PLUSMINUS
Jurnal Pendidikan Matematika

Friends or Foe? Secondary Students' Perceptions of Mathematics in Acehnese Cultural Contexts

Mulia Putra[1*], Rita Novita[2], Usman[3]
[1*,2,3]Mathematics Education Program, Universitas Singaperbangsa Karawang
Jalan HS. Ronggo Waluyo, Puseurjaya, Telukjambe Timur, Karawang, West Java 41361 Indonesia
[2]Mathematics Education Program, Universitas Bina Bangsa Getsempena
Jalan Tanggul Krueng Lamnyong, No.34, Rukoh, Kec. Syiah Kuala, Kota Banda Aceh, Aceh 23112 Indonesia
[3]Mathematics Education Program, Universitas Syiah Kuala
Jalan Tgk Hasan Krueng Kale, Kopelma Darussalam, Kec. Syiah Kuala, Aceh 23111 Indonesia
[1*]mulia.putra@fkip.unsika.ac.id; [2]rita@bbg.ac.id; [3]usmanagani@usk.ac.id

ABSTRAK

Studi ini mengekplorasi bagaimana siswa sekolah menengah dengan persepsi positive maupun negatif terlibat atau menyatu dengan konsep etnomatematis melalui artefak budaya Aceh. Data pada penelitian diperoleh dari kertas jawaban siswa yang kemudian dideskripsikan secara kualitatif. Triangulasi sumber dijadikan sebagai metode untuk mengecek kredibilitas data atau informasi yang diperoleh dalam penelitian. Empat siswa dipilih dengan komposisi dua orang meenganggap matematika sebagai temannya dan dua yang lainnya menganggap matematika sebagai musuhnya. Mereka dipilih karena mampu menuliskan informasi yang lebih. Dari penelitian ini didapatkan hasil bahwa baik siswa yang membenci matematika maupun yang menyukai matematika Ketika budaya menjadi konteks di dalam masalah matematis, mereka mampu untuk menunjukkan ide-ide matematis dalam merespon soal atau pertanyaan yang diberikan, khususunya pada geometri datar seperti segitiga, persegi Panjang dan lain-lain. Namun, tidak ada dari mereka yang menyebutkan tentang koneksi matematika dan artifak budaya dengan geometri bidang ruang seperti balok, prisma maupun kubus. Dari penelitian ini juga menguatkan siswa yang membenci matematika anda menyukainya, keduanya memiliki ide-ide sama yang dipikirkan tentang matematika Bersama dengan budaya, tetapi mereka tidak menyadarinya.

Kata Kunci: Etnomatematika; Matematika; Teman atau Musuh; Ide-ide Matematis; Artefak Budaya

ABSTRACT

This study explores how secondary students with positive/negative perceptions of mathematics engage with ethnomathematical concepts in Acehnese cultural artefacts. In this research the data from students' answer sheet that was described qualitatively, and the source triangulations method leads to clarification on how valid and credible the data or information delivered in the result. Four students were selected with the composition two students consider mathematics as their friends and the others two consider mathematics as their enemies. Those four students were selected on purpose with enormous information within their answer sheet. students who love mathematics consider mathematics as their friends and mathematics is the enemies for those who hate mathematics. However, when both students who hate mathematics and love it provide cultures as a context for mathematics ideas, they can perform some idea about geometry as especially flat plane such triangles, rectangles etc. none of them mention about the connection mathematics and culture artifacts with three-dimensional plane such as blocks, prims or cubes. it also strengthens the finding that students who hate mathematics and love it, both have some ideas to think about mathematics within the cultures, but they don't realise that.

Keywords: Ethnomathematics; Mathematics; friend or foe; Mathematical Ideas; Cultural artefacts

Article Information:

Accepted Article: 23 June 2025, Revised: 09 July 2025, Published: 14 July 2025

How to Cite:

DOI: https://doi.org/10.31980/plusminus.v5i2.2904

Putra, M., Novita, R., & Usman. (2025). *Friends or Foe*? Secondary Students' Perceptions of Mathematics in Acehnese Cultural Contexts. *Plusminus: Jurnal Pendidikan Matematika, 5*(2), 197-208.

