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The Effectiveness of Realistic Mathematics Approach Application to Improve Students' Mathematical Literacy

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Abstract

Mathematical literacy is an individual's ability to formulate, use, and interpret mathematics in various contexts. However, currently students in Indonesia have very low literacy skills. The aim of this research is to test the effectiveness of a realistic mathematics approach in improving students' mathematical literacy skills. This type of research is quasi-experimental using a Nonequivalent Control Group Design, involving 80 students as research samples. The instrument of this research is a test that is valid and reliable, and the data collected was analyzed using the N-Gain test and the Independent Sample t test. The results of this research show that in the experimental class the level of students' mathematical literacy ability was at level 4 at 62.5%, with an average value of students' mathematical literacy ability in the experimental class of 65.48, while in the control class the level of students' mathematical literacy ability was at level 4 it was 62.5%, with an average value of students' mathematical literacy skills in the experimental class of 65.48. So it was concluded that the realistic mathematics approach was effective in improving students' mathematical literacy skills, with the N-Gain Score achieved reaching 61% or quite effective.
Keywords: *mathematical literacy, quasi experiment, Realistic Mathematics Education (RME)*

1. Introduction

Mathematical literacy involves mathematical reasoning and the use of mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena (OECD, 2019). Prior to its introduction through PISA, the term "mathematical literacy" had been introduced by NCTM (*National Council of Teachers of Mathematics*), as quoted in (Sara & Sari, 2015). NCTM defines mathematical literacy as an individual's ability to explore, infer, and reason logically and use a variety of mathematical methods effectively to solve problems. By becoming literate, their mathematical powers must develop. This concept plays a role in facilitating solutions to everyday problems while at the same time advancing mathematical skills (Sara & Sari, 2015).

Mathematical literacy designed by PISA (*Programme International Student Assessment*) to prepare future generations for the challenges that will arise in the future. However, at present, the level of mathematical literacy competence among students in Indonesia is still far behind in the global ranking. Based on the results of PISA 2018, Indonesia was ranked in the bottom 10 out of 79 countries participating in the assessment program. The average reading ability of Indonesian students is 80 points below the OECD average. In addition, the achievement of Indonesian students is also still below the average of ASEAN students. Average scores in reading, math, and science for Indonesian students are 42 points, 52 points, and 37 points lower than the ASEAN average, respectively. (Noor'aini, Ikhya Uloomuddin, Lisna Sulina's Four, 2021).

Mathematical literacy is a very significant factor, because it prioritizes students' ability to analyze, argue, convey ideas and representation skills effectively when facing mathematical problems

faced by them (Masjaya &; Wardono, 2018; Stiadi, E., Fitriani, F., & Putra, A., 2023). The results of observations made by researchers in class VIII Tahfidz 2 at MTsN 1 Makassar showed that out of a total of 40 students, only 12 were able to come up with mathematical ideas or concepts that were in accordance with indicators of mathematical literacy ability when given questions. They then proceed to design a mathematization process to solve the problem and come to a conclusion regarding the solution of the problem. Nevertheless, the majority of other students still face difficulties in achieving mathematical literacy indicators. One of the factors that can cause low mathematical literacy is a lack of understanding in the process of solving problems (Hasanah et al., 2021).

The realistic mathematical approach refers to a learning approach that begins with an introduction to real situations from everyday life as learning material (Setianto & Risnanosanti, 2020). Based on previous research, it has been shown that realistic mathematical approaches have a positive impact on the skills that support elements of mathematical literacy (Dewi &; Agustika, 2020; Hidayat et al., 2020; Utami et al., 2022). However, previous studies have not evaluated how effective the application of realistic mathematical approaches is in improving mathematical literacy. Therefore, this study aims to fill the gap. This research is also expected to contribute empirically by providing a new understanding of the effectiveness of applying realistic mathematical approaches to students' mathematical literacy abilities.

