



Mathematics Practicum-Based Learning to Improve Critical Thinking Skills for Fourth Grade Students at Madrasah Ibtidaiyah

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ARTICLE INFO

Article history:

Received June 14, 2021

Revised June 21, 2021

Accepted January 30, 2022

Available online April 25, 2022

Kata Kunci:

Pembelajaran Berbasis
Praktikum Matematika,
Kemampuan Berpikir Kritis,

Keywords:

Mathematics Practicum-Based
Learning, Critical Thinking
Skills



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ABSTRAK

Realitas pendidikan dewasa ini masih hanya sebatas transfer of knowledge, belum sampai transfer of value, yang menciptakan konsep pendidikan kritis, bahwa pendidikan adalah suatu proses dimana suatu bangsa mempersiapkan generasi mudanya untuk menjalankan kehidupan dan untuk memenuhi tujuan hidup secara efektif dan efisien. Penelitian ini bertujuan untuk menganalisis pengaruh metode pembelajaran berbasis praktikum Matematika terhadap kemampuan berpikir kritis di Madrasah Ibtidaiyah. Jenis penelitian ini adalah penelitian kausalitas. Metode kausalitas merupakan penelitian untuk mengetahui ada tidaknya akibat dari suatu yang dikenakan pada subjek selidik. Subjek dalam penelitian ini adalah siswa kelas IV yang berjumlah 32 siswa. Teknik pengumpulan data menggunakan kuesioner dan tes. Analisis data menggunakan analisis Regresi Sederhana dengan bantuan SPSS versi 25. Hasil penelitian menunjukkan bahwa respon siswa terhadap penerapan metode pembelajaran berbasis praktikum Matematika adalah respon yang positif. Hal ini terlihat dari 32 siswa memberikan respon yang positif. Hasil dari test keterampilan berpikir kritis siswa setelah menunjukkan siswa mendapatkan skor yang sangat baik. Hal ini menandakan bahwa kemampuan berpikir siswa dikategorikan sangat tinggi. Uji kebaikan model menunjukan Koefisien determinasi (R-Square) sebesar 0,437% atau 43,7% variabel berpikir kritis dijelaskan oleh variabel penggunaan metode pembelajaran berbasis Matematika dan sisanya sebesar 55,3% dijelaskan oleh variabel lain. Hal ini menunjukan bahwa penerapan metode pembelajaran praktikum cocok diterapkan di kelas IV Madrasah Ibtidaiyah.

ABSTRACT

The reality of education today is still limited to the transfer of knowledge, not to the transfer of value, which creates the concept of critical education, that education is a process in which a nation prepares its young generation to live and fulfill life goals effectively and efficiently. This study aims to analyze the effect of the Mathematics practicum-based learning method on critical thinking skills at Madrasah Ibtidaiyah. This type of research is causality research. The causality method is a study to determine whether there is a consequence of something that is imposed on the subject under investigation. The subjects in this study were fourth-grade students, totaling 32 students—data collection techniques using questionnaires and tests. Data analysis used Simple Regression analysis with the help of SPSS version 25. The results showed that the student responded positively to applying the Mathematics practicum-based learning method. It can be seen from 32 students who gave a positive response. The test results of students' critical thinking skills after showing students get a very good scores. It indicates that students' thinking ability is categorized as very high. The model's goodness shows the coefficient of determination (R-Square) of 0.437% or 43.7% of critical thinking variables explained by the variable using mathematics-based learning methods. Another variable explains the remaining 55.3%. It shows that applying practical learning methods is suitable in fourth-grade Madrasah Ibtidaiyah.

1. INTRODUCTION

In essence, education is a process of humanization (humanizing humans) which implies that without education, humans will not become humans in the true sense (Saadah & Isaeni, 2020; Tungkasamit, 2019). The problem of education is very important in human life; even the life of a nation and

state will be determined by the progress of education in the country itself. No nation can build and can also achieve progress without being based on education (Astrilova, 2020; Tungkasamit, 2019). Learning activities transform educational messages through learning materials from learning resources to learners. In learning, there is a communication process to convey messages from teachers to students with the aim that messages can be well received and affect understanding and changes in behavior (Dwijayanti et al., 2020; Huang et al., 2017). Thus the success of learning is highly dependent on the effectiveness of the communication process during the learning. Teachers in the current era of information and communication technology are not just teaching (transfer of knowledge) but must be learning managers, which means teachers are expected to be able to create learning conditions that challenge student creativity and activity, motivate students, use multimedia, multi-methods, and multi-sources, so that achieve the expected learning objectives. Teacher competencies include pedagogical, personality, social, and professional competencies obtained through professional education (Ari Pertiwi, 2018; Immah, F., Sukidin, S., & Kartini, 2020).