1. INTRODUCTION

One of most difficult situations that has been faced by educators including teachers in learning mathematics at school is a gap between formal mathematics that seems Eurocentric and non-formal mathematics that seem out of school mathematics knowledge which triggers lack of example in connecting formal mathematics and informal mathematics at school (Shirley, 1995). D' Ambrosio (2001) also stated that the point of view of educators to see mathematics as culture free and valueless also contribute to lack of pedagogical activities in mathematics education. In fact, mathematics education has a strong relationship with culture itself, even mathematics that was usually known at school or universities also connected with their own culture which is western culture. Bishop (1991) stated that this process happens because of enculturation process in mathematics education.

Therefore, mathematics education has become huge issue in many countries since many educators begin to realise there is need for educators to use students' daily life mathematics (informal mathematics) for teaching mathematics at school (formal mathematics) as reason to put emphasis on student's culture in learning mathematics (Borba, 1990; Presmeg, 1998; Bonotto, 2001; Bishop, 2004; H, Planas &Vilella, 2006). One of the educators like Lockhart (2009) in his book argued that school mathematics cheats students out of their most fascinating and imaginative art form and it is what he called as mathematician's lament. Thus, again it is about what student's need in their life which related to what kind of mathematics which can provide their need whether as mathematicians in the future or not. However, challenging this issue in mathematics education, ethnomathematics come up as one of the solutions to bridge between informal mathematics and formal mathematics where at some point both stop at mathematical knowledge (Palmer, 2010).

Furthermore, another aspect that should be considered is multicultural education in mathematics education where cultural diversity in classroom is inevitable, the gaps are much more complex which lead for *complex instruction* for mathematics in the classroom where we put students equally, irrespective of students' diversity, but his or her everyday mathematical practices (Francois, 2009). Bishop (2002) stated that cultural diversity in a classroom appears because of mathematics is defined as human and cultural knowledge as any other field of knowledge, thus the need for the teacher which ready for this challenge must put into the account. One of the ways to take the challenge is that using ethnomathematics as a standing

point for teaching mathematics since ethnomathematics provides legitimate mathematical knowledge for learners outside-school condition (Bishop, 1994). Moreover, countries such as India, China, and Brazil already implemented this kind of approach to tackle multicultural education impact especially in mathematics education at school (Balamurugan, 2015; Zhang & Zhang, 2010; Rosa & Orey, 2016).

Considering the description above, Indonesia also faced the same problem in teaching and learning mathematics in the classroom, besides there a lot of contexts that useful for teaching and learning mathematics from elementary until secondary level. Indonesia as a country with a great population and diversity of culture is a fact, each area has their own uniqueness in term of culture and characteristics (Miftah, 2016). In one hand, it is a great bounty for Indonesia, but in the other hands, this condition also can be a dangerous situation for creating conflict in the learning process. Therefore, it is not an easy task for Indonesia' s educators especially mathematics educators and teachers for achieving the goal which is providing a conducive mathematics learning process, thus proposing an alternative framework for reaching the aim is legitimate for better mathematics education at school (Putra, 2018) and of course understanding students perspective about mathematics in the classroom is very essential to achieve the goal. Considering the situation, ethnomathematics could help to solve the situation. Ethnomathematics recently become another possible approach for a country who has great diversity in cultures such as Indonesia. However, bringing ethnomathematics in classroom only for emphasising culture contexts for students could lead to another problem since the contextual learning formerly already implemented in Indonesia, then what is the purpose for bring ethnomathematics in the classroom if enriching the context learning is the main goal.

Ethnomathematics is defined as techniques or styles in explaining, learning, knowing and coping with natural, social, cultural even imaginary environment, it is what D' Ambrosio (2001) etymologically defined ethnomathematics. Moreover, Ascher (1991) provided many examples of ethnomathematics around the world, even Ascher (2002) also explored more related to ethnomathematics example in her next books. Even though both of D' Ambrosio and Ascher have some different point of related to ethnomathematics, in fact, they come at the same purpose for mathematics knowledge (Ascher & D' Ambrosio,1994). In addition, Gerdes (2007) also conveyed about ethnomathematics in Angola. In Indonesia itself, term for ethnomathematics already known in some research which explored ethnomathematics examples from a special tribe in Indonesia such as Baduy tribe (Karnilah, Juandi, and Turmudi, 2013) and Sundanese (Abdullah, 2017). Both of paper described the type of ethnomathematics that exist in Indonesia, in fact, there are many others aspect of ethnomathematics that can be explored since Indonesia is diverse in cultural aspects including traditional dance (Fitriani, 2022; Kusumayanti, A., Putry, E. D., Hidayat, M. N., & Sriyanti, A., 2025). Therefore, putting