2. Method

This research used a quantitative approach (quasi-experimental research) that aimed to evaluate the effectiveness of a realistic mathematical approach (Ahayer DKK., 2020). The population in the study included all grade VIII students at MTsN 1 Makassar, with a total of 400 students. Samples were taken using the cluster random sampling technique, with class VIII Tahfidz 2 as the experimental class and class VIII-2 as the control class. The design of this study used a model nonequivalent control group design. In the experimental group, learning was coducted by applying a realistic mathematical approach, while in the control group, learning was isntructed with a deductive approach. The research instrument consists of a test sheet in the form of essay questions pretest and posttest which consists of 5 questions designed to measure students' mathematical literacy skills. The hypothesis test was conducted using the Independent Sample t-test, while the effectiveness of a realistic mathematical approach to students' mathematical literacy was analyzed using a normalized gain test (Vulture, 2021).

$$\begin{array}{cc} O_1 & X \quad O_2 \\ \hline O_3 & O_4 \end{array}$$

Picture 1. *Nonequivalent Control Group Design*

Information:
O1 = Experimental group before using a realistic mathematical approach.
O2 = Experimental group using a realistic mathematical approach.
O3 = Control group before there was a realistic mathematical approach.
O4 = Control group without using a realistic mathematical approach.
X = Application of a realistic mathematical approach

Interpretation of effectiveness *N-Gain* The following criteria are used: (Vulture, 2021):

Table 1 N-Gain Effectiveness Criteria

Percent Value	Interpretation
< 40	Ineffective
40 – 55	Less effective
56 – 75	Effective enough

>76	Effective

3. Results and Discussion

From the results of the evaluation of students' mathematical literacy skills in grade VIII Tahfidz 2 MTsN 1 Makassar, the data collected included pretest and posttest scores of students' mathematical literacy abilities. Below are the results of pretest and posttest scores obtained from the experimental group.

Table 2 Data on the Results of Students' Mathematical Literacy Ability in the Experimental Class

Statistics	Statistical Score	
	Pretest	***Posttest***
Samples (N)	40	40
Minimum Value	6	41
Maximum Value	16	93
Mean	11,4	65,48
Standard Deviation	2,73	10,01
Variance	7,48	100,1

From Table 2, it can be seen that there is a significant improvement in mathematical literacy ability. This upward trend is quite striking, with a value of 11.4 increasing to 65.48 after the application of a realistic mathematical approach. Furthermore, the categorization of the level of mathematical literacy ability in the experimental class is presented in Table 3 below:

Table 3 Students' Mathematical Literacy Ability Level in the Experimental Class

Mathematical Literacy Level	***Pretest***		***Posttest***	
	Frequency	**Percentage**	**Frequency**	**Percentage**
1	40	100%	0	0%
2	0	0%	0	0%
3	0	0%	2	5%
4	0	0%	25	62,5%
5	0	0%	11	27,5%
6	0	0%	2	5%
Amount	40	100%	40	100%

Based on Table 3, it was found that the *pretest* results of all students in grade VIII Tahfidz 2 showed the level of mathematical literacy ability at level 1. This means the students have the ability to answer questions with general context, recognize information, and follow instructions clearly in a given situation. Then, after going through a learning process that applies a realistic mathematical approach, the *posttest results* show a significant improvement in the mathematical literacy ability of students. The average mathematical literacy ability was at level 4, there were 25 students or 62.5% who were able to use special methods effectively in complex but concrete situations. They can overcome obstacles and make necessary assumptions, as well as being able to present opinions based on their understanding, reasoning, and formulations. Furthermore, the results of the evaluation of students' mathematical literacy skills in grade VIII-2 MTsN 1 Makassar, are presented in Table 4 below.

Table 4 Results Data on the Mathematical Literacy Ability of Control Class Students

Statistics	Statistical Score	
	Pretest	***Posttest***
Samples (N)	40	40
Minimum Value	8	19

Maximum Value	16	29
Mean	12,25	24
Standard Deviation	2,33	3,17
Variance	5,4	10,05

From the information in Table 4, it can be seen that students who use a deductive approach experience an increase in mathematical literacy skills. However, this increase did not have a significant impact. This can be seen from the average value of the pretest results, which is 12.15, and the posttest, which is 24. Next, categorize the level of mathematical literacy ability in the control class in Table 5 below.

