



## Analysis of Case-Based Learning Assisted by Math Song Media on Students' Mathematical Literacy

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### Abstract

The 2018 PISA results show that Indonesia ranked 74th out of 79 participating countries. The rationale behind this lies in the fact that students are unaccustomed to engaging with mathematical literacy questions, particularly those concerning two-dimensional geometric shapes. Furthermore, the instructional model employed does not yet adhere to a student-centred approach. The study aimed to analyze and determine the effectiveness of case-based learning assisted by math song media on students' mathematical literacy in the material of geometric shapes of cubes and blocks at State MTs Negeri 2 Semarang City. The research method was a mixed method-exploratory sequential design. The population was all students of class VIII MTs Negeri 2 Semarang City. The sampling technique was purposive sampling, with 32 students of class 8th grade B as the sample. The research instruments included observation sheets, questionnaires, interview guides, and mathematical literacy tests. Qualitative data analysis techniques were data reduction, data presentation, and conclusion and quantitatively using the normality test, Paired Sample t-test, and N-Gain test. The percentage of students interested in learning was 78.4%, and the teacher's response questionnaire was perfect, 88.9%. The acquisition of the Paired Sample t-test was Sig. (2-tailed) 0.000 means  $0.000 < 0.05$   $H_a$  accepted; in conclusion, there is a difference in mathematical literacy's pre-test and post-test averages, increasing from 53.06 to 86.34. The N-Gain test results obtained 0.7 with a percentage of 65.1% in the category of quite effective. Applying this learning, students are involved in learning and trained to analyze the case's problems critically.

**Keywords:** Case-Based Learning, Mathematical Literacy, Math Song Media

### Abstrak

Hasil PISA 2018 menunjukkan peringkat ke 74 dari 79 negara partisipan. Penyebabnya siswa tidak dibiasakan mengerjakan soal-soal yang berkaitan dengan literasi matematika khususnya pada materi bangun ruang sisi datar dan model pembelajaran yang digunakan belum bersifat *student center*. Tujuan penelitian untuk menganalisis dan mengetahui keefektifan case-based learning berbantuan media lagu matematika terhadap literasi matematis siswa pada materi bangun ruang sisi

datar kubus dan balok di MTs Negeri 2 Kota Semarang. Metode penelitian adalah *mixed method-exploratory sequential design*. Populasi adalah seluruh siswa kelas VIII MTs Negeri 2 Kota Semarang. Teknik pengambilan sampel adalah *purposive sampling* dengan sampel yang digunakan adalah 32 siswa kelas VIII B. Instrumen penelitian yaitu lembar observasi, angket, pedoman wawancara, dan tes literasi matematis. Teknik analisis data kualitatif adalah reduksi data, penyajian data, dan penarikan kesimpulan dan kuantitatif menggunakan uji normalitas, Paired Sample t-Test, dan uji N-Gain. Siswa tertarik dengan pembelajaran, persentase 78,4% dan angket respon guru sangat baik, persentase 88,9%. Perolehan Paired Sample t-Test yaitu Sig. (2-tailed) 0,000 artinya  $0,000 < 0,05$  maka  $H_a$  diterima, simpulannya ada perbedaan rata-rata pre-test dan post-test literasi matematis meningkat dari 53,06 sampai 86,34. Hasil uji N-Gain diperoleh 0,7 dengan persentase sebesar 65,1% dengan kategori cukup efektif. Penerapan pembelajaran membuat siswa terlibat dalam pembelajaran dan siswa terlatih untuk menganalisis kritis terhadap persoalan dalam kasus.

**Kata Kunci:** Case-Based Learning, Literasi Matematika, Media Lagu Matematika

## Introduction

21st-century education requires students to have skills, knowledge, and abilities in technology, media, and information, learning and innovation skills, as well as life and career skills (Partnership for Century Skills in Anwar, 2018). Students' contribution to this century's development must be balanced with mathematical literacy skills. The result of 21st-century skills through mathematical literacy requires the ability to formulate, employ, interpret, and understand how mathematics is helpful in various everyday situations (Rizki & Priatna, 2019). Mathematical literacy is the ability to imitate mathematics in real situations, including using mathematical reasoning, ideas, methods, and data to explain, describe, and predict events or phenomena (Hayati & Kamid, 2019). The reality is that the mathematical literacy of Indonesian students has yet to reach the PISA (Program for International Student Assessment) results standard, which means that this ability still needs to improve. Indonesia experienced a decline in the various fields tested by PISA, especially in reading and mathematics 2018. The Organization for Economic Cooperation and Development (OECD) showed that the results of Indonesian students' ability to read achieved a score proportion of 30% (score 371) of the OECD mean score of 77% (score 487). Then, for the math proportion score, around 28% (score 379) of the OECD mean score of 76% (score 489) (OECD, 2018). The data proves that the ability of Indonesian students' mathematical literacy is in the low-performance quadrant with high equity, which means it is at a low level when viewed on an international scale.

