PRISMA, 14(1), 157-165, June 2025
https://jurnal.unsur.ac.id/prisma
DOI:10.35194/jp.v14i1.5101

p-ISSN 2089 3604
e-ISSN 2614 4611

Analysis of Students' Mathematical Representation Ability in Solving Ethnomathematics-Based Story Problems Reviewed from Self-Efficacy

Dinda Zahrotun Nisa[1], Elsa Komala[2*], Erma Monariska[3]
[1,2,3] Universitas Suryakancana, Cianjur, Indonesia
[*]Corresponding Author: elsakomala@gmail.com

Submitted: 26-03-2025	*Revised: 17-05-2025*	*Accepted: 21-05-2025*	*Published: 20-06-2025*

ABSTRACT

This study aims to determine students' mathematical representation ability in solving ethnomathematics-based story problems, to determine students' self-efficacy in mathematics learning and to determine students' mathematical representation ability in solving ethnomathematics-based story problems in terms of self-efficacy. This study uses a descriptive method with a qualitative approach. The subjects of the study were students at one of the State Junior High Schools in Cianjur, class VIII A with a total of 29 students selected by purposive sampling. The instruments were in the form of mathematical representation ability test questions, self-efficacy questionnaires, and interviews based on mathematical representation indicators. The data analysis technique used on the test results and questionnaires was carried out by adding up the scores then categorizing and describing them in words, while the interview results would be described as supporting the results of the students' answers. The results of the data analysis showed that more students had mathematical representation abilities, namely 25 students. In student self-efficacy, it was known that more students were in the moderate category, namely 22 students. In terms of students' mathematical representation ability, viewed from self-efficacy, there are more in the medium category because the self-efficacy of students in the medium category is the largest, as well as their mathematical representation ability, which is also the largest in the medium category, while in the high category of students' self-efficacy, there are still students who have medium mathematical representation ability and in the low category of students' self-efficacy, students have medium mathematical representation ability.

Keywords: ethnomathematics, mathematical representation, self-efficacy, story problems.

INTRODUCTION

Mathematics has a very important role because it is a basic science that is widely used in various fields of life (Novferma, 2016). According to the National Council of Teachers of Mathematics (2000), there are five process standards in mathematics, namely problem solving, reasoning and proof, communication, connection, and representation. Of the five process standards, it is stated that one of them is the ability to represent, which is an ability that students must have in learning mathematics. This is because mathematical representation is very important because it can help students organize their thoughts when solving problems or questions that representation (Wijaya, 2018). Mathematical representation skills are needed by students to find and create ways of thinking in communicating mathematical ideas/concepts from abstract mathematical properties to concrete ones so that they are understood more easily (Apriliyani et al., 2022).

According to Villegas et al. (2009) mathematical representation has 3 indicators, namely: 1) Pictorial representation, which is making pictures or graphs to solve the given problem, 2) Verbal representation, which is solving problems using words or written text,

3) Symbolic Representation, which is solving problems by making equations or mathematical models from other representations given. Based on this, according to Nasution et al., (2020), with representation skills, students will find it easier to understand concepts and solve the problems given.

Mathematical representation skills are so important for students, but based on the results of the researcher's observations when implementing the Introduction to School Fields at one of the schools in Cianjur, mathematical representation skills are still not optimal and there are still errors in the problem-solving process, especially in translating questions related to story problems and what is asked from the question. These errors occur because the context of the questions given is different from what has been done and discussed previously. This is in line with Silviani et al. (2021), that mathematical representation skills are very important in learning mathematics, but in reality students tend to imitate the teacher's steps in solving problems (Silviani et al., 2021). According to Safitri et al. (2015) one of the factors that causes low mathematical representation skills in solving problems is the lack of understanding of students' mathematical concepts. To improve visual representation, students can increase their practice in visualizing contextual story problems (Nangim & Hidayati, 2021). Story problems are one of the most common forms of problems encountered and are usually taken from everyday life problems (Jumiati & Zanthy, 2020). In addition, story problems are problems that are considered to have a higher level of difficulty compared to mathematics problems that display mathematical models directly (Dwidarti et al., 2019). Story problems in mathematics learning can be linked to the culture in the area where the students are located. Science adapted from a culture is called Ethnomathematics (Fauzana, 2022). According to Fouze & Amit (2018), using ethnomathematics in mathematics learning, students can be helped in solving more complex problems with their culture, and can use relationships to help in teaching mathematics.