Table 5 Students' Mathematical Literacy Ability Level in the Control Class

Mathematical Literacy Level	***Pretest***		***Posttest***	
	Frequency	**Percentage**	**Frekuensi**	**Frequency**
1	40	100%	7	17,5%
2	0	0%	33	82,5%
3	0	0%	0	0%
4	0	0%	0	0%
5	0	0%	0	0%
6	0	0%	0	0%
Amount	40	100%	40	100%

From Table 5, it can be seen that the mathematical literacy ability of all students in grades VIII-2 was initially at level 1, as can be seen from the *pretest results*. At this level, students are able to answer questions with general understanding, recognize information, and follow clear instructions in a given situation. However, after going through the learning process with a deductive approach, the posttest results showed an increase in students' average mathematical literacy ability to level 2. There were 33 students or 82.5% of the total students who achieved this level. At level 2, students can interpret and recognise situations, as well as have the ability to select relevant information from a single source and use a single way of presentation. However, as many as 7 students or 17.5% of other students are still at level 1.

After confirming that the prerequisite tests namely the normality test and the homogeneity test have been met, the next step is to conduct hypothesis testing. The hypothesis test was conducted to test whether there was a significant difference between the mathematical literacy ability of students who received learning with a realistic mathematical approach and students who received learning with a deductive approach. The following are the results of the *Independent Sample t-test* using the IBM SPSS Statistics 29 application.

Table 6 Independent Sample t Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	Df	Significance	
						One-Sided p	Two-Sided p
NGain_ Persen	Equal variances assumed	20.382	<,001	-25.6	78	<,001	<,001
	Equal variances not assumed			-25.6	48.2	<,001	<,001

From the information in Table 6, the output results of the *Independent Sample Test* show that the value of Sig. (2-tailed) is 0.001. Since the value of Sig. (2-tailed) is less than the established

significance value of 0.05, the null hypothesis (H_0) is rejected. Therefore, there is a significant difference between the mathematical literacy ability of students who are given learning with a realistic mathematical approach and students who get learning with a deductive approach. This effectiveness test using *IBM SPSS Statistics 29*, obtained the following results:

Table 7 N-Gain Score Test Results

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
NGain_Persen	Control	40	13.45	3.85	.61
	Experiment	40	61.11	11.14	1.76

Based on the calculation of the N-gain score test given above, the results showed that the average N-gain score for the experimental group was 61.11 or equivalent to 61%, which is included in the category of quite effective. On the other hand, the average N-gain score for the control group was 13.45 or 13%, which falls into the ineffective category.

Based on data on exam results in experimental classes, where a realistic mathematical approach is used in learning, it is noted that before the treatment is carried out, the pretest results show that the mathematical literacy ability of all students is at level 1. However, after applying this method, there was a significant improvement where as many as 62.5% of students improved their mathematical literacy skills to level 4. This development reflects the success of the learning approach applied, namely the realistic mathematical approach. This method promotes students' active participation in the learning process, enabling them to successfully overcome mathematical challenges. The main focus is to change students' perception of the subject, so that they no longer perceive it as something difficult to understand (Antasari et al., 2023), this thing resulting in a more significant learning process for students (Puspitasari &; Airlanda, 2021)**.**

The realistic mathematical approach emphasizes the development of students' ability to handle mathematical problems. This approach emphasizes the importance of relating mathematical concepts to real-world situations, encourages direct involvement in the problem-solving process, as well as stimulating the development of critical thinking (Suparatulatorn et al., 2023). Its function is to improve students' critical and creative thinking skills, as well as a means to strengthen communication and reasoning skills through the preparation of learning materials compiled in a structured manner by educators (Palinussa et al., 2021). The main principle is to find solutions from real-world situations presented in a realistic mathematical context (Larsen, 2018). Therefore, a realistic mathematical approach helps students in associating problems that arise in everyday life with the mathematical concepts studied.

Increasing mathematical literacy in this study by applying a realistic mathematical approach because it is based on cooperation and collaboration. This is in line with opinion Afriansyah &; Turmudi (2022) that a realistic mathematical approach is in accordance with the evolution of learning that is considered effective. For example, in the context of learning that involves discussion, students will act as actors in the social learning process, in accordance with the lesson plan that has been prepared by the teacher to achieve learning objectives (Haataja et al., 2022). Superiority Realistic Mathematical Approach involves four main points: (1) Realistic mathematics education produces a concrete understanding of how mathematics relates to everyday life; (2) Realistic mathematics education asserts that mathematics is constructed and developed by students themselves, not just by experts in that subject; (3) Realistic mathematics education teaches that how to solve problems or approaches in solving tasks do not have to be singular and can differ between individuals; (4) Realistic mathematics education shows how important it is to follow the learning process and develop an independent understanding of concepts (Awaliyah &; Ahmad, 2021).