However, the facts in the field show that few elementary school teachers still facilitate students to think critically in mathematics. It can be seen from the low achievement of Indonesian students in the international world, according to the data from the TIMSS and PISA studies which show that the ability of Indonesian junior high school students, especially in mathematics, is still below international standards. The latest TIMSS 2011 results put Indonesia in 38th place out of 42 countries, and the latest PISA 2012 results are even more concerning. Indonesia is in 64th rank out of 65 countries. This is similar to the findings of Elder and Paul in Suwarma, the director of the Foundation For Critical Thinking, that at least elementary school students are taught how to analyze. Naturally, a person's life is always changing, so he needs provisions to adapt to new situations. This provision is in the form of basic abilities to analyze different points of view, recognize inconsistencies, analyze various information choices, and make informed choices based on accurate information. Facilitating someone to get used to critical thinking can reduce biased, changeable, partial, uninformative thinking or which is prejudice.

Efforts to facilitate students' critical thinking skills are very important, considering that some research results still indicate Indonesian students' low critical thinking skills (Jawadiyah, 2021; Polat & Aydin, 2020; Silberman et al., 2021). Not many teachers try to create a conducive learning environment to improve mathematical critical thinking skills in the learning process. It can be seen when the teacher explains the material that has been prepared. The teacher gives practice questions that are routine and procedural. Students only record or copy the material and tend to memorize formulas or mathematical rules with a meaningless understanding (Dwijayanti et al., 2020; Wu & Wu, 2020). This condition reflects a mathematics learning process that is not student-centered and does not facilitate mathematical thinking skills. One method that a teacher can apply is the practicum learning method. The practicum learning method is a problem-solving process through variable manipulation activities and observations (Khairunnufus et al., 2019; Samsu et al., 2020). Practicum is one of the learner-centered teachings that describes teaching strategies where the teacher facilitates rather than direct teaching. In student-centered teaching strategies, the teacher focuses more on involvement, initiative, and learners' social interaction.

Previous findings stated that practicum's effect on the results of Arthropod material for junior high school students (Siagian, 2021). There is a significant positive effect of the simple practicum method on the compound polarity material on students' interest in learning (Fitri et al., 2021). Through the practicum, students can also learn science and direct observation of scientific phenomena and processes, practice scientific thinking skills, instill and develop scientific attitudes, find and solve various new problems through scientific methods, and develop through practical activities. Based on these problems, the purpose of this study was to analyze the effect of the Mathematics practicum-based learning method on the critical thinking skills of fourth graders at MI Persatuan Ummat Islam Kota Cihami.

2. METHOD

This type of research is causality research. The causality method is research to determine whether there is a consequence of something imposed on the subject under investigation (Arikunto, 2013). The population is a generalization area consisting of objects or subjects with certain qualities and characteristics determined by the author to be studied, and then conclusions are drawn (Sugiyono, 2013). The population of this study was the fourth-grade students of the MI Persatuan Ummat Islam Kota Cihami, amounting to 32 students. Data collection techniques are the most important part of a research process that is useful for obtaining data needed in a study. To obtain data on mathematics practicum-based learning and critical thinking skills of fourth-grade students of the MI Persatuan Ummat Islam Kota Cihami in the 2020/2021 academic year, data collection steps were carried out. This research is quantitative, so the data sought is quantitative data or data measured by numbers. Data collection techniques carried out by researchers in this study were tests and questionnaires. The test determines student learning outcomes through oral,

written, or deed tests. This study prepared a teacher-made test with the researcher referring to the student's book. The test aims to get answers to be used as a numerical score determination. After treatment, the test was given at the end of the meeting using audio-visual media. The type of test used in this study is a written test. The instrument used to measure the variable X (practical learning method) in this research is a questionnaire. The questionnaire consists of statements with four alternative answers: agree, strongly agree, disagree, and strongly disagree. The questionnaire in this study was in the form of a Likert scale between 1-4. In this study, statistical testing uses simple regression analysis. Simple regression is a tool used to determine the effect of one or more independent variables on one dependent variable.