ethnomathematics as a connecting tool for mathematical learning is indispensable as the way to accommodate mathematics practice surrounding student' s environment (Presmeg, 1998; Bonotto, 2001; Karssenberg, 2014; Amit & Qouder, 2017) and formal mathematics which is considered as universal (Reeve, 1968).

Indeed, learning Mathematics in classroom from time to time even within this recent decades do not reach a clear point how mathematics should be delivered. For examples, there are a lot of method and teaching model have delivered. Putra (2024) explains that all students have their own potencies and capabilities in solving mathematical problem even mathematics problem. Even students who consider mathematics as their enemies have some strategies and able to solve mathematical or mathematics problems that they faced. It means that not only students who love mathematics can solve mathematical problems but also those who don' t love it.

Therefore, the term of monsters, lovers and old friends by Zazkis (2015) and continue by Putra (2018) *Ethios*, *Meukhop and Geom* and now *friends* and *enemies* should be clarified descriptively on how students emotionally face mathematical problems in mathematics learning process since the emotions also influence the success of a student in solving mathematical problem.

2. METHOD

This research aims at describing students' emotion on how they are thinking about mathematical ideas at secondary level while culture as their context. In this research the data from students' answer sheet that was described qualitatively and the source triangulations method leads to clarification on how valid and credible the data or information delivered in the result. Four students were selected with the composition two students consider mathematics as their friends and the others two consider mathematics as their enemies. Those four students were selected on purpose with enormous information within their answer sheet. It is because even students' who hate mathematics also have strategies in solving mathematical problem (Putra, 2024). The two selected students who love mathematics are coded with x1 and x2, meanwhile those two selected students who hate mathematics are coded with y1 and y2.

3. RESULT AND DISCUSSION

a. Result

To begin in exploring the data, the following problems are given to students in class. The problems consist of three question which related to Acehnese context where students are familiar with the context. There two cultural artefacts from Aceh in it which are the first one is *Rumoh Aceh* or traditional house from Aceh and the second one is *Pinto Khop* or former gate for a Princess to the pool for swimming. It is based on the history fact. The whole question are as

follows: The first question "What is Mathematics in your opinion?", is it your enemy, friend or something else out of those two? Please explain your opinion! The first question aims at conveying students' emotion toward mathematics and the reason behind why those emotions appear.

The second question starts with providing a cultural context from Aceh which *Rumoh Aceh* or Traditional Aceh house and *Pinto Khop* as previously mentioned. The picture of the context as put in Figure 1. It follows by the question "is there any mathematics ideas or mathematical ideas come ups after observing both pictures? If yes mentions and describes the ideas! If no then you should explain about what you know about from figure 1!". The objectives of second question are to grasp students' understanding about mathematical ideas that probably they don't realise about.

Figure 1. Rumah Aceh and Pinto Khop

The third question is about the idea about making connections between cultures and mathematics or mathematical things or ideas. The researchers asked, "after answering questions number 1 and number 2, is there anything that would to describe related cultures and mathematics?" finally the whole questions aim at finding their perceptions about mathematics when they hate mathematics and love it!

Based on the data that was collected the following is x1's answers toward whole questions. The x1 loves mathematics and consider it as friend. Although difficult to understand, *x1* stated that mathematics always exists in our daily lives. For the second question, x1 responded as follows that x1 can find mathematical ideas in the given figures and the example of the idea is the triangles pictures in it. For the last question, x1 responded that there are connections between mathematics and cultures because in every creation or construction of traditional house there should be mathematics in it. Figure 2 shows x1's responds toward whole questions.

