

Mathematics Learning Model in Elementary School to Developing Critical Thinking

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Abstract. 21st-century learning is about material and critical thinking skills, collaboration, communication, creativity, and character. During the learning tools workshop, researchers as instructors found a tendency for teachers participating in Teacher Professional Education (PPG Daljab) to be confused about the learning model. The result is that most teachers use models of *problem-based learning* and *project-based learning*. If there is no other choice, there may be a lack of literacy regarding learning models to develop students' critical thinking. This study aims to reveal the nature of critical thinking learning and alternative learning models in developing students' critical thinking. The method used in this study is a literature review of articles on Google Scholar. The literature review results include the nature of critical thinking learning to facilitate students with constructing thinking, adapting, evaluating, and planning a follow-up. Alternative learning models include *problem-based learning*, *problem posing*, *project-based learning*, *reciprocal teaching*, *scientific discovery learning*, *inquiry*, *discovery*, *cooperative learning*, *ethnomathematics*, *steam*, and realistic mathematics approach (RME). This article is expected to provide convenience for elementary school teachers in choosing various learning models to develop students' critical thinking.

Keywords: Learning Model, Mathematics Learning, Critical Thinking.

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INTRODUCTION ~ The current global era has a high complexity of problems in various aspects of people's lives. Students as part of society must be equipped with skills that are expected to make students adapt and not be left behind from other nations. Education in Indonesia is intensively implementing 21st-century learning, requiring teachers or educators to adapt to the learning process so that students have 21st-century skills. These skills are the 4Cs which include first *Communication*, second *Collaboration*, third *Critical Thinking and problem solving*, and fourth *Creative and Innovative*. The K13 instruction also hopes for education managers to equip students with critical thinking skills that can be applied to daily activities to be successful in the future (Curriculum,

2013). Students are not enough to be wise, intelligent, and knowledgeable, but students must also work together and collaborate with others. Because by being innovative, only goodwill appears ideas but implementing them will not be optimal. So students who can collaborate are essential for the achievement of an advanced Indonesian nation. In the end, this nation can coexist and socialize, helping each other towards mutual success.

Digital literacy has brought an abundance of information flow with problems in it. Students need to be equipped with critical thinking skills to solve complex problems to access, analyze, communicate, share and use information. The ability to systematically evaluate the weight of personal opinions and the opinions of

others is the ability to think critically (Johnson, 2009). It's explained that critical thinking includes other skills such as identifying and searching, selecting and organizing, and considering various alternatives. According to Alec Fisher, John Dewey called this "critical thinking" as "reflective thinking." He defined it as an active, continuous, and thorough consideration of a belief or form of knowledge taken for granted regarding the reasons that support it and conclusions. - further conclusions that become the trend (Fisher, 2009).

These skills should be developed through the learning process in the classroom because all elements of learning are contained in it. So teachers in their learning are given great opportunities for the development of students' critical thinking. However, there are still teachers who are confused in determining the learning model that develops critical thinking skills in schools. This is evidenced in the implementation of the teaching profession program (PPG Daljab). The result is that most teachers use models of problem-based learning and project-based learning. If there is no other choice, teachers may still lack literacy about learning models to develop students' critical thinking. Teachers should always try to create learning through various approaches or methods, or learning models to achieve learning objectives.

The impact that occurs when teachers always use a monotonous and unvarying learning model is that students can experience boredom and less efficient learning. Teachers do not develop their pedagogical skills because they think that the model that has been mastered is

enough. To make matters worse, if it impacts student learning outcomes, this will be a loss for both students and schools. According to Syah (2009), learning saturation can occur in students who have lost motivation and consolidated at one particular skill level before moving on to the next skill level.

It is time for educators to make breakthroughs to realize successful learning through learning models that develop critical thinking skills. The variety of learning models that teachers can use in the learning process is expected to add insight and increase teacher competence in developing students' critical thinking skills. So that teachers can be more varied in applying learning models and students will be more motivated and can develop critical thinking skills. Based on the discussion above, the researcher is interested in providing alternative learning models to develop critical thinking.

METHOD

This study uses a literature review method. The literature used in this study includes scientific journals related to learning models that develop students' critical thinking skills.

