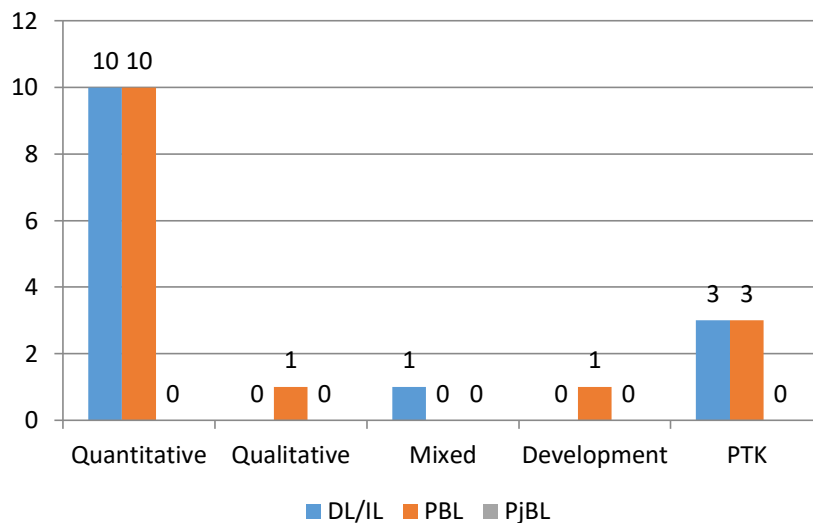


Figure 5. Total of Articles Based on Research Methods

From 2017 to 2022, research on the topic of HOTS-oriented learning models and mathematical reasoning abilities is dominated by quantitative research. Of the 29 articles analyzed, there were 20 research articles that used quantitative methods from all HOTS-oriented learning models. 1 article each using qualitative, mixed and development research, and 6 research articles using the PTK method. This means that the research trend in 5 years is in quantitative research.

Based on 29 articles with various research methods as well as various research areas presented in **Figure 6**.

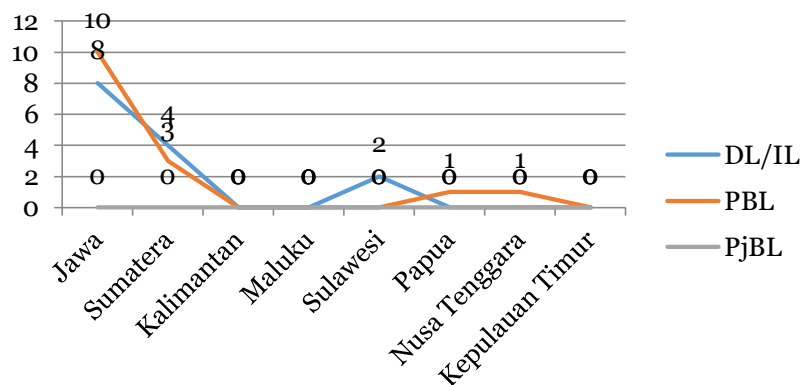


Figure 6. Total of Articles Based on Research Location/Demography

Based on the demographics of Indonesia's territory, there are 3 out of 9 islands, namely Kalimantan, Maluku and the Eastern Islands, where there are no research results on the topic of mathematical reasoning abilities using HOTS-oriented learning models. Figure 5 provides information that based on demographics, the highest number of publications occurred in Java with 10 articles from 2017 to 2022 using the PBL model. This is the hope of other demographers who are still doing a little research

on the topic of using the HOTS learning model on mathematical reasoning abilities to be further improved and published.

Based on 29 articles with various research methods, it also shows research results that vary from one to another. The implementation of the HOTS-oriented learning model does not always have the same effect on students' mathematical reasoning abilities. However, the results of the study were dominated by the success of the DL/IL model in improving students' reasoning abilities in learning mathematics.

Several quantitative research articles reveal that the application of the DL/IL model can have a better effect on increasing mathematical reasoning abilities than other learning (Badjeber, 2017; Hermawan & Hidayat, 2018; Mahrifah & Samosir, 2019; Mukhlis & Manullang, 2019; Nurmala et al., 2018; Rahman et al., 2019; Riyadi et al., 1907; Roesdiana, 2017; Syahputri & Manullang, 2017). However, in the results of Yuni et al. (2018) gave no better effect on increasing mathematical reasoning abilities.

Results in a mixed study using the DL/IL model revealed an increase ability reasoning mathematical on class with learning models *discovery learning* more tall from on class normal (Santana et al., 2022). Furthermore, for PTK research using the DL/IL model, it shows that students' mathematical reasoning abilities increased from cycle I to cycle II (Jabar & Lestari, 2018; Parida et al., 2020; Tukaryanto et al., 2018).