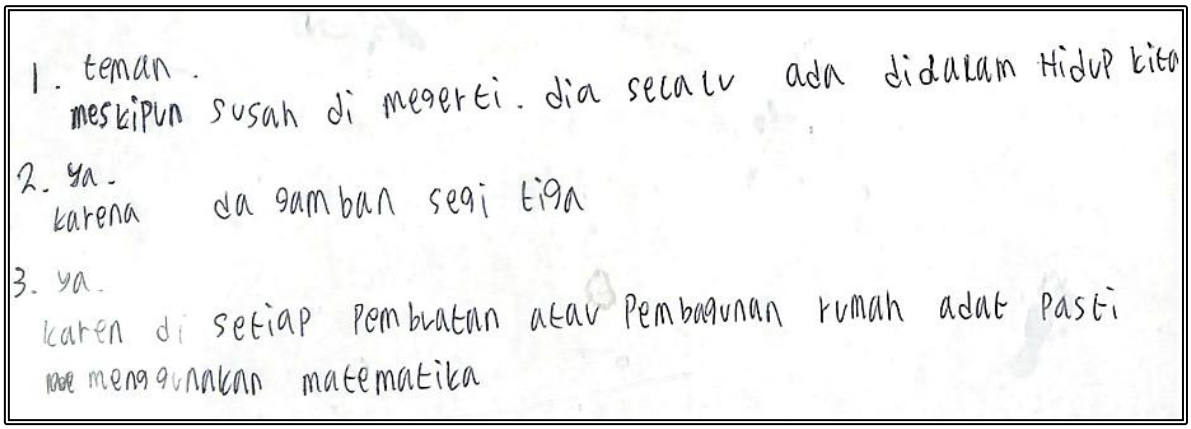

Figure 2. x1' s answer to whole questions

Moreover, almost the same with x1' s answers, x2 also respond the whole questions. For the first question, x2 states that mathematics is a friend because "every we go, mathematics always follows us. When we buy something, we really need mathematics to count". Although the languages that students used close to metaphor way of describing mathematics as friend, student means to say that mathematics is important as important as a friend. The second answer, students got the mathematical ideas from the given pictures in the question. X2 mentioned that something that connect with the pictures are triangles and squares. Here, x2' s answer confirms with the x1' s answer that the related mathematical thing from the given cultural artefacts is flat plane including triangles in it. The last question, x2 answer also the same with x1 where x2 can see the connection between the artefacts and mathematics by saying that x2 can describe the connection between culture and mathematics which refers to traditional house and Gunongan (*Pinto Khop*). In the answer x2 think that the second picture is *gunongan,* in fact, it is not. It was *Pinto Khop.* Etymological meaning, Pinto is door or gate and *khop* mean covering for protection such as hat covering the head of the user. The following Figure 3 is x2' s responds to whole questions.