The inadequate level of mathematical literacy can be attributed to the necessity for students to familiarize themselves with solving mathematical literacy questions within the school environment, particularly those concerning flat-sided geometric shapes. Building space on the data side requires a real context so that this material is more accessible for students to understand because there are many mathematical problems related to mathematical literacy that require a systematic solution (Setiawan, 2022). Training students in this material is that they often experience errors in the operation of mathematics, the use of inaccurate formulas, errors in mathematical calculations, and students who need help understanding the questions given (Tania et al., 2022). Greater emphasis should be placed on students' development of mathematical literacy skills such as analyzing, arguing, and communicating ideas effectively in solving mathematical problems found in flat-sided shapes. Mathematical literacy ability is also affected by low teacher competency. The role of the teacher in enhancing the quality of learning, according to Mansur (2018), is improving the learning process in schools, especially the processes of reasoning, problem-solving, opinion, and communication. Teachers must understand how to teach, manage classes, understand students' needs, use suitable learning models and media, and develop their students' mathematical literacy abilities. As a facilitator, the teacher must be able to design active, innovative, creative, and fun learning to motivate students to be more interested in participating in learning. Nevertheless, in practical implementation, instructional activities remain teacher-centric, necessitating students to acquire authentic learning experiences.

The application of better learning to improve mathematical literacy skills must be student-centred, with students playing an active role in teaching and learning activities. Mathematics teachers must carry out learning that involves students in solving real-life problems that students might encounter regarding their mathematical literacy abilities (Nurhanurawati et al., 2022). The problems that occur need to be addressed by the teacher, including implementing case-based learning. Case-based learning is a teaching model that requires students to actively participate in real situations in the form of cases (Dharmayanti, 2021). According to Azzahra (2017), the presentation of case-based learning contains criteria that focus on new and exciting issues.

Case-based learning can be effectively utilized with the support of math song media, aiding students in comprehending mathematical formulas. Additionally, this media can assist teachers in transforming their teaching methods (Untari et al., 2017). Students' feelings also become happy so that the delivery of material by the teacher can be well understood (Wardani et al., 2018). Mathematical song media is

used to minimize the opinion of students who think mathematics is a complex science because, through the media of math songs, students can enjoy learning while singing and learning. Teachers can also use math song media as a medium for learning flat-side space, which contains many formulas that students find difficult to memorize.

The low level of mathematical literacy skills in flat-sided geometric material is an attraction for researchers to conduct research. The research focuses on the application of case-based learning assisted by the media of mathematics songs and mathematical literacy. The aim of the research is to analyze case-based learning assisted by mathematics song media on students' mathematical literacy abilities. The research also aims to determine the effectiveness of case-based learning assisted by mathematics song media on students' mathematical literacy.

## Method

Research that focuses on the application of case-based learning assisted by mathematics song media uses the following learning steps.

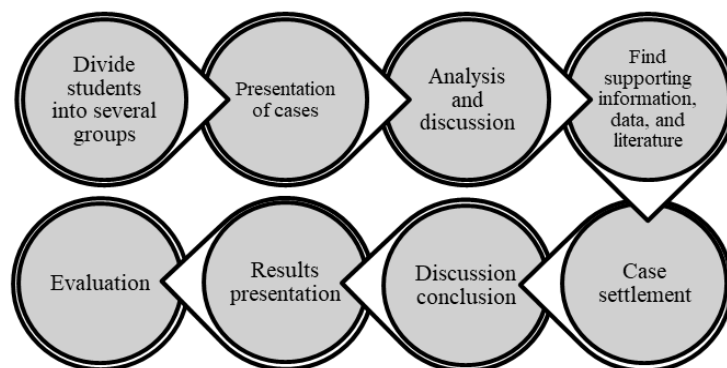


Figure 1. Case-Based Learning Step-By-Step Chart

The song media used is a composition of a children's song entitled "Menanam Jagung" for cube material and the folk song "Soleram" for block material. The following shows the mathematical song media used for block material.