Then, several quantitative research articles revealed that the application of the PBL model can have a better effect on improving mathematical reasoning abilities than other learning (Bedilius Gunur & Apolonia Hendrice Ramda, 2020; Fatimah et al., 2017; Julia, 2019; Khaeroh et al., 2020; Komala et al., 2020; Munawaroh et al., 2018; Rhofiqah & Thaariq, 2019; Sugandi & Bernard, 2020; Wiyanti and Leonard, 2016).

The results of qualitative research using the PBL model reveal that all indicators of reasoning ability can be fulfilled in PBL if all PBL phases are carried out properly (Afif et al., 2016; Astiati, 2020). Furthermore, for development research with the PBL model it is effective in increasing students' mathematical reasoning abilities by 82.76% (Palobo & Nur'aini, 2018). PTK research using the PBL IL model shows that students' mathematical reasoning abilities increase from cycle I to cycle II (Abidah et al., 2021; Fitriana, 2019; Kurniawati, 2018)

4. CONCLUSION

There are 29 research articles that use the HOTS-oriented learning model as a treatment for students who aim to improve mathematical reasoning abilities in the 2017-2022 period which are identified and classified based on the year of publication, level of education, learning materials, research methods and research locations/demography.

The most publications occurred in 2018 which used the DL/IL learning model and were most frequently applied to students at the SMP/MTs level on the island of Java. The research trend uses quantitative methods and teaches material on flat side shapes. In general, based on the results of his research, it shows that the HOTS-oriented learning model in mathematics learning is able to have a positive impact on increasing students' mathematical reasoning abilities when compared to other

learning models. A series of steps from one of the HOTS-oriented learning models, namely the PBL model, can help students hone their mathematical reasoning abilities for each indicator used.

The results of this SLR can be considered by researchers and practitioners in the field of mathematics education in conducting research and learning activities in class. For further research, it is necessary to analyze all articles in a more comprehensive manner using meta-analysis or meta-synthesis methods so that the results obtained are more in-depth.

References

- Abidah, N., Hakim, L. El, & Antari, D. (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. <https://doi.org/10.21009/jrpmj.v3i1.15523>
- Afif, A. M. S., Suyitno, H., & Wardono. (2016). Analisis kemampuan penalaran matematis ditinjau dari gaya belajar siswa dalam *problem based learning* (PBL). *Seminar Nasional Matematika X, 2007*, 328–336.
- Astiati, S. D. (2020). Analisis kemampuan penalaran matematis siswa MTs dalam menyelesaikan soal-soal geometri. *JISIP (Jurnal Ilmu Sosial dan Pendidikan)*, 4(3), 6–12. <https://doi.org/10.36312/jisip.v4i3.1239>
- Badjeber, R. (2017). Asosiasi kemampuan penalaran matematis dengan kemampuan koneksi matematis siswa SMP dalam pembelajaran inkuiri model alberta. *Jurnal Penelitian Dan Pembelajaran Matematika*, 10(2), 50–56. <https://doi.org/10.30870/jppm.v10i2.2030>
- Bedilius Gunur, & Apolonia Hendrice Ramda. (2020). Model *problem based learning* dan prespektif gender terhadap kemampuan penalaran matematis siswa. *Numeracy*, 7(1), 65–78. <https://doi.org/10.46244/numeracy.v7i1.1000>
- Calderón, A., & Ruiz, M. (2015). A systematic literature review on serious games evaluation: An application to software project management. *Computers and Education*, 87, 396–422. <https://doi.org/10.1016/j.compedu.2015.07.011>
- Demir, M., Zengin, Y., Özcan, Ş., Urhan, S., & Aksu, N. (2022). Students' mathematical reasoning on the area of the circle: 5E-based flipped classroom approach. *International Journal of Mathematical Education in Science and Technology*. <https://doi.org/10.1080/0020739X.2022.2101955>
- Fatimah, L., Maulana, M., & 'Atun, I. I. (2017). Pengaruh problem-based learning (PBL) berstrategi "MURDER". *Jurnal Pena Ilmiah*, 2(1), 871–880.
- Fitriana, U. (2019). Penerapan pendekatan problem based learning terhadap peningkatan kemampuan penalaran matematis siswa SMA pada materi peluang. *Journal on Education*, 01(02), 317–322. <http://jonedu.org/index.php/joe/article/view/70>
- Fitriani, R., & Prahmana, R. C. I. (2021). penelitian implementasi pembelajaran matematika bagi anak berkebutuhan khusus di Indonesia. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 10(3), 1293. <https://doi.org/10.24127/ajpm.v10i3.3968>
- Hermawan, A. S., & Hidayat, W. (2018). Meningkatkan kemampuan penalaran matematik siswa smp melalui pendekatan penemuan terbimbing. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 1(1), 7. <https://doi.org/10.22460/jpmi.v1i1.p7-12>