A person's ability to solve problems and students' confidence in their ability to solve a problem is self-efficacy. According to Bandura (1994), self-efficacy is a person's belief in their ability to produce something. In addition to representational ability, students' confidence in their ability to express ideas also contributes to a person's success in solving a problem (Dewi & Nuraeni, 2022). Bandura (1997) also stated that self-efficacy has 3 dimensions, namely: 1) Magnitude, this dimension is related to the level of difficulty that the individual believes can be solved; 2) Strength, this dimension is related to the level of strength or weakness of an individual's beliefs about their perceived competence; 3) Generality, this dimension shows whether beliefs will take place in a particular domain or apply to a variety of other activities and situations. Self-efficacy is a very important psychological aspect in education, because it will have a significant influence on students' success in completing tasks and solving problems well (Rajagukguk & Hazrati, 2021). Individuals who have low self-efficacy tend to give up when facing challenges and commitments, but if individuals have high self-efficacy, then they consider that commitment or challenges are something that must be faced and solved, not to be avoided, as expressed by Bandura (1997). Thus, the lack of self-efficacy in students can cause a lack of student skills in solving math problems, in addition to that which can cause low student achievement.

Based on the problems previously described, this study presents a novelty through the integration of an ethnomathematics approach into mathematical story problems, combined with an analysis of students' mathematical representation abilities in relation to their levels of self-efficacy. Until now, studies on mathematical representation have tended to focus on conventional problems without considering the local cultural context that is closely related to students' daily lives. In this study, elements of ethnomathematics are utilized to construct contextual and meaningful story problems, which are expected to help students express their mathematical ideas and thoughts more representatively. On the other hand, this study also explores the affective dimension of students, namely self-efficacy in learning mathematics, which has rarely been examined in depth in connection with representation abilities. By categorizing students based on their levels of self-efficacy (high, medium, low), this study provides a more comprehensive picture of how students' self-belief influences the way they represent mathematical ideas, particularly in a cultural context. Therefore, this research not only contributes theoretically to the development of contextual and culturally-oriented learning models, but also offers practical implications for designing instruction that considers both the cognitive and affective aspects of students simultaneously. Thus, this study aims to analyze students' mathematical representation abilities in solving ethnomathematics-based story problems, determine their self-efficacy in learning mathematics, and examine students' mathematical representation abilities in solving ethnomathematics-based problems in terms of self-efficacy.

RESEARCH METHODS

The method used in this study is descriptive with a qualitative approach, with 29 students as subjects in one of the State Junior High Schools in Cianjur, class VIII A. The instruments used in this study were mathematical representation ability questions, self-efficacy questionnaires and interviews with 3 students selected based on each self-efficacy category. The mathematical representation ability questions consisted of 4 ethnomathematics-based questions on the Pythagorean theorem material, each of which contained indicators of mathematical representation, namely Pictorial, verbal and symbolic. The questionnaire was given to group students into 3 categories, namely students with high, medium and low self-efficacy. This questionnaire has 20 statements based on four dimensions: namely Magnitude, Strength and Generality. The results of the test and questionnaire were carried out by adding up the scores then categorized and described in words, while the results of the interview will be described as supporting the results of the students' answers.

RESULTS AND DISCUSSION

Based on the results of the mathematical representation ability test on 29 students, it was found that there were 3 students with high mathematical representation ability, 25 students with medium category, and 2 students with low category. This means that most students have medium mathematical representation ability.

Figure 1 shows the answers of students from ethnomathematics-based questions who have high mathematical representation ability, represented by student S21. Students were asked to find the number of isosceles triangle-shaped hats with a base length of 32 cm

and the other two sides 20 cm, made from a piece of Maenpo motif batik cloth as in Figure 1.

Figure 1. Maenpo Motif Batik Cloth

The cloth is rectangular, with a width of 24 cm and a length of 64 cm, in figure 2 is the answer of student S21.