Table 1. The Mathematical Song Media

Cube Song	Block Song
Mari kawan kita belajar Mengenal suatu bangun ruang Punya enam sisi, berbentuk persegi 8 sudut, 12 rusuk Kubus, kubus, itu namanya Semua rusuk sama panjangnya Rusuk pangkat 3 itu rumusnya Mencari volume bangun ruang kubus	Oh balok, si bangun ruang Yang mempunyai 8 sudut 12 rusuk dan 6 sisi Bentuk sisinya persegi panjang Panjang $\times$ lebar $\times$ tinggi Itu rumus mencari volumenya Dan bagaimana rumus luas permukaannya? Yuk kawan semua, kita mengenalnya
Mari kawan kita belajar Mengenal suatu bangun ruang Ada 12 diagonal sisi Dan punya 4 diagonal ruang Kubus, kubus itu namanya Apa rumus luas permukaannya 6 kali rusuk kuadrat ( $6r^2$ ) Itu rumus luas permukaannya	Panjang dikalikan lebarnya Tambah panjang kali tingginya Ditambah lebar kali tingginya kawan Hasilnya nanti dikalikan 2 ( $2 \times (pl + pt + lt)$ ) 12 diagonal sisi Dan 4 diagonal ruang Itu ciri-ciri dari bangun ruang balok Yuk kawan semua, kita mengenalnya

The research employed a mixed methods approach, specifically utilizing an exploratory sequential design. This involved qualitative research conducted initially to inform and develop subsequent quantitative research (Samsu, 2021). This study used qualitative methods to analyze the application of case-based learning assisted by mathematical song media to students' mathematical literacy and quantitative to determine the effectiveness of case-based learning assisted by mathematical song media on students' mathematical literacy with a pre-experimental design type pre-test-post-test design in one group. The sampling technique was purposive sampling with a population, and the sample used was students of class 8th grade B MTs Negeri 2 Semarang City, totalling 32 students. The independent variable (X) is case-based learning assisted by math song media, and the dependent variable (Y) is mathematical literacy ability.

Qualitative data collection techniques consist of (1) observation sheets to observe the implementation of case-based learning assisted by math song media; (2) a questionnaire to find out student responses and teacher responses after learning; (3) guided interviews were conducted to explain student and teacher responses orally. The quantitative data collection technique is a mathematical literacy test consisting of a pre-test and a post-test. The test contains three

description questions, which contain three indicators of mathematical literacy. The indicators of mathematical literacy used in this study were:

Table 2. Mathematical Literacy Indicators

Indicator	Achievement Sub Indicators	Question Numbers	
		<i>Pre-test</i>	<i>Post-test</i>
Formulate the problem systematically ( <i>formulate</i> )	Identify the mathematical nature of the problem as it arises in a real-world context and highlight important variables Understand the mathematical structure of a problem or situation.	1	1
Using concepts, facts, procedures, and reasoning ( <i>employ</i> )	Create designs and use strategies to solve math problems Reflect on mathematical ideas and explain and prove mathematical results.	2	2
Interpret the results of the mathematical process ( <i>interpret</i> )	Re-interpreting the results of a mathematical solution into a real context	3	3

Source: OECD (2018)

Other instruments used were the syllabus, learning implementation plan for curriculum 2013, and student worksheets for case-based learning corresponding to the material on the flat-side spaces of cubes and blocks. Qualitative data analysis techniques, namely: (1) data reduction, (2) data display, (3) conclusion drawing. Quantitative data analysis techniques were used in the initial analysis: the Shapiro-Wilk normality test, the Paired Sample t-test, and the N-Gain test.

## Results

Case-based learning is case-loading, containing contextual simple narrative stories and cube and block-based math problems. The theory that forms the basis for the development of case-based learning is the problem-solving approach. Case-based learning can be used optimally with the help of math song media. This mathematics song media is a foundation for students to solve a case because the song lyrics contain cubes and blocks. Therefore, the update in this research is case-based learning assisted by mathematical song media for flat-sided geometric material.

The learning process by implementing case-based learning requires preparation to present cases by the material to be taught. Before learning begins,

the teacher divides students into small groups of 3-5. Case-based learning prioritizes group discussion systems to solve cases. The media of math songs assist the application of case-based learning to create a fun learning atmosphere. The material taught was geometric flat-side space with cubes and blocks as sub-materials in class 8th grade B MTs Negeri 2 Semarang City. The following presents a graph of student and teacher responses to applying case-based learning assisted by math song media.

