

The Effect of the Open-Ended Learning Approach on Student Creativity

**Syarif Hidayat Matondang^{*1}; Khotna Sofiyah²; Isra Suna Hasibuan³;
Lili Nur Indah Sari⁴; Diyah Hoiriyah⁵**

^{1,2,4,5}Universitas Islam Negeri Syekh Ali Hasan Ahmad Addary Padangsidempuan,
Indonesia, ³STAI Al-Hikmah Tebing Tinggi, Indonesia

syarifhidayatmatondang@uinsyahada.ac.id^{*1}, khotnasofiyah@uinsyahada.ac.id²,
sunahasibuanisra@gmail.com³, lilinurindahsari@uinsyahada.ac.id⁴,
diyahhoiriyah@uinsyahada.ac.id⁵

Abstract

Mathematics learning in junior high schools (SMP) still tends to focus on a single correct answer, which limits the development of students' creativity. The purpose of this study was to examine the effect of implementing the open-ended learning approach on students' creativity in mathematics learning using a quantitative approach and a quasi-experimental method. The population of this study consisted of all eighth-grade students of SMP Swasta IT Darul Hasan Padangsidempuan, while class VIII-B was selected as the research sample through purposive sampling. The data collection instrument was an essay test administered in the form of a pretest and a posttest. The collected data were analyzed using a t-test statistical analysis. The results showed that the pretest score was 51.08, while the posttest score increased to 78.78. The results of hypothesis testing indicated that the calculated t-value was greater than the t-table value, namely $11.67 > 2.042$ at a 5% significance level with 26 degrees of freedom. Based on these results, it can be concluded that the implementation of the open-ended learning approach has a significant effect on students' creativity in mathematics learning.

Keywords: *Mathematics Learning; Open-Ended Approach; Students' Creativity.*

Abstrak

Pembelajaran matematika di SMP masih cenderung menekankan satu jawaban benar sehingga kreativitas siswa kurang berkembang. Tujuan dilaksanakan penelitian ini adalah untuk mengkaji pengaruh penerapan pendekatan pembelajaran *open-ended* terhadap kreativitas siswa pada pembelajaran matematika dengan menggunakan pendekatan pembelajaran kuantitatif. Metode yang digunakan adalah metode eksperimen semu (*quasi experiment*). Populasinya merupakan semua siswa kelas VIII SMP Swasta IT Darul Hasan Padangsidempuan, sedangkan kelas VIII-B menjadi sampel penelitian yang ditetapkan secara purposif. Instrumen data yang dikumpulkan merupakan tes esai yaitu *pretest* dan *posttest*. Pretest diberikan kepada siswa untuk mengetahui kemampuan awal kreativitas. Kemudian, ada perlakuan kepada siswa berupa penerapan pendekatan pembelajaran *open-ended* dalam pembelajaran matematika dan diakhiri dengan pemberian *posttest* untuk mengetahui peningkatan kreativitas siswa. Sehingga, analisis data yang diperoleh menggunakan uji statistik *t-test*. Hasil analisis menyatakan bahwa nilai

*Correspondence:

Email: syarifhidayatmatondang@uinsyahada.ac.id

pretest sebesar 51,08, dan nilai *posttest* meningkat menjadi 78,78. Hasil dari uji hipotesis menyatakan bahwa nilai $t_{hitung} > t_{tabel}$, yaitu $11,67 > 2,042$ pada taraf signifikansinya 5% dengan derajat kebebasan 26. Berdasarkan hasil tersebut disimpulkan bahwa penerapan pendekatan pembelajaran *open-ended* berpengaruh secara signifikan terhadap kreativitas siswa dalam pembelajaran matematika. Hasil penelitian ini dapat menjadi rujukan bagi guru dalam memilih pendekatan pembelajaran yang mendorong keterlibatan aktif dan kreativitas siswa, khususnya pada jenjang SMP.

Kata Kunci: Kreativitas Siswa; Pembelajaran Matematika; Pendekatan Pembelajaran *Open-Ended*.