The results of this study also confirm previous findings stating that a realistic mathematical approach has a positive impact on mathematical literacy skills in grade X students of MA Syafi'iyah East Goat (Masriyani, Minggani & Zakiyah (2022). Other research by Narmi, Permatasari, Rustan and Anas (2020), also affirmed that a realistic mathematical approach is effective in improving students' mathematical literacy skills. Similar findings were obtained from Febryani's research (2022) which shows that the application of a realistic mathematical approach is quite successful in improving the

mathematical literacy of grade IX students in MTsN 1 Banda Aceh. This shows that success can be attributed to success in applying the appropriate learning approach, namely a realistic mathematical approach.

From the data on the results of the exams that have been done, the average increase in scores between the results Pretest and posttest amounted to 11.85. Result posttest shows that the mathematical literacy ability of students taught with a deductive approach is on average at level 2. This factor may be caused by the mismatch of the learning process using a deductive approach to improve students' mathematical literacy skills. The deductive approach is a method based on agreed principles. Thabroni (2022) Revealing that the deductive learning approach is a learning process that starts from general principles, then is applied to reach more specific conclusions then followed by relevant examples. So it can be concluded that the deductive approach refers to a thinking approach that starts from general concepts, which includes explanations of learning such as formulas or theories, and then applied to specific situations through concrete examples.

The facts about literacy skills in the control class are in line with the results of research by Wa Sudi, Jafar, Kadir, and Salim (2022) which shows results that state that with conventional learning, students' mathematical literacy skills do not experience good improvement. Also on the research of Praja, Budiarti and Samsiyah (2022) shows that conventional approaches are less effective in improving students' mathematical comprehension skills. The deductive learning approach is sometimes also known as the hands-on learning method, where the teacher starts by conveying theories and then illustrates their application through examples. The deductive approach in learning also emphasizes the role of the teacher in transferring information or knowledge to students (Rahmawati & Daryanto, 2015).

The results of the effectiveness test that have been carried out show that the realistic mathematical approach has a significant impact in improving students' mathematical literacy skills compared to the deductive approach applied in grade VIII MTsN 1 Makassar. This difference is influenced by the basic principles of a realistic mathematical approach that is in line with indicators of students' mathematical literacy ability. A realistic mathematical approach links mathematical concepts with everyday situations commonly experienced by students, so that learning materials become more relevant to them. The principle of student participation in this approach encourages active involvement of students in the learning process, with the aim of stimulating problem-solving abilities. These advantages support the improvement of students' mathematical literacy skills, where mathematical literacy refers to the ability to apply mathematical concepts in everyday life to solve problems. On the other hand, a deductive approach that focuses on teaching by teachers, delivering lesson material and providing examples. However, students become more passive in the learning process, only acting as recipients of information from the teacher and doing the tasks and exercises given. As a result, students become more passive in learning compared to realistic mathematical approaches.

Approach Realistic mathematics ensures that a high level of teaching is achieved through improving the quality of teachers and paying serious attention to effective teaching methods (David, 2020:24). A positive understanding of mathematics can arise when students recognize the role of mathematics in everyday life (Susanti & Sham, 2017:33). Therefore, it is expected that students are actively involved in interaction with teachers and their colleagues, the learning process is not only focused on the role of the teacher alone, but students also actively participate in the learning process (Vusparatih, 2014).

4. Conclusion

This study showed that in the experimental class, the level of students' mathematical literacy ability was at level 4 of 62.5%, with the average score of students' mathematical literacy ability in the experimental class of 65.48, while in the control class, the level of students' mathematical literacy ability was at level 2 of 82.5%, with the average score of students' mathematical literacy ability in the experimental class of 24. So it can be concluded that a realistic mathematical approach was effective in improving students' mathematical literacy skills, with *the N-Gain Score* that was successfully obtained reaching 61% or quite effective. On the other hand, the deductive approach does not seem to produce effective results in improving students' mathematical literacy skills. Thus, the development of mathematics teaching based on realistic mathematical approaches can be recommended for teachers and future research.