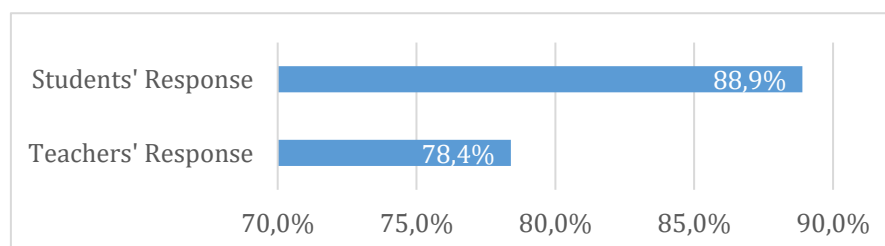


Figure 2. Graph of Student and Teacher Response Questionnaire Results

The graph above shows that the percentage of students' responses was 78.4% in the interested category and the teachers' responses were 88.9% in the very good category. This achievement means that the application of case-based learning assisted by math song media on cubes and blocks material received a positive response from students and teachers. Students' mathematical literacy was measured from the results of tests before (pre-test) and after (post-test) learning by applying case-based learning assisted by math song media. Mathematical literacy was measured from three indicators, each of the three questions in a description. The average results of the mathematical literacy test seen from the indicators are presented as follows.

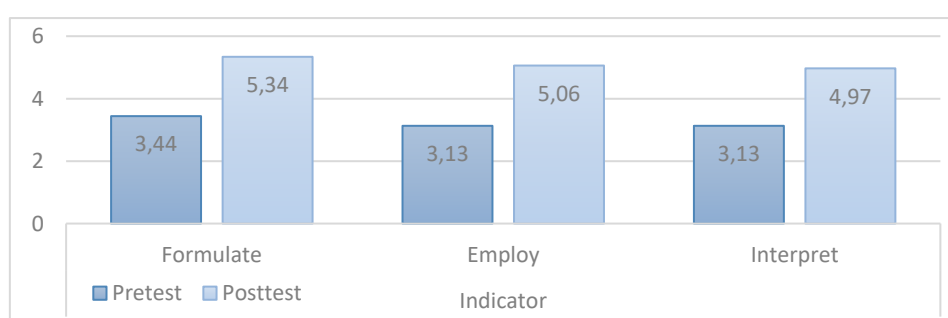


Figure 3. Average Test Results for Three Indicators of Mathematical Literacy

The study employed rigorous statistical analyses to evaluate the effectiveness of implementing case-based learning supported by math song media. Initial data assessments involved testing for normality using the Shapiro-Wilk test, revealing a standard distribution pattern with significant values. Subsequently, the

pre-test ( $0.279 > 0.05$ ) and post-test ( $0.201 > 0.05$ ) results underwent detailed analysis via the Paired Sample t-test. Remarkably, the significance level (Sig) from the Paired Sample t-test (two-tailed) indicated a remarkably low value of 0.000 for both pre-test and post-test scores, signifying values well below the critical threshold of 0.05. Consequently, the alternative hypothesis ( $H_a$ ) was affirmed, confirming the impact of case-based learning assisted by math song media on students' mathematical literacy. This robust statistical evidence underscores the substantial positive effect resulting from the integration of case-based learning and math song media, illuminating its potential in enhancing students' mathematical proficiency. Detailed results of the N-Gain test, pivotal to understanding the magnitude of this impact, are meticulously presented in the subsequent table for comprehensive scrutiny.

Table 3. Mathematical Literacy N-Gain Test Results

	<i>Pre-test</i>	<i>Post-test</i>	<i>Post-test - pre-test</i>	<i>100 - pre-test</i>	N-Gain	
					Score	%
Mean	53,8	85,2	31,4	46,2	0,7	65,1

Based on the table above, the N-Gain value is 0.7 with an N-Gain percentage of 65.1%; this shows that the pre-test and post-test data are moderate and quite effective. The teacher (researcher) prepared a case containing cube and block material based on the 2013 curriculum, which was presented in the student worksheet with examples of cases given as follows.

Table 4. Sample Case

Antiques are interesting old things, such as furniture, weapons, art, and household items. One of the antiques is charcoal and telephonic radio. As the name suggests, charcoal irons use wood charcoal as fuel to heat the bottom. Telesonic radio is an old-school radio with a length of 30 cm, a width of 6 cm, and a height of 14 cm. Charcoal irons and telephonic radios are antiques foreign collectors seek for 1-5 million rupiah.



Source: [Pinterest](#)

Pak Hidan and Bu Rina are husband and wife whose hobby is collecting antiques. They are looking for charcoal irons and telescopic radios to make their newest collection at home. They found what they were looking for at an antique and immediately bought it. The shopkeeper wraps the charcoal iron in a box, which will be covered with wrapping paper. The box is in the form of a cube with a size of 28 cm, as shown above. Help an antique shop seller determine the size of wrapping paper he needs to wrap his charcoal iron and determine the surface area of a telephonic radio!



The cases that have been given will be analyzed by students so that students find the solution steps. The answers to the student case analysis above are as follows.