- Jabar, A., & Lestari, D. (2018). Pembelajaran inkuiri terbimbing dalam pembelajaran segiempat untuk meningkatkan kemampuan penalaran matematis siswa SMP. *4*(1), 34–46.
- Juandi, D. (2021). Heterogeneity of problem-based learning outcomes for improving mathematical competence: A systematic literature review. *Journal of Physics: Conference Series*, *1722*(1), 0–7. <https://doi.org/10.1088/1742-6596/1722/1/012108>
- Julia, N. T. (2019). Perbedaan kemampuan penalaran matematis siswa antara model pembelajaran berbasis masalah dan penemuan terbimbing di SMAN 1 Binjai Kabupaten Langkat. *III No.2*(2), 134–143.
- Kaplar, M., Radović, S., Veljković, K., Simić-Muller, K., & Marić, M. (2022). The Influence of Interactive Learning Materials on Solving Tasks That Require Different Types of Mathematical Reasoning. *International Journal of Science and Mathematics Education*, *20*(2), 411–433. <https://doi.org/10.1007/s10763-021-10151-8>
- Kartono, & Shora, R. Y. (2020). Effectiveness of process oriented guided inquiry learning with peer feedback on achieving students' mathematical reasoning capabilities. *International Journal of Instruction*, *13*(3), 555–570. <https://doi.org/10.29333/iji.2020.13338a>
- Khaeroh, A., Anriani, N., Mutaqin, A., Pertanian, S., & Serang, K. (2020). Pengaruh model pembelajaran *problem based learning* terhadap kemampuan penalaran matematis. *Tirtamath: Jurnal Penelitian dan Pengajaran Matematika*. Vol. 2, 73–85.
- Komala, T. R., Nurlaelah, I., & Setiawati, I. (2020). Peningkatan kemampuan penalaran siswa melalui model *problem based learning* (pbl) ditinjau dari kemampuan akademik siswa di SMA. *SINAU: Jurnal Ilmu Pendidikan dan Humaniora*, *6*(2), 73–86. <https://doi.org/10.37842/sinau.v6i2.31>
- Kurniawati, R. F. (2018). Peningkatan penalaran matematis melalui PBL bernuanasa etnomatika pada siswa XI MIPA 6 SMA Negeri 7 Semarang. *PRISMA (Prosiding Seminar Nasional Matematika)*, *1*, 830–834.
- Lakin, J. M., & Kell, H. J. (2019). Intelligence and reasoning. In *The Cambridge Handbook of Intelligence* (pp. 528–552). <https://doi.org/10.1017/9781108770422.023>
- Mahrifah, & Samosir, K. (2019). Siswa menggunakan model pembelajaran *discovery learning* dengan model pembelajaran *problem -based learning* siswa kelas VIII MTS Negeri Siabu. *5*(2), 12–23.
- Mukhlis, R., & Manullang, M. (2019). Perbedaan kemampuan penalaran matematis siswa yang diajar dengan model pembelajaran *discovery learning* dan *group investigation* dengan bantuan media *winggeom*. *Karismatika*, *5*(2), 11–16.
- Munawaroh, L., Sampoerna, P. D., & Yurniwati. (2018). Pengaruh *problem based learning* terhadap kemampuan penalaran matematis dan kemampuan pemahaman konsep matematika ditinjau dari kemampuan awal matematika. *Prosiding Seminar Dan Diskusi Nasional Pendidikan Dasar "Menyongsong Transformasi Pendidikan Abad 21,"* 301–306. <http://journal.unj.ac.id/unj/index.php/psdspd/article/view/10152>
- NCTM. (2000). Principles and standars for school mathematics.
- Novianda, D., Darhim, & Prabawanto, S. (2021). Analysis of students' mathematical reasoning ability in geometry through distance learning. *Journal of Physics: Conference Series*, *1882*(1). <https://doi.org/10.1088/1742-6596/1882/1/012085>