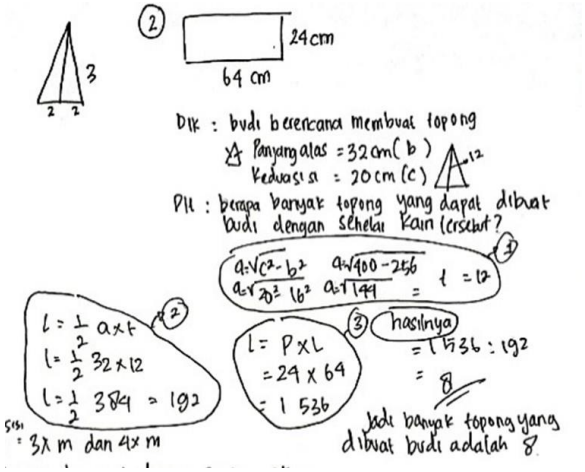

Figure 2. Example of Student Answers with High Mathematical Representation Ability S21

Based on Figure 2, it is known that students have been able to answer correctly, students are correct in the pictorial and symbolic indicators while the verbal indicator is still incomplete because students do not conclude the final results obtained, this is in line with the results of the interview that students already understand and can solve the problem easily and also understand each indicator in number 1. In addition, S21 students have been able to solve the problem correctly, in the pictorial indicator the subject is correct in drawing only the turtle is clearly visible, in the verbal indicator the student is correct, can write the steps and conclude the final result of question number 2 while in the symbolic indicator the student has calculated it correctly but there are some mathematical symbols that are not written. Based on the interview obtained, S21 students already understand and are able to solve question number 2. Likewise with number 3 students have been able to solve it, but in the symbolic indicator students are still not right in operating it correctly. Students are still wrong in finding the value of x in number 3. In the pictorial indicator students have been able to make it correctly, in the verbal indicator students have also been able to make conclusions even though the final result is not correct. Based on the interview, students can solve number 3 based on confidence in their abilities. In number 4,

the student has completed the problem until it is finished, but in the symbolic indicator, he is still wrong in finding the value of x. While in the verbal and pictorial indicators, the student has been able to describe it, based on the results of the interview with student S21, he was still confused in finding the value of x. Based on the results of the answers of student S21 from numbers 1 to 4, it is known that the student has fulfilled the pictorial representation indicator, while in the verbal representation indicator, he has been able to represent the problem into verbal form, although in number 1 he did not conclude the results of the solution and the symbolic representation has not been fulfilled because the student was not right in taking steps to find the value of x.

In Figure 3 is the student's answer to the ethnomathematics-based question that has moderate mathematical representation ability, represented by student S14, where the student was asked to find the price of Mr. Udin's fragrant pandan rice field which will be sold at a price of $Rp.\ 200{,}000.00/m^2$. The rice field is rectangular and is divided into two equal diagonals of 15 meters with side lengths of $3x$ meters and $4x$ meters. In Figure 3 is the answer of student S24.

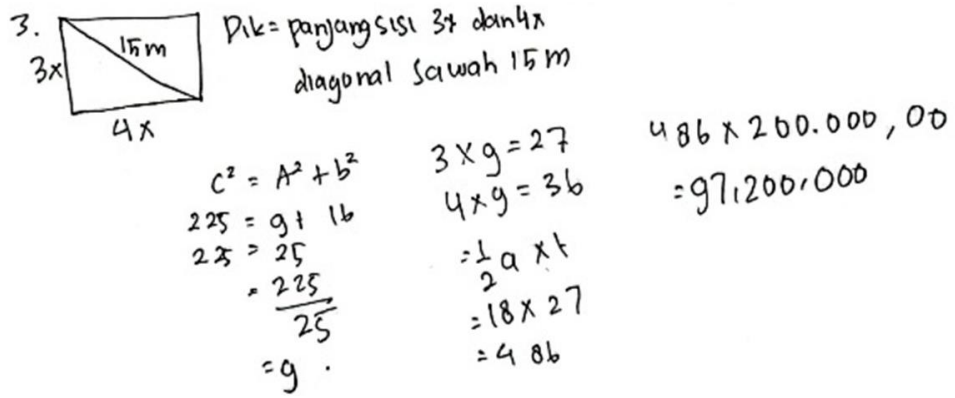

Figure 3. Example of Student Answers with Moderate Mathematical Representation Ability S14