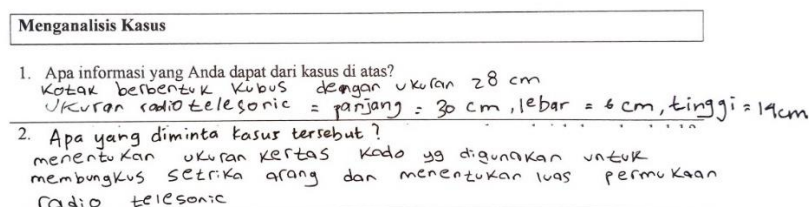
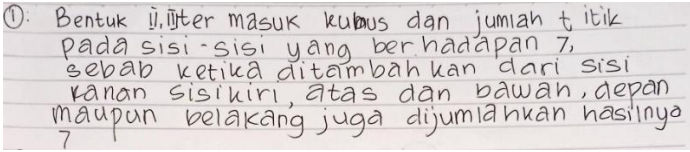
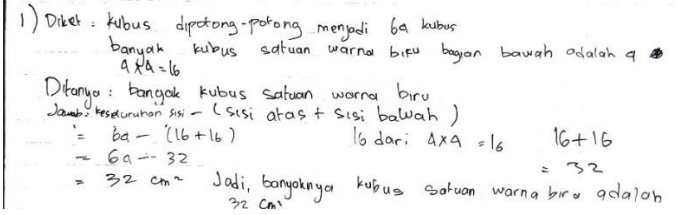


Figure 4. Answers Analyzing Cases

At this stage, students are encouraged to provide quick responses to case-related information and questions. They should record relevant information based on the case's content and take note of the complete set of case questions. The analysis of these cases aims to enhance students' mathematical literacy skills, specifically in understanding formula indicators. Students can achieve proficiency in this area by identifying the mathematical aspects of real-world problems, marking crucial variables, and comprehending the mathematical structure underlying the problem or situation. Subsequently, the following section presents the differences in students' mathematical literacy test answers before and after the implementation of case-based learning.

Table 5. Differences in Pre-test and Post-test Mathematical Literacy Formulate Indicator Answers

Formulate Indicators for Mathematical Literacy Test Answers	Description
<p><i>Pre-test</i></p> 	<p>Students need to identify essential aspects and variables of mathematics, such as writing unknown, asked, and answered. Students only write down the reasons for the answers they write.</p>
<p><i>Post-test</i></p> 	<p>Students have written down the mathematical aspects and essential variables in questions such as knowing, asking, and answering. Students have also written down the answers correctly and could conclude what was asked again. Students already understand the mathematical structure of a problem or situation.</p>

In the subsequent phase of case-based learning, students are tasked with gathering information, data, and relevant literature to resolve the given cases. To aid them in this process, students can utilize math song media as a resource. The required information pertains to flat-sided building materials, specifically the formulas for calculating the surface area of cubes and blocks. The student responses detailing the collected information are presented in the following column.

Karena kubus mempunyai 6 buah sisi, maka rumus luas permukaan adalah

$$= \text{banyak sisi kubus} \times \text{rumus luas persegi}$$

$$= 6 \times s^2$$

Karena balok memiliki sisi yang panjang tiga pasang maka luas permukaan balok

$$= 2 \times (\text{luas persegi panjang 1} + \text{luas persegi panjang 2} + \text{luas persegi panjang 3})$$

$$= 2 \times (pl + tl + pt)$$

Jadi, balok dengan panjang  $p$ , lebar  $l$ , dan tinggi  $t$  memiliki luas permukaan  $2 \times (pl + tl + pt)$

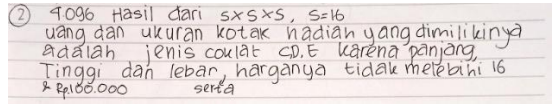
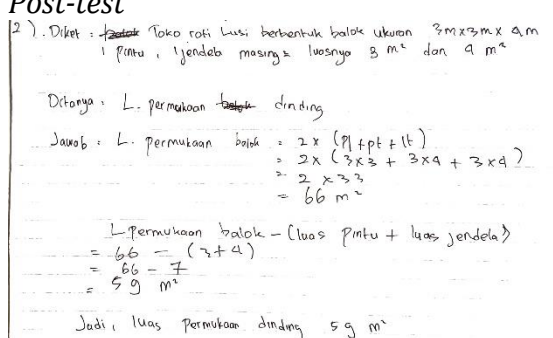
Figure 5. Sample Answers Students collect Case Information

The picture shows the results of students' answers after following the steps to find the formula for the surface area of a cube and block. Students find the formula for the surface area of a cube is  $6 \times s^2$ , and the formula for the surface area of a block is  $2 \times (pl + tl + pt)$ . At this step, the teacher must help and monitor students to

minimize misconceptions. Students are very active in asking about their ignorance and actively answering when the teacher asks, "What is the formula for the area of a square?" or "What is the formula for the area of a rectangle?". The information found can help students solve cases and other mathematical problems related to the surface area of cubes and blocks.