According to Marzali (2017), a literature review is a literature search and research by reading journal books and other sources of information to produce an article according to specific topics and issues.

The literature used by researchers as study material and systematic analysis is from scientific articles from the National Journal with the help of the Google Scholar search tool. Researchers use studies from the results of previous

research as material to create something new.

RESULTS

Critical thinking can facilitate students with constructing thinking, adapting, evaluating, and planning follow-up actions. Alternative learning models include problem-based learning, problem posing, reciprocal teaching, scientific, discovery learning, inquiry, cooperative learning, ethnomathematics, steam, and realistic mathematics approach (RME).

Nisa'ul Fajriyah's 2021 research entitled Analysis of Critical Thinking Skills for Elementary School Students in Mathematics Subjects shows that the most widely used learning model is problem-based learning (PBL) compared to other models from a total of three 35 articles. These results prove that PBL is the most desirable learning model by teachers in developing students' critical thinking skills.

The results of Jaya Yanti's research compare two learning models between Problem Posing and PBL. Problem Posing with the results of the ANCOVA test, which shows the average score on the post-test score of 76.26 is greater than the average post-test result of the PBL learning model with a score of 74.36 (Istiqomah & Indarini, 2021). A similar study conducted by Ericha Widhiyana Pratiwi compared two learning models between problem-solving and problem-posing. Both models had a moderate effect. However, the problem-posing model had a more significant influence (Pratiwi & Indarini, 2021).

According to the research results, Khoerul Umam revealed an increase in students' critical thinking skills through the

learning model reciprocal teaching (Umam, 2018). In line with the results of Sundahry research which revealed that reciprocal teaching improved critical thinking skills (Sundahry et al., 2019).

The results of Rusnah's research prove that the scientific learning model approach can improve the critical thinking skills of elementary school students (Rusnah & Mulya, 2018).

Yusmanto, in his research, stated through the results of his research that model discovery learning could improve mathematical critical thinking skills (Yusmanto & Herman, 2016).

Maryam, in her research, revealed that the inquiry learning model affects students' critical thinking skills (Maryam et al., 2020).

Many cooperative learning models can affect students' critical thinking skills, including the results of Bunga Leniati's research, which revealed that the Jigsaw and Two Stay Two Stray (TSTS) learning models in mathematics learning have a relatively significant influence on students' critical thinking skills (Leniati & Indarini, 2021).

Research conducted by Rahmah Kumullah revealed an increase in critical thinking skills through the use of the type cooperative learning model talking stick (Kumullah & Yulianto, 2020).

Research conducted by Andriyani found that ethnomathematics-based mathematics learning was effective in problem-solving skills and students' mathematical critical thinking (Andriyani & Kuntarto, 2017).

Vivi Puspita's research states that the RME (learning model realistic Mathematics Education) positively influences students' critical thinking skills, especially in learning mathematics (Puspita et al., 2020). Research from Ujiati Cahyaningsih also revealed that RME-based teaching materials could be used to develop students' critical thinking skills (Cahyaningsih & Nahdi, 2020).

In the RME learning process, students will be invited to understand real contextual mathematical problems and be explored, using various models, provided with a set of alternative concepts, interactive, utilizing linkages (intertwining) between topics. The following table shows examples of the learning process from each model of learning that can develop critical thinking.

Table 1.

No	Model Learning	Process
1	problem based learning	The orientation phase by showing a video containing problems related to the material. Students are guided to identify and formulate problems. They are organizing students to learn to solve problems in groups. This is followed by finding solutions to problems, presenting group work results, and making conclusions. (Perdana & Slameto, 2016)
2	problem posing	Students create, propose, formulate problems experienced and, by the material, solve problems and verify.
3	project-based learning	They are completing a project in daily life, for example, building a bridge over a broken river. Students make bridges by comparison and make miniatures of straws by paying attention to the geometric shapes formed. Students plan and implement projects, evaluate, and present in-class presentations.
4	reciprocal teaching	Create an independent understanding by summarizing teaching materials, either with a mind map or otherwise. Trying to arrange questions and at the same time solve them, clarifying by providing an explanation of the material that has been obtained, immediately predicting the results and weaknesses of learning.
5	scientific	Steps scientifically observe the problem of waste that accumulates in the surrounding environment. Students are asked to ask about any problems that arise regarding the waste. Students try to calculate the amount of waste generated at home in a certain time, the data obtained is processed, the results are presented and presented, conclude the results of discussions about waste, and create a waste management process or actions that should be about waste based on the calculations obtained.