3. RESULT AND DISCUSSION

Result

Hypothesis testing is done by using simple linear regression analysis that examines the effect of the independent variable on the dependent variable. The results of simple regression testing are presented in Table 1.

Table 1. Simple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	109.289	23.719		4.608	0.000
	BPM Learning	0.988	0.916	-0.193	1.079	0.032

A simple regression equation is obtained based on the results of the simple regression analysis in the table above. In the equation above, the constant score is 109.289, meaning that if the Mathematics Practicum-Based Learning score equals zero (no change), then the students' critical thinking skills score is 109.289. The regression coefficient for Mathematics Practicum-Based Learning in the equation is 0.988 (positive), which means that if the Mathematics Practicum-Based Learning increases by 1 unit, the student's critical thinking ability is 0.988 and vice versa if the Mathematics Practicum-Based Learning decreases by 1 unit, the student's critical thinking ability will decrease by 1 unit. Partial effect testing is needed to determine whether there is an individual influence between the independent and dependent variables. This regression test aims to determine whether each independent variable has a significant effect using a confidence level of 5% or $(\alpha) = 0.05$. Accepting and rejecting H_0 are based on significant scores (Ghozali, 2011). If the significance level $(\alpha) = 0.05$, then H_0 is accepted (there is a significant effect). If the significance level $> (\alpha) = 0.05$, then H_0 is rejected (no significant effect). The test results in Table 1 obtained a significance score of $0.032 < 0.05$. These results indicate that mathematics practicum-based learning significantly affects the critical thinking skills of fourth graders at MI Persatuan Ummat Islam Kota Cihami.

Testing the coefficient of determination (R^2) aims to measure how far the model can explain the variation of the independent variables. The decision-making criteria for this test are as follows. Suppose the coefficient of determination (R^2) score is close to 0. In that case, it can be concluded that the independent variables' ability to explain the variation of the dependent variable is very limited. Suppose the coefficient of determination (R^2) score is close to 1. In that case, it can be concluded that the independent variables can provide a lot of information to predict the variation of the dependent variable. Based on the results of the output shows that the magnitude of R^2 is 0.437 or 43.7%. It shows that the coefficient of determination (R Square) is 0.437%, or 43.7%, the critical thinking variable is explained by the variable using mathematics-based learning methods, and other variables explain the remaining 55.3%. It shows that the practical learning method is suitable to be applied in the fourth grade of the MI Persatuan Ummat Islam Kota Cihami.

Discussion

The results showed that the Mathematics practicum-based learning method significantly improved students' critical thinking skills at MI Persatuan Ummat Islam Cihami City. Students experience increased critical thinking skills after the learning process because students have been directed to develop their critical thinking skills through practical activities and direct observation. Developing optimal critical thinking skills requires an interactive class so students can be actively involved in the learning process (Afriansyah et al., 2020; Oktavia Wahyu Ariyani & Prasetyo, 2021; Wibowo et al., 2022). Critical thinking includes higher-order thinking skills that require many cognitive resources (Meilana et al., 2020; Ningsih et al., 2018). Practical-based learning allows students to get more cognitive content compared to conventional

learning. Practical-based learning, the learning situation is fun because it involves students directly and trains students to think (Dewi et al., 2019; Jannah & Atmojo, 2022). Because by making direct observations of students' their thinking skills will develop.

The practicum method is a way of presenting lessons using experiments. In implementing this method, students carry out activities that include controlling variables, observing comparisons or controls, and using practical tools. Practicum plays an important role in education because it can provide practice to students by following the instructions detailed in the instruction sheet (Alexander et al., 2018; Mustika & Susanti, 2020). By doing practicum, students will also become more sure of one thing than just receiving from teachers and books, it can enrich the experience, develop scientific attitudes, and learning outcomes will last longer in students' memories. Mathematics practicum-based learning methods have a significant effect on increasing students' critical thinking skills. This finding is reinforced by previous findings, which stated that previous findings stated that there was an effect of practicum on the results of Arthropod material for junior high school students (Siagian, 2021). There is a significant positive effect of the simple practicum method on the compound polarity material on students' interest in learning (Fitri et al., 2021). The implications of this research are expected to improve critical thinking skills through applying practical methods.