Using indicators, this case-based learning step can train students' mathematical literacy skills. Students achieve this indicator if they can design and use strategies to solve mathematical problems, reflect on mathematical ideas, and explain and strengthen mathematical results. The differences in the answers to the math literacy test on the employ indicator before and after implementing case-based learning.

Table 6. Differences in Pre-test and Post-test Mathematical Literacy Answers Employ Indicators

Employ Indicator Mathematical Literacy Test Answers	Description
<p><b>Pre-test</b></p>  <p>2) 9096 Hasil dari <math>s \times s \times s</math>, <math>s=16</math> uang dan ukuran kotak hadiah yang dimilikinya adalah jenis coklat C.E karena panjang, tinggi dan lebar, harganya tidak melebihi 16 Rp100.000 serta</p>	<p>Students still need to design and implement strategies. Students only express their opinion reflections from the answers they have obtained, but without using the completion steps.</p>
<p><b>Post-test</b></p>  <p>2). Diket: <del>1</del> Toko roti Lusi berbentuk balok ukuran <math>3 \text{ m} \times 3 \text{ m} \times 4 \text{ m}</math> 1 pintu, jendela masing-masing luasnya <math>3 \text{ m}^2</math> dan <math>4 \text{ m}^2</math></p> <p>Ditanya: L. permukaan <del>balok</del> dinding</p> <p>Jawab: L. permukaan balok = <math>2 \times (p \times l + p \times t + l \times t)</math> = <math>2 \times (3 \times 3 + 3 \times 4 + 3 \times 4)</math> = <math>2 \times 33</math> = <math>66 \text{ m}^2</math></p> <p>L. permukaan balok - (luas pintu + luas jendela) = <math>66 - (7 + 4)</math> = <math>66 - 11</math> = <math>59 \text{ m}^2</math></p> <p>Jadi, luas permukaan dinding <math>59 \text{ m}^2</math></p>	<p>Students have designed and implemented a problem-solving strategy using the formula for the surface area of a cuboid. Students have also provided complete information on questions (known and asked) and written reflections of their opinions.</p>

The final step of case-based learning is case completion and conclusion. The worksheet answers in this step are presented as follows.

penyelesaian kasus Radio telesonik

diketahui :  $p = 30 \text{ cm}$   
 $L = 6 \text{ cm}$   
 $t = 14 \text{ cm}$

dijawab :  $2 \times (pxl + L \times t + p \times t)$   
 $= 2 \times (30 \times 6 + 14 \times 6 + 30 \times 14)$   
 $= 2 \times (180 + 84 + 420)$   
 $= 2 \times (684)$   
 $= 1368 \rightarrow \text{Luas permukaan}$

Kotak Kubus

= diket = ukuran kubus = 28 cm

jawab =  $6 \times s^2$   
 $= 6 \times 28^2$   
 $= 6 \times 784$   
 $= 4704$

Figure 6. Examples of Student Answers Case Settlement

kesimpulan: Setrika arang dan radio teleponik merupakan barang antik yang dicari kolektor-kolektor asing. Setrika arang adalah setrika yang menggunakan arang kayu untuk membuat Panas bagian bawahnya. radio teleponik merupakan radio jadul yang memiliki ukuran, Panjang 30 cm, lebar 6 cm, tinggi 14 cm.

Figure 7. Example of Student Answers Case Conclusion

Figure 6 shows that students can write down their answers in full using what is known and asked, and then students use the formula for the surface area of a cube and a block. The conclusions written by the students in Figure 7 are by the case description, but at this conclusion, the students have not written the conclusions from solving the case. In conclusion, students must also include conclusions from solving cases such as "...so, the telephonic radio's surface area and the wrapping paper size in the case above is...". Solving this case is easy for students to do because students have followed the steps of case-based learning from the beginning to this stage. The teacher also gives many directions to students so that students can solve cases and gain insight to write conclusions.

Case-solving steps can train students' mathematical literacy skills on interpretation indicators. Students have achieved this indicator when students can re-interpret the results of solving mathematics in a natural context. The following illustrates the differences in students' mathematical literacy test answers on interpretation indicators before and after learning.