6	discovery learning	Provide stimuli, identify problems, collect data, process data, prove, draw conclusions—examples of activities: apperception, observing the shape of a rectangular snake, and ladder board. Questions and answers with student worksheets regarding the area and perimeter of a rectangular board, then conclude the concepts of perimeter and area, review and reflection. (Utama et al., 2019)
7	inquiry	Problem orientation can be done by presenting a problem, for example, in an elevator with a maximum weight that can be transported 850 kg. Outside there are 17 people with a certain weight. How many times can the elevator move the 17 people? The student's hypothesis formulation gives an approximate answer. The definition stage makes suitable tables and patterns. The exploration stage tries to arrange people based on body weight, proves by describing and trying the composition of the people. The formulation of generalizations concludes the results of the activities.
8	Cooperative learning	Group learning can use STAD, TGT, NHT, and others.
9	Etnomatematika	Teaching mathematics with the existing culture. For example, they are taking students to the market to buy traditional snacks. On the way to rest and stop to observe the traditional snacks that have been purchased, together we explore what forms exist in these traditional snacks with questions and answers. Arriving at school, students are asked to describe the flat shapes and shapes found in the snack shapes while identifying the elements in the flat shapes.
10	Steam	Designing a house building with SketchUp software, students are free to color the building. There is the concept of building space, technology, the beauty of color, and the shape of the building.
11	Pendekatan Matematika Realistik	The real problem is that there are two families, A and B, who have a "nyekar" tradition; family A has a nyekar once every 15 days, while B every 30 days. On November 2, 2021, the families cross together. What date will the two families be able to cross together for the second time. The model uses a date and a sticker to determine the date with a second "nyekar". Build knowledge by creating tables. Go to formal mathematics by finding multiples and determining Least Common Multiple.

DISCUSSION

From various mathematical learning models that can develop critical thinking,

it can be seen that certain aspects must be present in every activity. The characteristics of critical thinking ensure

that there is a problem orientation that is presented with various possibilities. The questions presented use the context of everyday life problems. Problems close to students' lives will be easier to accept and more accessible for students to understand.

In addition to problem orientation, it is also essential to have activities that activate students and allow students to experience, explore, and conclude the material for themselves—outline of the learning model expected to develop critical thinking. In practice, each of these models can be combined or even modified. A teacher is free to create and provide variations of learning activities in the classroom.

Then, what learning models can be combined and complement each other? There is a need for more in-depth research in learning practices to determine whether or not the learning is appropriate. The incorporation of learning models can also be adjusted from the characteristics of the material, student conditions, and the responses that arise for the success of the learning process.

CONCLUSION

Students' critical thinking skills are essential to teachers to solve problems in everyday life, now and in the future. From the results of the discussion above, there is much literature that proves that mathematics learning models can develop critical thinking skills, including problem-based learning, problem posing, project-based learning, reciprocal teaching, scientific, discovery learning, inquiry, discovery, cooperative learning, ethnomathematics, steam, and realistic mathematical approach (RME). So it is

hoped that teachers will no longer hesitate or be confused in determining the model of learning mathematics in schools.

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REFERENCES

- Andriyani & Kuntarto. (2017). Etnomatematika : Model Baru dalam Pembelajaran. *Jurnal Gantang, II*(2).
- Cahyaningsih, U., & Nahdi, D. S. (2020). Pengembangan Bahan Ajar Matematika SD Berbasis Model Pembelajaran *Realistic Mathematics Education* yang Berorientasi Kemampuan Berpikir Kritis. *Jurnal Educatio FKIP UNMA, 6*(2). <https://doi.org/10.31949/educatio.v6i2.622>
- Fisher, A. (2009). *Berpikir Kritis*. Erlangga.
- Istiqomah, J. Y. N., & Indarini, E. (2021). Meta Analisis Efektivitas Model Problem Based Learning dan Problem Posing Terhadap Kemampuan Berpikir Kritis Siswa Sekolah Dasar Pada Pembelajaran Matematika. *Jurnal Cendekia : Jurnal Pendidikan Matematika, 5*(1). <https://doi.org/10.31004/cendekia>