In Figure 3, it is known that students can solve the problem even though the results are not correct. In the pictorial indicator, students can already make pictures correctly, as well as in the verbal indicator, they can write known and asked as well as conclusions, but in the symbolic indicator, students are still wrong in calculating it. Based on the results of the interview, students have understood question number 1 and can solve it even though it is not correct. Then students have solved question number 2 even though the final result is still not correct, in the pictorial indicator students do not represent the question into a picture, in the verbal indicator students are able to write known, asked and are able to conclude the final result even though the calculation result is not correct. While in the symbolic indicator, the initial steps taken by the subject are correct, it's just that in the final step there is an error in calculating the results. Based on the results of the interview, students are confused in representing the question into a picture and are not careful in calculating the answer. In addition, S14 has solved question number 3 even though the result is not correct. In the pictorial indicator, students can already draw correctly, in the verbal indicator, students have not concluded the final result of the answer to the question, while in the symbolic indicator, students are still wrong in finding the value of x, in line with the results of the interview that students are still confused in determining the value of

x. S14 did not complete question number 4, based on the results of the interview, students found it difficult to complete it, and this was also influenced by insufficient time.

A student with low mathematical representation ability demonstrated several difficulties in solving the given problems. For item number 1, the student was unable to accurately represent the problem in symbolic or verbal form; however, they were able to construct a visual representation in the form of a diagram. Based on the interview, the student expressed confusion regarding the selection of appropriate steps to solve the problem. Furthermore, subject S9 did not complete item number 2. One of the responses written merely stated the formula $p \times l = 24\ m \times 64\ m$ without proceeding to calculate the final result. The subject also failed to complete items 3 and 4. According to the interview, the student encountered significant difficulties in solving problems 2 through 4 and reported that the time allocated was insufficient to complete all tasks.

The results of the self-efficacy questionnaire showed that there were 4 students with high self-efficacy, 22 students with low self-efficacy, and 3 students with low self-efficacy. This means that most students have moderate self-efficacy. This is in line with research conducted by Pratiwi & Imami (2022) that most students' self-efficacy abilities are in the moderate category. This means that most students have confidence in the skills they have and also believe that they can overcome the difficulties they face and do their assignments well.

Table 1. Students' Mathematical Representation Ability Reviewed from Self-Efficacy

No	Student self-efficacy categories	Students' Mathematical Representation Categories	Amount
1	high	high	1
		moderate	2
		low	1
2	moderate	high	2
		moderate	20
		low	0
3	low	high	0
		moderate	3
		low	0

Based on table 1, self-efficacy in the high category is 3 students, 1 student whose mathematical representation ability is in the high category, 1 student whose mathematical representation ability is in the medium category and 1 student whose mathematical representation ability is in the low category. In low self-efficacy there are 3 students, all three students are in the medium mathematical representation ability. While self-efficacy in the medium category is 23 students where 2 students have high mathematical representation ability and 21 students have medium mathematical representation ability. Judging from the data, the self-efficacy of most students is in the high category.

Based on the results of the study of students' mathematical representation ability tests with ethnomathematics-based questions, it is known that more students have mathematical representation abilities in the moderate category, compared to students whose mathematical representation abilities are in the high and low categories. This is in line with research conducted by Sintia & Effendi (2022) which shows that based on the

results of the study, it is known that students' representation abilities are in the moderate category.

In this study, students with medium and low levels of mathematical representation ability were still found to experience difficulties in representing problems in pictorial form. This is supported by Suganda (2015), who stated that students' difficulties in creating visual representations of problems are caused by the failure to transfer their prior knowledge of fundamental concepts into long-term memory, resulting in an inability to recall the previously learned material. Consequently, students need to review the material in order to solve problems more easily. Furthermore, students with medium and low representation ability also performed lower on verbal indicators compared to other indicators. Based on the analysis of test answers and interviews with the three students representing high, medium, and low categories, it was found that all of them were able to represent problems in verbal form, although some responses were incomplete. This is in line with the research conducted by Suningsih and Istiani (2022), which found that students' achievement in verbal representation indicators remained weak, particularly in: (1) describing problem situations based on the given data or representations, (2) writing interpretations or forming representations, (3) explaining mathematical problem-solving steps in words, (4) constructing a story that matches a given representation, and (5) answering questions using written text or words.