Table 7. Differences in Pre-test and Post-test Mathematical Literacy Answers Interpret Indicators

Interpret Indicator Mathematical Literacy Test Answers	Description
<p><b>Pre-test</b></p> <p>3. gacoan milik Siti lebih besar dari gacoan Fatimah karena berukuran 30 cm sedangkan gacoan Fatimah berukuran 18 cm</p>	Students should have written down information about the problem and the steps for solving it.
<p><b>Post-test</b></p> <p>3. Diketahui  <math>P = 30 \text{ cm}</math>  <math>L = 20 \text{ cm}</math>  <math>T = 10 \text{ cm}</math>                      Panjang kawat = 10 m                      Ditanyakan                      Berapa banyak kerangka balok yang dapat dibuat oleh paman dari kawat tersebut?                      Jawaban:                      Jumlah rusuk balok seluruhnya:  <math>= 4 \times (p + l + t)</math>  <math>= 4 \times (30 + 20 + 10)</math>  <math>= 4 \times 60</math>  <math>= 240 \text{ cm}</math>                      Banyaknya kerangka balok yang dibuat  <math>= \frac{\text{kawat}}{\text{rusuk}} = \frac{10 \text{ m}}{240 \text{ cm}}</math>  <math>= \frac{1000 \text{ cm}}{240 \text{ cm}}</math>  <math>= 4,167</math>  <math>= 4</math>                      Jadi banyak kerangka balok yang dapat dibuat oleh paman dari kawat tersebut adalah 4 buah.</p>	Students have re-interpreted mathematical results into real problems by systematically writing down information about the problem (known and asked) and problem-solving.

## Discussion

The learning process incorporates case-based learning, supported by math song media, wherein students demonstrate enthusiasm for mastering cube and block materials. They engage in reciprocal interactions with their instructors, actively seeking pertinent information to address cases, and exhibit confidence in articulating their viewpoints. Moreover, students display a genuine concern for their peers and a heightened awareness of their capacity to accommodate diverse perspectives in discussions. Case-based learning offers students authentic educational experiences by immersing them in real-life contexts through the examination of relevant cases. Asfar et al. (2019) explain that in case-based learning, students can understand mathematical problems regarding essential concepts and facts in real-life contexts and can motivate students to understand lessons more easily. Teachers and students responded positively to the application of case-based

learning assisted by math song media; this is also by Arianto's (2020) thoughts that students have excellent responses to case-based learning compared to ordinary learning.

Applying math songs as an instructional medium fosters an engaging and enjoyable learning environment. Furthermore, these mathematical songs offer a unique perspective on mathematics, transforming what students initially perceived as challenging material into an area of keen interest. The complexity of learning mathematics, particularly related to cube and block concepts, shifted from being perceived as daunting to becoming a desired subject of study. This change in perspective facilitated a deeper understanding of the topic. This aligns with Saputra's (2021) song media in learning can generate new desires and interests and generate motivational stimuli to facilitate students in learning activities. This view was also shared by Untari et al. (2017), who said that the math song media assists students in developing their psychomotor skills. The effectiveness of case-based learning was also explained by Syarafina et al. (2017) that students experience an increase in self-confidence, which can provide a deeper understanding of mathematical material, which ultimately trains critical thinking skills and develops problem-solving skills from the experience of identified cases.

The measured mathematical literacy skills provide substantial evidence of the significant impact resulting from the implementation of case-based learning supported by math song media. This approach proves highly effective in enhancing mathematical literacy skills, as it empowers students to analyze, identify, and resolve problems encountered within the given cases. Students can formulate, use, and interpret mathematical problems. This is in line with Ubaidah et al. (2022) that students with this ability can reason and use mathematical tools to explain and predict concepts, procedures, facts, and phenomena so that students become constructive, active, and reflective, know the role of mathematics and make decisions.

## Conclusion

Prior to the introduction of case-based learning supported by mathematics song media, teachers predominantly employed traditional teacher-centred instructional methods. Under this approach, students were passive participants, lacking the opportunity to delve into the study material in-depth. The findings from the mathematical literacy pre-test indicated that students faced challenges in drawing conclusions and solving problems systematically. Following the implementation of this new learning method, students actively engage in the learning process. They are encouraged to critically analyze case problems, fostering

their ability to address mathematical literacy challenges through the provision of comprehensive and detailed problem solutions.

Utilizing case-based learning with the support of math song media elicited positive responses from both students and teachers, with a notable 78.4% of students expressing interest and 88.9% receiving outstanding ratings. This heightened interest among students facilitates a deeper understanding of cube and block concepts, fostering increased class participation and enhancing the overall learning atmosphere. Teachers have responded favorably to this approach, capitalizing on students' enthusiasm. By integrating case-based learning assisted by math song media, students actively engage with real-life problem-solving scenarios, utilizing mathematical song media tailored to the given material.