4. CONCLUSION

The results showed that Mathematics-based practicum learning positively correlated with students' critical thinking skills. It is evidenced by a significant score of $0.032 > 0.05$. The goodness of the model test shows the coefficient of determination (R Square) of 0.437%, or 43.7% of critical thinking variables explained by the variable using mathematics-based learning methods, and other variables explain the remaining 55.3%. It shows that the practical learning method is suitable to be applied in the fourth grade of the MI Persatuan Ummat Islam Kota Cihami.

5. REFERENCES

- Afriansyah, E. A., Herman, T., & Dahlan, J. A. (2020). Mendesain Soal Berbasis Masalah untuk Kemampuan Berpikir Kritis Matematis Calon Guru. *Mosharafa: Jurnal Pendidikan Matematika*, 9(2), 239–250. <https://doi.org/10.31980/mosharafa.v9i2.649>.
- Alexander, A., Rahayu, H. M., & Kurniawan, A. D. (2018). Pengembangan Penuntun Praktikum Fotosintesis Berbasis Audio Visual Menggunakan Program Camtasia Studio di SMAN 1 Hulu Gurung. *Jurnal Pendidikan Sains Indonesia*, 6(2), 75–82. <https://doi.org/10.24815/jpsi.v6i2.12075>.
- Ari Pertiwi, N. L. S. (2018). Penerapan Model Problem Based Learning Berbantuan Media Interaktif Untuk Meningkatkan Hasil Belajar Matematika Siswa. *Jurnal Ilmiah Pendidikan Profesi Guru*, 1(1), 331–339. <https://doi.org/10.23887/jippg.v1i1.14262>.
- Arikunto. (2013). *Prosedur Penelitian, Suatu Pendekatan Praktek*. Rineka Cipta.
- Astrilova, A. (2020). Peningkatan Hasil Belajar Peserta Didik Melalui Penerapan Model Pembelajaran Problem Based Learning Pada Pokok Bahasa Jurnal Penyesuaian Perusahaan Jasa Kelas XI Akuntansi dan Keuangan Lembaga SMK Negeri 4 Lahat Tahun Pelajaran 2020/2021. *JURNAL ILMIAH EDUNOMIKA*, 5(1), 1–17. <https://doi.org/10.29040/jie.v5i1.1476>.
- Dewi, A. C., Hapidin, & Akbar, Z. (2019). Pengaruh Model Pembelajaran dan Kemampuan Berpikir Kritis terhadap Pemahaman Sains Fisik. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 3(1), 18. <https://doi.org/10.31004/obsesi.v3i1.136>.
- Dwijayanti, I., Nugroho, A. A., & Pratiwi, Y. I. (2020). Meta-Analysis: the Effect of Problem Approach and Inquiry Approach Toward Students' Mathematical Critical Thinking Skill Over the Past 4 Years. *Al-Jabar: Jurnal Pendidikan Matematika*, 11(1), 1–10. <https://doi.org/10.24042/ajpm.v11i1.4944>.
- Fitri, Z. N., Anwar, Y. A. S., & Purwoko, A. A. (2021). Pengaruh Metode Praktikum Sederhana pada Materi Kepolaran Senyawa Terhadap Minat Belajar Siswa Kelas X SMA. *Chemistry Education Practice*, 4(1), 90–97. <https://doi.org/10.29303/cep.v4i1.2287>.
- Huang, M. Y., Tu, H. Y., Wang, W. Y., Chen, J. F., Yu, Y. T., & Chou, C. C. (2017). Effects of cooperative learning and concept mapping intervention on critical thinking and basketball skills in elementary school. *Thinking Skills and Creativity*, 23(101), 207–216. <https://doi.org/10.1016/j.tsc.2017.01.002>.
- Immah, F., Sukidin, S., & Kartini, T. (2020). Pengaruh Kompetensi Profesional Guru Terhadap Kinerja Guru Di Sma Negeri 01 Kalisat Tahun Pelajaran 2018/2019. *Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi Dan Ilmu Sosial*, 14(1), 253. <https://doi.org/10.19184/jpe.v14i1.12493>.
- Jannah, D. R. N., & Atmojo, I. R. W. (2022). Media Digital dalam Memberdayakan Kemampuan Berpikir Kritis Abad 21 pada Pembelajaran IPA di Sekolah Dasar. *Jurna Basicedu*, 6(1), 1064 – 1074.