- Nurmala, R., Samparadja, H., & Salam, M. (2018). Pengaruh model discovery learning terhadap kemampuan penalaran matematis siswa kelas VII SMP Negeri 3 Kendari. *1*, 86–88.
- OECD. (2019). Pisa 2018 assessment and analytical framework. *OECD Publishing Paris*. <https://doi.org/10.1787/b25efab8-en>
- Palobo, M., & Nur'aini, K. D. (2018). Pengembangan perangkat pembelajaran berbasis problem based learning berorientasi pada peningkatan kemampuan penalaran dan sikap siswa terhadap matematika. *Jurnal Magistra*, *5*(1), 15–25. <https://core.ac.uk/download/pdf/268213993.pdf>
- Parida, Nusantara, T., & Abadyo. (2020). Pembelajaran penemuan terbimbing untuk meningkatkan penalaran matematis siswa pada materi program linear. *Jurnal Kajian Pembelajaran Matematika*, *4*(2), 1–11.
- Rahman, L., Fitriani, D., & Fitri, I. (2019). Pengaruh penerapan model discovery learning terhadap kemampuan penalaran matematis ditinjau dari pengetahuan awal siswa SMP Negeri 3 Tambang Kabupaten Kampar. *JURING (Journal for Research in Mathematics Learning)*, *2*(1), 001. <https://doi.org/10.24014/juring.v2i1.7467>
- Rhofiqah, L., & Thariq, S. M. H. (2019). Pengaruh model pembelajaran problem based learning (Pbl) terhadap kemampuan penalaran matematik siswa kelas XI SMA Negeri I Meurebo. *Maret*, *6*(1), 45–57.
- Riyadi, A. S., Dahlan, J. A., & Rosita, T. (1907). *Agus Soleh Riyadi, 2 Jarnawi Afgani Dahlan, 3 Tita Rosita 1*. 85–96.
- Roesdiana, L. (2017). Perbandingan kemampuan penalaran matematis antara siswa yang belajarnya menggunakan pendekatan inkuiri dengan setting kooperatif tipe jigsaw dengan model pembelajaran biasa. *AdMathEdu : Jurnal Ilmiah Pendidikan Matematika, Ilmu Matematika Dan Matematika Terapan*, *7*(2), 141. <https://doi.org/10.12928/admathedu.v7i2.9155>
- Santana, H. H., Sunarso, A., & Mariani, S. (2022). Analisis kemampuan penalaran dalam soal pemecahan masalah matematika ditinjau dari self-confidence melalui model pembelajaran discovery learning. *Jurnal Basicedu*, *6*(5), 7879–7887. <https://doi.org/10.31004/basicedu.v6i5.3643>
- Siregar, N. F., & Nasution, E. Y. P. (2019). Pembelajaran matematika berbasis higher order thinking skills. *Prosiding Seminar Nasional Tadris (Pendidikan) Matematika*, 20–27. <http://prosiding.iaincurup.ac.id/index.php/cacm/article/view/10%0Ahttp://prosiding.iaincurup.ac.id/index.php/cacm/article/download/10/16>
- Sugandi, A. I., & Bernard, M. (2020). Efektivitas pembelajaran daring berbasis masalah berbantuan geogebra terhadap kemampuan penalaran matematis di era covid-19 IKIP Siliwangi, Cimahi, Jawa Barat, Indonesia. *E-mail : Abstrak Pendahuluan Pada tahun 2020, dunia dilanda cobaan oleh Sang Maha*. *9*(4), 993–1004.
- Syahputri, I. ., & Manullang, M. . (2017). Perbedaan kemampuan penalaran matematis siswa yang diajar dengan model pembelajaran discovery learning dan model pembelajaran kooperatif tipe stad di kelas VIII SMP Negeri 6 Medan. *Inspiratif : Jurnal Pendidikan Matematika*, *3*(2), 37–46. <https://doi.org/10.24114/jpmi.v3i2.8891>
- Tukaryanto, Hendikawati, P., & Nugroho, S. (2018). Peningkatan kemampuan penalaran matematik dan percaya diri siswa kelas X melalui model discovery learning. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 810–813. <https://journal.unnes.ac.id/sju/index.php/prisma/>

- Wiyanti dan Leonard. (2016). Prosiding diskusi panel nasional pendidikan matematika. pengaruh model problem based learning (PBL) terhadap kemampuan penalaran matematis siswa. 611–623.
- Yuni, Y., Darhim, D., & Turmudi, T. (2018). Peningkatan berpikir intuisi dan penalaran matematis melalui pembelajaran inquiry berbasis open-ended. *Prima: Jurnal Pendidikan Matematika*, 2(2), 107. <https://doi.org/10.31000/prima.v2i2.760>