INTRODUCTION

Education is an fundamental aspect that is inseparable from the process of shaping an individual's character, mindset, and behavior. Through education, people are guided to develop in accordance with the norms that govern social life, including religious norms, moral standards, etiquette, and the law. Therefore, education plays a vital role in shaping human character (Slavin, 2011).

Mathematics has its uniqueness as a basic subject that is essential to the development of various fields of knowledge. Suherman and colleagues state that mathematics is often referred to as the "queen of sciences" because it serves as the foundation for the development of various other disciplines (Suherman, 2001). In addition, mathematics serves as a tool for solving problems both theoretically and practically, so that mastery of mathematics is essential for students (Astin et al., 2016).

In mathematics learning process, understanding of abstract concepts requires continuous reinforcement so that these concepts can be retained in students' memories. According to Heruman, every new abstract concepts must be immediately connected to meaningful learning experiences (Heruman, 2008). Therefore, the selection of learning approaches depends on the teacher's perspective on mathematics and the characteristics of the students. (Wijaya, 2012) According to Adams and Hamm, mathematics can be considered as a way of thinking, as an understanding of patterns and relationships, as a tool, and as a language or as communication tool.

One of the approach to teaching mathematics is the open ended approach. This approach allows students to take an active role in discovering mathematics concepts on their own way (Panjaitan, 2016). (Lestari et al., 2016) has conducted research showing that in mathematics education, students should be given the opportunity to discover knowledge on their own after it has been taught, whether through the process of discovery or invention. This indicates that teachers play a greater role as facilitators and mentors rather than as direct providers of information.

Based on interviews with mathematics teachers at SMP Swasta IT Darul Hasan in Padangsidempuan, it was found that teaching has so far been dominated by conventional lecture-based methods. Open-ended teaching approaches have never been implemented because teachers believe that lectures are the most effective way to explain the material to students. As a result, teaching methods are limited, and student participation is not optimal.

A preliminary study found that many students still struggle to understand the material. from 27 students who took the pretest, 11 were able to answer the questions correctly, while the other 16 were unable to do so. This suggests that students' creativity in solving mathematical problems remains relatively low.

Students' creativity and activeness in learning can be enhanced by selecting appropriate approaches based on the characteristics of the learning material and the students' term and conditions. (Heruman, 2008). One example of a learning approach that focuses on student activity and creativity is the open-ended approach (Marhamah, n.d.). This approach presents open-ended problems that allow students to discover various solution strategies with a range of possible answers. According to Suherman, the open-ended learning approach supports students in developing their ideas, thinking critically, and expressing their understanding more broadly (Suherman, 2001).

The primary objective of implementing this approach is to foster both students' creative activities and their mathematical thinking skills simultaneously (Mayasari, 2014). By giving open-ended questions, students have the opportunity to explore various possible solutions based on their knowledge and skills. Based

on that, this approach is considered as an effective approach for enhancing students' creativity in mathematics learning.

RESEARCH METHODS

This study used a quantitative approach with a quasi-experimental method (Arikunto, 2012). By applying *One Group Pretest–Posttest Design* in this research design, This study was conducted on a single group without a control group. This design was chosen to allow the researcher to determine the difference in student learning outcomes before and after the implementation of the instructional approach. The research design is illustrated as follows:

$$T_1 - X - T_2$$

Note:

T1 : preliminary measurement taken before the treatment is given.

X : application of the treatment using an open-ended approach.

T2 : final measurement taken after the treatment is given.

All eighth-grade students at SMP Swasta IT Darul Hasan in Padangsidempuan is the population of this study. Used *non-probability technique sampling*, the *purposive sampling* used in sample selection. The sample was selected based on specific criteria, and Class VIII-B was chosen as the sample class because it was considered representative of the characteristics of the study population.

In this study, data were collected using an essay test designed to assess students' level of creativity regarding fraction material. The tests given were pretests and posttests. Expert validation of test instruments prior to their use helps ensure the appropriateness of both content and item construction. The validity of the instruments is assessed rationally, covering the alignment of the material with learning indicators as well as the clarity of item formulation, as noted by Sudijono (Sudijono, 2012).