References

Afriansyah, & Turmudi. (2022). Prospective teachers' thinking through realistic mathematics education based emergent modeling in fractions. *Jurnal Elemen*, *8*(2), 605–618.

Ahyar, H., Maret, U. S., Andriani, H., Sukmana, D. J., Mada, U. G., Hardani, S.Pd., M. S., Nur Hikmatul Auliya, G. C. B., Helmina Andriani, M. S., Fardani, R. A., Ustiawaty, J., Utami, E. F., Sukmana, D. J., & Istiqomah, R. R. (2020). *Buku Metode Penelitian Kualitatif & Kuantitatif* (Issue March).

Antasari, M., Hanifah, Susanta, A., & Andriani, I. (2023). Penerapan Pendekatan Realistic Mathematics Education Melalui Model APOS Berbantuan Geogebra Untuk Meningkatkan Hasil Belajar Matematika. Jurnal AKSIOMA, *12*(2), 2468-2478.

Awaliyah, Z., & Ahmad, S. (2021). Pengaruh Penggunaan Pendekatan Pendidikan Matematika Realistik Terhadap Hasil Belajar Jaring–jaring Kubus Dan Balok Di Kelas V Gugus I Pariaman Utara. *Journal of Basic Education Studies*, *4*(1), 2858–2868. https://ejurnalunsam.id/index.php/jbes/article/view/3999

Daud, R. M. (2020). Sistem Pendidikan Finlandia Suatu Alternatif Sistem Pendidikan Aceh. *A-Raniry*, 21–36.

Dewi, N. P. W. P., & Agustika, G. N. S. (2020). Efektivitas Pembelajaran Matematika Melalui Pendekatan Pmri Terhadap Kompetensi Pengetahuan Matematika. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *4*(2), 204. https://doi.org/10.23887/jppp.v4i2.26781

Febryani, D. R. (2022). *Peningkatan Kemampuan Literasi Matematis Peserta Didik SMP/MTs Melalui Pendekatan Matematika Realistik Indonesia (PMRI)*.

Fransisca Nur'aini, Ikhya Ulumuddin, Lisna Sulinar Sari, sisca F. (2021). Meningkatkan Kemampuan Literasi Dasar Siswa Indonesia Berdasarkan Analisis Data PISA 2018. *Pusat Penelitian Kebijakan*, *3*(April), 1-8Rusman. (2015). Pembelajaran Tematik Terpadu Te.

Haataja, E., Chan, M. C. E., Salonen, V., & Clarke, D. J. (2022). Can noncomplementarity of agency lead to successful problem solving? A case study on students' interpersonal behaviors in mathematical problem-solving collaboration. *Learning and Instruction*, 1–10.

Hasanah, Z. N., Usodo, B., & Saputro, D. R. S. (2021). Kemampuan Literasi Matematika Siswa Sma Pada Konteks Pendidikan Dan Pekerjaan Ditinjau Dari Kemampuan Awal. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(4), 2395. https://doi.org/10.24127/ajpm.v10i4.4178

Hera, R., & Sari, N. (2015). *Literasi Matematika: Apa, Mengapa dan Bagaimana?* 713–720.

Hidayat, E. I. F., Vivi Yandhari, I. A., & Alamsyah, T. P. (2020). Efektivitas Pendekatan Realistic Mathematics Education (RME) Untuk Meningkatkan Kemampuan Pemahaman Konsep Matematika Siswa Kelas V. *Jurnal Ilmiah Sekolah Dasar*, *4*(1), 106. https://doi.org/10.23887/jisd.v4i1.21103

Larsen. (2018). Didactial Phenomenology: The Engine that Drives Realistic Mathematics Education. *For the Learning of Mathematics*, *38*(3), 25–29.

Masjaya, & Wardono. (2018). Pentingnya Kemampuan Literasi Matematika untuk Menumbuhkan Kemampuan Koneksi Matematika dalam Meningatkan SDM. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 568–574.