In addition, the three students with high, medium, and low levels of mathematical representation ability were found to be capable of representing problems using mathematical symbols. However, some errors were still observed in their use of formulas and operations, which led to incorrect results. On the other hand, the student with low mathematical representation ability was not yet able to represent the problem in symbolic form. According to Wati and Sujadi (2017), this difficulty in constructing the problem situation is caused by the student’s lack of understanding of the problem's meaning. Furthermore, Fennell and Rowan (2001) also stated that low representation ability prevents students from being able to solve mathematical problems.

In this study, there is a difference with previous studies, where the results showed that students who have low mathematical representation abilities have high self-efficacy, which is not as it should be. This can be caused by several factors. As in the study of Purnama et al. (2019) things that can affect students' mathematical representation abilities in solving mathematical problems include: (a) not being careful in the calculation process; (b) not understanding the material or concept of arithmetic sequences and series; (c) not being able to use symbol representation; (d) considering verbal representation is not needed; and (e) still confused and hesitant to explain the answer. In addition, according to Bandura's theory (1997), one of the things that can affect students' self-efficacy is physiological and emotional states, which are physical and emotional states that affect self-efficacy in carrying out a task.

CONCLUSION

Based on the research data, it was found that more students had mathematical representation abilities, namely 25 students. In student self-efficacy, it was known that more students were in the medium category, namely 22 students. Students whose

representation abilities were in the high category already understood the mathematical concepts in the questions, in the pictorial and verbal indicators they were good, but in the symbolic indicator there were still errors in taking steps to solve them. In the mathematical representation abilities of students in the medium category in the pictorial indicator, they were able to represent them in the form of pictures, but there were still errors in drawing and confusion in drawing. In the verbal indicator, they were able to conclude and write down the steps to solve them. While in the symbolic indicator, students were not yet able to choose the right steps to solve the problem. In the mathematical representation abilities of students in the low category, they could not understand the meaning of the question and could not solve the problems in the question, students were still confused in representing the question into three indicators of mathematical representation, students could not choose the right steps to solve the question and represent it.

The mathematical representation ability of students in solving ethnomathematics-based story problems reviewed from self-efficacy shows that most students are in the middle category in self-efficacy. Students who have high mathematical representation abilities are mostly in the middle category in student self-efficacy.

REFERENCES

Apriliyani, S. W., Hartati, L., & Rahmatulloh, R. (2022). Analisis Kemampuan Representasi Matematis Siswa dalam Penyelesaian Soal Statistika Ditinjau dari Self Efficacy. *JKPM (Jurnal Kajian Pendidikan Matematika)*, *7*(2), 193-210.

Bandura, A. (1994). *Self-efficacy. Dalam V.S.Ramachaudran (Ed.). Encyclopedia of human behavior* (Vol. 4). Academic Press.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. W. F. Freeman and Comoany.

Dewi, M. W. K., & Nuraeni, R. (2022). Kemampuan Komunikasi Matematis Siswa SMP ditinjau dari Self-Efficacy pada Materi Perbandingan di Desa Karangpawitan. *Plusminus: Jurnal Pendidikan Matematika*, *2*(1), 151–164.

Dwidarti, U., Mampouw, H. L., & Setyadi, D. (2019). Analisis Kesulitan Siswa dalam Menyelesaikan Soal Cerita pada Materi Himpunan. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *3*(2), 315–322.

Fauzana, R. (2022). Pencapaian Representasi Matematis Siswa melalui Pendekatan RME berbasis Etnomatematika. *Madaris: Jurnal Guru Inovatif*, *2*(2), 163–176.