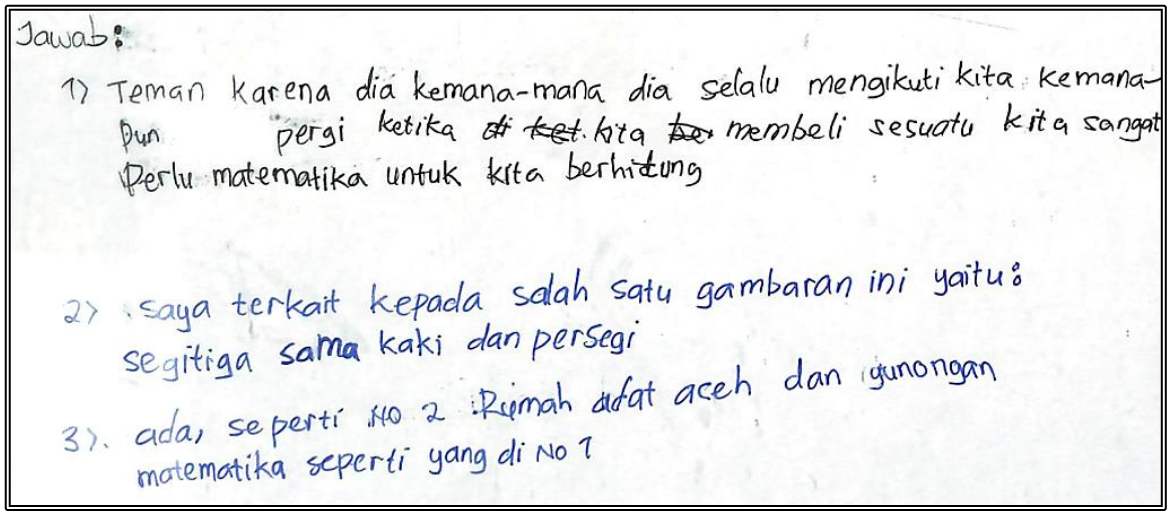

Figure 3. x2' s answer to whole questions

After describing the data information from students who consider mathematics as their friends, coded by *x*, then y represents the students who hate mathematics. However, almost the same with what *x* conveys, y represents those students who hate mathematics, two students who hate mathematics gave the response to the first and second questions but not with number 3 as the last questions. Therefore, in relation with how student who hate and love mathematics realise about the connection between culture and mathematics cannot be the same in terms of how they solve mathematical problems. It happens because for students who consider mathematics as their friends, they can see the relation between culture and mathematics, but students who consider mathematics as their enemies in this case coded by y1 and y2, they cannot connect precisely between mathematics and cultures.

The y1 consider mathematics as an enemy because it is very complicated and difficult to understand. The student y1 also able to show the mathematical idea from the given cultural artefact from question by saying that the given pictures represent triangle. For the last question y1 did not respond to question. Indeed, no further information provided by the y1. Since there are two selected respondents from student who hate mathematics, another student who hate mathematics which y2 almost respond the same way as y1. The y2 did not like mathematics and considered as an enemy because sometimes it was difficult to understand. Although y2 respond to the last question, the answer only saying "yes" not confirming further information in what way the connection between cultural artefacts and mathematics related to each other's. the following Figures 4 and 5 shows both answers y1 and y2.