Several stages of data analysis were conducted. The first stage was descriptive analysis to determine an overview of students' initial and final abilities, including the mean, median, mode, and standard deviation. The next stage was testing the prerequisites for analysis, specifically the normality test. This test was conducted to determine whether the data from the pretest and posttest were normally distributed.

After confirming that the data were normally distributed, a t-test was used to test the hypotheses. This test is used to determine whether there is a significant difference between the pretest and posttest results following the implementation of the open-ended learning approach. The hypothesis testing criteria are set at a significance level of 5% ($\alpha = 0.05$) with a degrees of freedom (df) of $N - 1$. If the calculated t-value is bigger than the critical t-value, the alternative hypothesis is accepted and the null hypothesis is rejected.

RESULTS AND DISCUSSION

RESULTS

Pretest Description

A pretest was given to students prior to the instructional approach as a means of assessing their initial level of creativity in learning mathematics, specifically regarding fractions.

Tabel 1. Pretest Data

Mean	Median	Modus	Deviation Standars
51,08	55,40	55	11,02

The data indicates that students' initial creativity levels remain relatively low and are not yet consistent. The distribution of pretest scores indicates that most students have not yet been able to develop various strategies for solving problems creatively, suggesting that their previous learning experiences have not fully encouraged their active and creative engagement in the mathematics learning process.

Posttest Description

After being treated through the implementation of an open-ended learning approach, the students took a posttest to assess changes in their learning creativity. Analysis of the data showed a significant improvement. Previously, the approach had not fully encouraged students' active and creative engagement in the mathematics learning process.

Tabel 2. Posttest Score

Mean	Median	Modus	Deviation Standard
78,78	77,01	88	9,36

The increase in the average score and the more even distribution of scores indicate that this approach is effective in helping students develop their creativity in solving math problems. Students no longer focus solely on a single solution method but are beginning to demonstrate a variety of strategies and a broader range of answers.

Pretest Normality Test

Normality test for the pretest data used the form of chi-square. Based on the result counted that the the score of X^2_{count} is 7,094 and score of X^2_{tabel} is 7,815. The decision regarding the normality test is made by comparing the values X^2_{count} dan X^2_{tabel} . Karena nilai $X^2_{count} < X^2_{tabel}$, Therefore, the pretest data is considered to be normally distributed.

Posttest Normality Test

Tabel 3. Normality Test Result

X^2_{Count}	X^2_{tabel}
3,959	7,815

Based on the table, the result showed that X^2_{Count} is 3,959 smaller than the score of X^2_{tabel} is 7,815. Thus, the posttest data can also be said to be normally distributed. The normality test for the posttest data also uses the chi-square formula.

Hypothesis Test

To determine whether the implementation of an open-ended learning approach affects student creativity, a hypothesis test using a t-test was conducted.

Tabel 4. T-test Result

X^2_{count}	X^2_{tabel}
11,67	2,042

The data in the table shows that t_{count} result is 11,67 bigger than the score of t_{tabel} value of 2,042 with significance level 5% and deviation standard (df) = 26. Based on this test criteria, H_a = accepted dan H_o = rejected.

Therefore, it can be concluded that the use of an open-ended learning approach has a significant effect on students' creativity in learning fractions in the eighth grade at SMP Swasta IT Darul Hasan Padangsidempuan.

DISCUSSION

The results of the study showed a significant difference in students' creativity before and after the implementation of the open-ended learning approach. In the early stages, students tended to have difficulty expressing ideas and determining strategies for solving mathematical problems. However, after the open-ended learning approach was implemented, students began to show improvement in their creative thinking skills, as evidenced by the diversity of methods and answers they produced.

Throughout the learning process, students are provided with worksheets containing open-ended problems, enabling them to develop mathematical thinking both individually and in groups. Discussions and the exchange of ideas among students foster curiosity and encourage them to express their opinions. This approach aligns with the goals of the open-ended learning approach, which emphasizes the students' thinking process rather than just the final outcome.

The findings of this study are also consistent with Piaget's theory of cognitive development, which emphasizes the importance of students' active engagement in constructing their own knowledge. Furthermore, Vygotsky's view on the importance of social interaction in learning supports these findings, as

group discussions and interactions among students play a role in enhancing creativity and the ability to understand mathematical concepts.