The effectiveness of this approach was substantiated through statistical analysis, where the Paired Sample t-test yielded pre-test and post-test scores of 53.06 and 86.34, respectively, indicating a significant impact on students' mathematical literacy. This effect was further confirmed by the N-Gain test, which reported a value of 0.7, representing a 65.1% improvement—placing it within the moderate effectiveness category. Hence, it can be concluded that case-based learning, supplemented by mathematical song media, stands as an effective method for enhancing students' mathematical literacy.

## References

- Anwar, Nevi Trianawaty. (2018). "Peran Kemampuan Literasi Matematis Pada Pembelajaran Matematika Abad-21." Pp. 364–70 in *PRISMA (Prosiding Seminar Nasional Matematika)*.
- Arianto, Handika. 2020. "Pengaruh Model Pembelajaran Case Based Learning (CBL) Berbasis Hots Terhadap Kemampuan Berpikir Kontekstual Siswa." Institut Agama Islam Negeri Ponorogo, Ponorogo.
- Asfar et al. (2019). "Efektivitas Case Based Learning (CBL) Disertai Umpan Balik Terhadap Pemahaman Konsep Siswa." *Histogram: Jurnal Pendidikan Matematika* 29–45. doi: 10.31100/histogram.v3i1.293.
- Azzahra, Azka. 2017. "Pengaruh Model Case Based Learning (CBL) Terhadap Hasil Belajar Biologi Siswa Pada Konsep Jamur." Universitas Islam Negeri Syarif Hidayatullah, Jakarta.
- Dharmayanti, Putu Ayu Paramita. 2021. "Case Based Learning in Language Teaching." *JOSELT (Journal on Studies in English Language Teaching)* 2(2).
- Mansur, N. (2018). "Melatih Literasi Matematika Siswa Dengan Soal PISA." Pp. 140–44 in *PRISMA (Prosiding Seminar Nasional Matematika)*.

- Nurhanurawati, et al. 2022. "The Analysis of Junior High School Students' Mathematical Literacy: Field Study in Bandar Lampung." *Al-Jabar: Jurnal Pendidikan Matematika* 13(1):199–209.
- OECD. (2018). "PISA 2022 Mathematics Framework." *PISA 2022* 1–95.
- Rahmah Hayati, Tri, and Kamid. 2019. "Analysis of Mathematical Literacy Processes in High School Students." *International Journal of Trends in Mathematics Education Research* 2(3):116–19.
- Rizki, L. M., and N. Priatna. 2019. "Mathematical Literacy as the 21st Century Skill." *Journal of Physics: Conference Series* 1157(4). doi: 10.1088/1742-6596/1157/4/042088.
- Samsu. (2021). *Metode Penelitian Teori Dan Aplikasi Penelitian Kualitatif, Kuantitatif, Mixed Methods, Serta Research and Development*. Cetakan II. edited by Rusmini. Jambi: Pusat Studi Agama dan Kemasyarakatan (Pusaka).
- Saputra, Wingky Arjun. 2021. "Pengaruh Metode Discovery Inquiry Berbantuan Media Lagu Terhadap Keterampilan Menulis Puisi Siswa Kelas V SDn 76 Bengkulu Tengah." Institut Agama Islam Negeri Bengkulu, Bengkulu.
- Setiawan, Raka Ade. 2022. "Analsis Kemampuan Literasi Matematika Siswa Tipe Kepribadian Introvert Dalam Pemecahan Maasalah Matematika Di Kelas VIII SMP."
- Syarafina, Dita Nur, Erlinda Rahma Dewi, and Rofi Amiyani. 2017. "Penerapan Case Based Learning (CBL) Sebagai Pembelajaran Matematika Yang Inovatif." Pp. 243–50 in *Seminar Matematika dan Pendidikan Matematika UNY*.
- Tania et al. (2022). "Karateristik Kesalahan Siswa SMP Kelas VIII Dalam Menyelesaikan Soal Pada Materi Bangun Ruang Sisi Datar." *Jurnal Pembelajaran Matematika Inovatif* 5(1):23–32. doi: 10.22460/jpmi.v5i1.23-32.
- Ubaidah, et al. 2022. "Mathematical Literacy: Ethnomathematics in PISA Leveling Representations." *International Conference on Science, Education, and Technology (ISET)* 8(1):1249–58.
- Untari, et al. 2017. "Pengembangan Media Lagu Matematika Dalam Pembelajaran Di Kelas V Sekolah Dasar." *Mimbar Sekolah Dasar* 4(1):92–105. doi: 10.23819/mimbar-sd.v4i1.6145.
- Wardani, et al. 2018. "Pengembangan Lagu Edukasi Matematika Dalam Pembelajaran Matematika Dengan Menggunakan Metode Edutainment Di Kelas V SDN Keleyan 1 Socah." *Seminar Pendidikan Matematika UMM*.