- <https://doi.org/10.31004/basicedu.v6i1.2124>.
- Jawadiyah, A. (2021). Pengembangan LKPD Berbasis Problem Learning Untuk Melatihkan Keterampilan Berpikir Kritis Pada Materi Larutan Penyangga. *Journal of Chemical Education*, 10(2), 195–204. <https://doi.org/10.25134/jes-mat.v6i1.2543>.
- Khairunnufus, U., Laksmiwati, D., Hadisaputra, S., & Siahaan, J. (2019). Pengembangan Modul Praktikum Kimia Berbasis Problem Based Learning Untuk Kelas XI SMA. *Chemistry Education Practice*, 1(2), 36. <https://doi.org/10.29303/cep.v1i2.981>.
- Meilana, S. F., Aulia, N., Zulherman, & Aji, G. B. (2020). Pengaruh Model Pembelajaran Think Pair Share (TPS) terhadap Kemampuan Berpikir Kritis di Sekolah Dasar. *Jurnal Basicedu*, 5(1), 218 – 226. <https://doi.org/10.31004/basicedu.v5i1.644>.
- Mustika, S. W., & Susanti. (2020). Pengembangan lembar kerja peserta didik (LKPD) berbasis Higher Order Thinking Skill (HOTS) praktikum akutansi lembaga. *Jurnal Pendidikan Ekonomi*, 13(2), 409–414. <https://doi.org/10.17977/UM014v13i22020p125>.
- Ningsih, P. R., Hidayat, A., & Kusairi, S. (2018). Penerapan problem based learning untuk meningkatkan kemampuan berpikir kritis dan hasil belajar siswa kelas III. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, 3(12), 1587–1593. <https://doi.org/10.17977/jptpp.v3i12.11799>.
- Oktavia Wahyu Ariyani, & Prasetyo, T. (2021). Efektivitas Model Pembelajaran Problem Based Learning dan Problem Solving terhadap Kemampuan Berpikir Kritis Siswa Sekolah Dasar. *Jurnal Basicedu*, 5(3), 1149–1160. <https://doi.org/10.31004/basicedu.v5i3.892>.
- Polat, Ö., & Aydın, E. (2020). The effect of mind mapping on young children's critical thinking skills. *Thinking Skills and Creativity*, 38. <https://doi.org/10.1016/j.tsc.2020.100743>.
- Saadah, K., & Isnaeni, W. (2020). Peran Model Brain-Based Learning Pada Pembelajaran Sistem Saraf Dalam Meningkatkan Literasi Sains Siswa. *Phenomenon: Jurnal Pendidikan MIPA*, 9(2), 132–149. <https://doi.org/10.21580/phen.2019.9.2.3967>.
- Samsu, N., Mustika, D., Nafaida, R., & Manurung, N. (2020). Analisis Kelayakan dan Kepraktisan Modul Praktikum Berbasis Literasi Sains untuk Pembelajaran IPA. *Jurnal IPA & Pembelajaran IPA*, 4(1), 29 – 40. <https://doi.org/10.24815/jipi.v4i1.15546>.
- Siagian, G. (2021). Implementasi Pembelajaran Berbasis Praktikum Terhadap Hasil Belajar Siswa dalam Materi Arthropoda di SMP. *Jurnal Basicedu*, 5(6), 5802–5809. <https://doi.org/10.31004/basicedu.v5i6.1498>.
- Silberman, D., Carpenter, R., Takemoto, J. K., & Coyne, L. (2021). The impact of team-based learning on the critical thinking skills of pharmacy students. *Currents in Pharmacy Teaching and Learning*, 13(2), 116–121. <https://doi.org/10.1016/j.cptl.2020.09.008>.
- Sugiyono. (2013). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, Dan R&D*. Alfabeta.
- Tungkasmit, A. (2019). The Effect of Using Research - based Learning Model in History Practicum in School Course. *PEDAGOGIA*, 8(1), 9 – 17. <https://doi.org/10.21070/pedagogia.v8i1.1770>.
- Wibowo, D. C., Peri, M., Awang, I. S., & Rayo, K. M. (2022). Analisis Kemampuan Berpikir Kritis Siswa Dalam Menyelesaikan Soal Cerita pada Mata Pelajaran Matematika. *Jurnal Ilmiah Aquinas*, 5(1), 152–161. <https://doi.org/10.36526/tr.v5i1.1185>.
- Wu, T. T., & Wu, Y. T. (2020). Applying project-based learning and SCAMPER teaching strategies in engineering education to explore the influence of creativity on cognition, personal motivation, and personality traits. *Thinking Skills and Creativity*, 35. <https://doi.org/10.1016/j.tsc.2020.100631>.