These findings are supported by several previous studies indicating that an open-ended learning approach can enhance students' problem-solving skills and creativity in mathematics learning process. (Setiawan & Harta, 2014). This approach gives students the opportunity to explore various alternative solutions in line with their individual abilities and thinking styles, thereby making the learning process more meaningful.

CONCLUSION

Based on the data analysis and discussion conducted, the conclusion is that the implementation of an open-ended learning approach has a significant effect on students' creativity in mathematics learning. This is evidenced by an increase in students' average scores, from 51.08 on the pretest to 78.78 on the posttest. The result of hypothesis test showed that $t_{count} = 11,67 > \text{score of } t_{tabel} = 2,042$ with a significance level of 5% and 26 degrees of freedom. These findings confirm that after implementing the open-ended learning approach, students' creativity improved compared to before the intervention. Therefore, the open-ended learning approach can be one option for effective learning to enhance students' creativity in mathematics education.

Based on the findings of the study, the recommendations are as follows.

1. For teachers are encouraged to apply this open-ended learning approach in mathematics instruction, particularly when teaching topics that allow for a variety of problem-solving strategies. Teachers are also expected to adapt their teaching approach to the characteristics of the material and the students' abilities to ensure that the learning process is as effective as possible.
2. Students are strongly encouraged to take an active role in the learning process, especially when faced with open-ended problems. Being active and having the courage to express their ideas will help students develop their creative thinking skills and understanding of mathematical concepts.

3. For Schools, especially school principals, it is recommended that they provide support and guidance to teachers in developing a variety of innovative teaching approaches to improve the quality of the teaching and learning process.
4. For future research, it is necessary to conduct further studies with broader and more complex experimental designs that include a control group and examine this open-ended learning approach in greater detail as it relates to other mathematical skills.

REFERENCES

- Arikunto (2012). *Dasar-Dasar Evaluasi Pendidikan*. 12(1).
- Astin, A. E., Bharata, H., Pendidikan, M., Universitas, M., & Surakarta, U. M. (2016). *PENERAPAN PENDEKATAN OPEN-ENDED DALAM*. 20, 631–639.
- Heruman. (2008). *Model Pembelajaran Matematika di Sekolah Dasar*.
- Lestari, N., Hartono, Y., & Purwoko, P. (2016). Pengaruh Pendekatan Open-Ended Terhadap Penalaran Matematika Siswa Sekolah Menengah Pertama Palembang. *Jurnal Pendidikan Matematika*, 10(1). <https://doi.org/10.22342/jpm.10.1.3284.81-95>
- Marhamah, A. (n.d.). *The Effect of an Open-Ended Approach on Students' Creativity in Fractional Material*. 4531, 54–63.
- Mayasari, D. (2014). *Pengembangan Bahan Ajar Dengan Menggunakan Pendekatan Open Ended Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa SMP Negeri 6 Pematangsiantar*. Skripsi. Universitas Negeri Medan.
- Panjaitan, B. (2016). Metakognisi Calon Guru Bergaya Kognitif Reflektif Dan Kognitif Impulsif Dalam Memecahkan Masalah Matematika the Metacognition of Prospective Teachers With Reflective and Impulsive Cognitivestyle in Solving Mathematical Problems. *Cakrawala Pendidikan*, 2, 244–253.
- Setiawan, R. H., & Harta, I. (2014). Analisis kemampuan pemecahan masalah matematis berdasarkan teori polya ditinjau dari gaya kognitif field dependent dan field independent pada pokok bahasan trigonometri kelas x SMA N 1 kota Jambi. *Jurnal Riset Pendidikan Matematika*, 1(2), 241. <https://journal.uny.ac.id/index.php/jrpm/article/view/2679>

Slavin, E. R. (2011). *Psikologi Pendidikan (Teori dan Praktik)*.

Sudijino, A. (2012). *Pengantar Evaluasi Pendidikan*.

Suherman, dkk. (2001). *Strategi Pembelajaran Matematika Kontemporer*.

Wijaya, A. (2012). *Pendidikan Matematika Realistik (Suatu Alternatif Pendekatan Pembelajaran Matematika)*.