- .v5i1.553
- Johnson, E. B. (2009). Contextual teaching & learning. *Mizan Media Utama, January 2016*.
- Kurikulum 2013, (2013).
- Kumullah, R., & Yulianto, A. (2020). Kemampuan Berpikir Kritis Peserta Didik Melalui Pembelajaran *Talking Stick* dengan Media Pohon Matematika Pada Materi Operasi Hitung Bilangan Bulat. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*, 2(2). <https://doi.org/10.36232/jurnalpe ndidikandasar.v2i2.490>
- Leniati, B., & Indarini, E. (2021). Meta Analisis Komparasi Keefektifan Model Pembelajaran Kooperatif Tipe Jigsaw dan TSTS (*Two Stay Two Stray*) Terhadap Kemampuan Berpikir Kritis pada Pembelajaran Matematika Siswa Sekolah Dasar. *Mimbar Ilmu*, 26(1). <https://doi.org/10.23887/mi.v26i1.33359>
- Maryam, M., Kusmiyati, K., Merta, I. W., & Artayasa, I. P. (2020). Pengaruh Model Pembelajaran Inkuiri Terhadap Keterampilan Berpikir Kritis Siswa. *Jurnal Pijar Mipa*, 15(3). <https://doi.org/10.29303/jpm.v15i3.1355>
- Marzali, A.-. (2017). Menulis Kajian Literatur. *Etnosia: Jurnal Etnografi Indonesia*, 1(2). <https://doi.org/10.31947/etnosia.v1i2.1613>
- Pratiwi, E. W., & Indarini, E. (2021). Meta Analisis Efektivitas Model Pembelajaran Problem Solving dan Problem Posing Terhadap Kemampuan Berpikir Kritis Matematika Siswa Sekolah Dasar. *Jurnal Basicedu*, 5(2). <https://doi.org/10.31004/basicedu.v5i2.854>
- Puspita, V., Yuhelman, N., & Rifandi, R. (2020). Dampak Pendekatan Realistic Mathematics Education Terhadap Keterampilan Berpikir Kritis Pada Siswa Sekolah Dasar. *Justek: Jurnal Sains Dan Teknologi*, 1(2). <https://doi.org/10.31764/justek.v1i2.3735>
- Rusnah, R., & Mulya, O. T. (2018). Meningkatkan Keterampilan Berpikir Kritis Siswa Melalui Pendekatan Saintifik di Sekolah Dasar. *Jurnal Gentala Pendidikan Dasar*, 3(2). <https://doi.org/10.22437/gentala.v3i2.6760>
- Sundahry, S., Fitria, Y., & Rakimahwati, R. (2019). Pengaruh Strategi *Reciprocal Teaching* terhadap Keterampilan Berpikir Kritis dalam Pembelajaran Tematik Kelas V SD. *EduHumaniora | Jurnal Pendidikan Dasar Kampus Cibiru*, 11(1). <https://doi.org/10.17509/eh.v11i1.9766>
- Syah, M. (2009). *Psikologi Belajar*. Rajawali Pers.
- Umam, K. (2018). Peningkatan Kemampuan Berpikir Kritis Matematis Siswa Melalui Pembelajaran *Reciprocal Teaching*. *JPMI (Jurnal Pendidikan Matematika Indonesia)*, 3(2). <https://doi.org/10.26737/jpmi.v3i2.807>

7i2.2705.

Yusmanto, & Herman, T. (2016).
Pengaruh Penerapan Model
Pembelajaran *Discovery Learning*
Terhadap Peningkatan Kemampuan
Berpikir Kritis Matematis dan Self
Confidence Siswa Kelas V Sekolah
Dasar. *EduHumaniora | Jurnal
Pendidikan Dasar Kampus Cibiru*,
7(2).<https://doi.org/10.17509/eh.v>