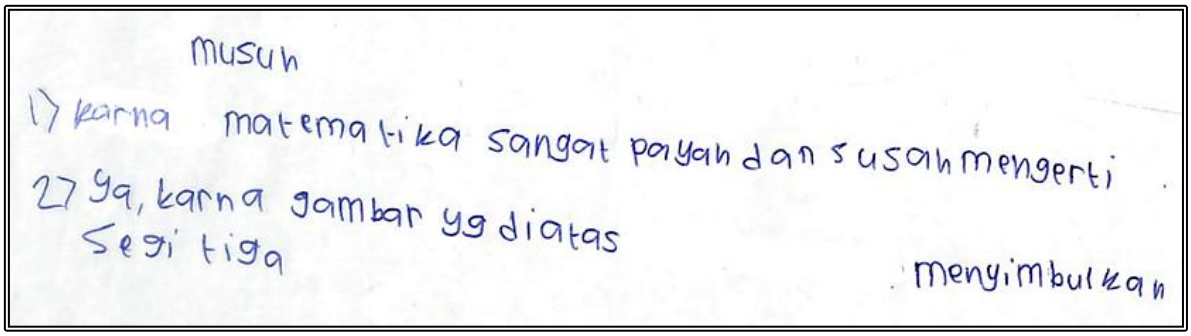

Figure 4. y1's answer to whole questions

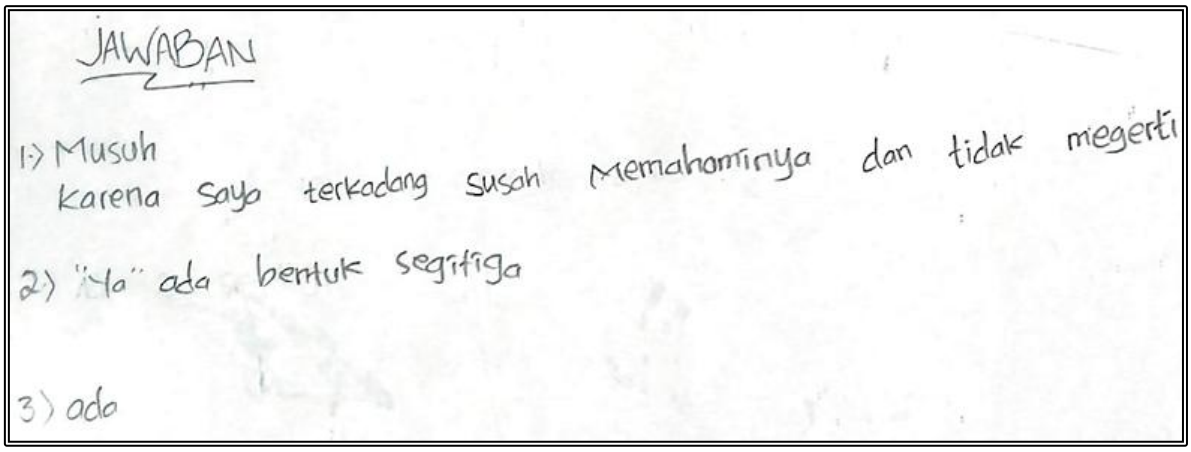

Figure 5. y2' s answer to whole questions

b. Discussion

The results from both emotions and responses on how students' perceptions toward mathematics and cultures are different. In one hand, students who love mathematics can describe the connections between culture and mathematics and on the other hand, students who hate mathematics and consider mathematics as an enemy did not want to describe how the connection between mathematics and culture is created. However, both students who hate and love mathematics share the same responses about mathematical ideas. Based on the data description from the result, mathematical ideas that understood by them through given cultural artefacts was triangles within the artefact. Moreover, the students did not share any thought about three-dimensional pattern based on the cultural artefact.

Therefore, solving mathematical problems is not always about student who hate mathematics could not solve mathematical problems, but students who love mathematics also could not solve it as well. From the result, it also shown that students who consider mathematics as an enemy and those students who consider mathematics as a friend can create the verbal representation from the cultural artefacts. It means that their ability in creating visual representation could be the same between mathematics' lovers and mathematics' haters. It stated that mathematical problems solving had a very close link with the art of representation (Polotskaia, Savard, & Nadon, 2021).

Although this finding cannot be generalized in other spesifics culture or daily activities from different students which diverse cultures, there should be one small part that those different cultures can be connected to other cultures in the teaching and learning mathematics classroom (Putra, 2021).

4. CONCLUSION

In summary, students who love mathematics consider mathematics as their friends and mathematics is the enemies for those who hate mathematics. However, when both students who

hate mathematics and love it provide cultures as a context for mathematics ideas, they can perform some idea about geometry as especially flat plane such triangles, rectangles etc. none of them mention about the connection mathematics and culture artifacts with three-dimensional plane such as blocks, prims or cubes. Furthermore, from the discussion, it also strengthens the finding that students who hate mathematics and love it, both have some ideas to think about mathematics within the cultures. It also emphasises that even those who hate mathematics and consider mathematics as their enemy have the possibility of overcoming mathematical problems accurately. It also shows that mathematics is not always about rigids and formal algorithm, but sometimes it fit with situation and the needs of students without considering the rigidness of the algorithm.

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AUTHOR BIOGRAPHY

	**Mulia Putra, M.Pd., M.Sc., Ph.D. in Ed.** Born in Desa Pasar Padang Tiji, on 26th December 1986. Faculty member at Universitas Singaperbangsa Karawang. Completed undergraduate studies in Mathematics Education at Universitas Syiah Kuala, Banda Aceh, in 2009; Completed graduate studies in Mathematics Education at Universitas Negeri Surabaya, Surabaya, in 2014; Completed graduate studies in Science and Mathematics Education at Curtin Univerisy, Australia, in 2015; and completed doctoral studies in Mathematics Education at Hiroshima University, Japan, in 2021.
	**Dr. Rita Novita, S.Pd., M.Pd.** Born in Aceh Utara, on 1st November 1987. Faculty member at Universitas Bina Bangsa Getsempena. Completed undergraduate studies in Mathematics Education at Universitas Syiah Kuala, Banda Aceh, in 2009; Completed graduate studies in Mathematics Education at Universitas Negeri Palembang, Palembang, in 2012; and completed doctoral studies in Mathematics Education at Universitas Pendidikan Indonesia, Bandung, in 2023.

Dr. Usman, S.Pd., M.Pd.

Born in Bayu, on 31st December 1974. Faculty member at Universitas Syiah Kuala. Completed undergraduate studies in Mathematics Education at Universitas Syiah Kuala, Banda Aceh, in 2001; Completed graduate studies in Mathematics Education at Universitas Negeri Surabaya, Surabaya, in 2005; and completed doctoral studies in Mathematics Education at Universitas Negeri Surabaya, Surabaya, in 2018.