Masriyani, M., Minggani, F., & Zakiyah, S. (2022). Pengaruh Pendekatan Pembelajaran Matematika Realistik Terhadap Kemampuan Literasi Matematika Pada Materi Trigonometri. *Jurnal Inovasi Pembelajaran Matematika (JIPM)*, *3*(2), 90–95. https://doi.org/10.36379/jipm.v3i2.223

Narmi, Permatasari, N., Rustan, E., & Anas, A. (2020). Efektivitas Pendekatan Realistic Mathematic Education (RME) ditinjau dari Kemampuan Pemecahan Masalah Pada Pembelajaran Matematika Peserta Didik. *Journal of Teaching and Learning Research*, *2*(2), 27–34.

OECD. (2019). PISA 2018 Assessment and Analytical Framework. In *OECD Publishing*.

https://doi.org/10.1787/b25efab8-en

Palinussa, Molle, & Gasperz. (2021). Realistic Mathematic Education:Mathematical Reasoning and Communication Skills in Rural Contexts. *International Journal of Evaluation and Research in Education*, 522–534.

Praja, A. F. N., Budiarti, S., & ... (2022). Efektivitas pendekatan realistic mathematic education (rme) untuk meningkatkan kemampuan pemahaman matematika kelas IV SDN Sempu Kabupaten Ponorogo. *Konferensi Ilmiah Dasar*, *3*, 548–553. http://prosiding.unipma.ac.id/index.php/KID/article/view/2678%0Ahttp://prosiding.unipma.ac.id/index.php/KID/article/download/2678/2039

Puspitasari, R. Y., & Airlanda, G. S. (2021). Meta-Analisis Pengaruh Pendekatan Pendidikan Matematika Realistik (PMR) Terhadap Hasil Belajar Siswa Sekolah Dasar. *Jurnal Basicedu*, *5*(2), 1094–1103. https://doi.org/10.31004/basicedu.v5i2.878

Rahmawati, & Daryanto. (2015). *Teori Belajar dan Proses Pembelajaran yang Mendidik*. Gavamedia.

Setianto, I. E., & Risnanosanti. (2020). Kemampuan Representasi Matematis Siswa SMP melalui Pendekatan Pembelajaran RME dan CTL pada Sub Pokok Bahasan Kubus dan Balok. *Indonesian Journal of Mathematics and Natural Science Education*, *1*(3), 175–181. https://doi.org/10.35719/mass.v1i3.50

Sudi, W., Jafar, J., Kadir, K., & Salim, S. (2022). Efektivitas Pendekatan Pembelajaran Matematika Realistik Terhadap Literasi Matematika Siswa. *Jurnal Amal Pendidikan*, *3*(2), 160. https://doi.org/10.36709/japend.v3i2.28874

Suparatulatorn, R., Jun-On, N., Hong, Y. Y., Intaros, P., & Suwannaut, S. (2023). Exploring problem-solving through the intervention of technology and Realistic Mathematics Education in the Calculus content course. *Journal on Mathematics Education*, *14*(1), 103–128. https://doi.org/10.22342/JME.V14I1.PP103-128

Supriadi, G. (2021). *Penelitian Pendidikan Metod1.pdf*. UNY Press.

Susanti, E., & Syam, S. S. (2017). Peran Guru dalam Meningkatkan Kemampuan Literasi Matematika Siswa Indonesia. *Seminar Matematika Dan Pendidikan Matematika*, *November 2017*, 1–6. https://www.researchgate.net/publication/328813314_Peran_Guru_dalam_Meningkatkan_Kemampuan_Literasi_Matematika_Siswa_Indonesia

Stiadi, E., Fitriani, F., & Putra, A. (2023). Analisis Kesalahan Siswa Terkait Aspek Communication, Mathematising, Dan Representation Pada Unsur Proses Literasi Matematis Pisa. *JTMT: Journal Tadris Matematika*, *4*(1), 66-75. https://doi.org/10.47435/jtmt.v4i1.1755

Thabroni, G. (2022). Pendekatan Deduktif: Pengertian, Karakteristik, dan Langkah. In *Serupa.id*. Serupa.id.

Utami, N. P., Aulia, S., & Yulia, Y. (2022). Pendekatan Pembelajaran Realistic Mathematics Education (RME) dan Kemampuan Komunikasi Matematis. *Lattice Journal : Journal of Mathematics Education and Applied*, *2*(1), 53. https://doi.org/10.30983/lattice.v2i1.5586

Vusparatih. (2014). Peranan Komunikasi Guru dalam Implemantasi Kurikulum 2013. *Humaniora*, *5*(1), 397.