Fennell, F., & Rowan, T. (2001). Representation: An Important Process for Teaching and Learning Mathematics. *Teaching Children Mathematics*, *7*(5), 288–292. https://doi.org/10.5951/tcm.7.5.0288

Fouze, A. Q., & Amit, M. (2018). Development of mathematical thinking through integration of ethnomathematic folklore game in math instruction. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(2), 617–630. https://doi.org/10.12973/ejmste/80626

J J Jumiati, Y., & Zanthy, L. S. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Persamaan dan Pertidaksamaan Linear satu Variabel. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *3*(1), 11-18.

Nangim, N., & Hidayati, K. (2021). Analisis Kemampuan Representasi Matematis Siswa Saat Pembelajaran Dalam Jaringan Di Masa Pandemi Covid-19. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(2), 1034–1042.

Nasution, S. K., Sirait, S., & Syafitri, W. (2020). Analisis Kemampuan Representasi Matematis Siswa SMA pada Materi Barisan dan Deret Aritmatika. *Jurnal Matematics*

Paedagogic, *IV*(2), 143–150.
National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standars for School Mathematics*. NCTM.
Novferma, N. (2016). Analisis Kesulitan Self Efficacy Siswa SMP dalam Pemecahan Masalah Matematika Berberntuk Soal Cerita. *Jurnal Riset Pendidikan Matematika*, *3*(1), 76–87.
Pratiwi, A. F., & Imami, A. I. (2022). Analisis Self-efficacy dalam Pembelajaran Matematika pada Siswa SMP. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, *13*(3), 403–410.
Purnama, R. N., Kusmaryono, I., & Basir, M. A. (2019). Analisis Kemampuan Representasi Matematis Siswa Kelas VIII SMP Al Fattah Semarang. *Kontinu: Jurnal Penelitian Didaktik Matematika*, *3*(1), 23–36.
Rajagukguk, W., & Hazrati, K. (2021). Analisis Self-Efficacy Siswa dalam Penelitian Pembelajaran Matematika dengan Pendekatan Matematika Realistik dan Inkuiri. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *5*(2), 2077–2089.
Safitri, E., Hartoyo, A., & Bistari. (2015). Kemampuan Representasi Matematis Luas dan Keliing Lingkaran Berdasarkan Teori Bruner di SMPN 9 Pontianak. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *4*(4), 1–11.
Silviani, E., Mardiani, D., & Sofyan, D. (2021). Analisis Kemampuan Representasi Matematis Siswa SMP pada Materi Statistika. *Mosharafa: Jurnal Pendiidkan Matematika*, *10*(3), 483–492.
Sintia, & Effendi, K. N. S. (2022). Analisis Kemampuan Representasi Matematis Siswa Sman 1 Klari. *Transformasi : Jurnal Pendidikan Matematika Dan Matematika*, *6*(2), 143–153.
Subaidi, A. (2016). Self-efficacy siswa dalam pemecahan masalah matematika. *SIGMA*, *1*(2), 144–145.
Suganda, V. A. (2015). Kesuitan Merepresentasikan Soal Pemecahan Masalah Matematika pada Siswa di Sekolah Dasar. *Jurnal Kajian Pengembangan Pendidikan*, *2*(1), 41–47.
Suningsih, A., & Istiani, A. (2022). Analisis Kemampuan Representasi Matematis Siswa. *Transformasi : Jurnal Pendidikan Matematika Dan Matematika*, *6*(2), 143–153.
Villegas, J. L., Castro, E., & Gutiérrez, J. (2009). Representations in problem solving: A case study with optimization problems. *Electronic Journal of Research in Educational Psychology*, *7*(17), 279–308.
Wati, M. K., & Sujadi, A. A. (2017). Analisis Kesalahan Dalam Menyelesaikan Masalah Matematika Dengan Menggunakan Langkah Polya Siswa Kelas Vii Smp. *Prisma*, *6*(1), 9–16. https://doi.org/10.35194/jp.v6i1.24
Wijaya, C. B. (2018). Analisis Kemampuan Representasi Matematis Siswa Dalam Menyelesaikan Soal Lingkaran Pada Kelas VII-B Mts Assyafi ' iyah Gondang. *Suska Journal of Mathematics Education*, *4*(2), 115–124.