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DISCOURSE TOWARD STUDENTS WHO HATE MATHEMATICS IN SOLVING A MATHEMATICAL PROBLEM: AN ETHNOMATHEMATICAL PERSPECTIVE

Mulia Putra*[1]
[1]*Universitas Bina Bangsa Getsempena*

* Corresponding Author: *muliaputra@bbg.ac.id*

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ABSTRACT

This research aims to identify students who hate mathematics in solving mathematical problem where culture is the context. In this research the context was *Rumoh Aceh*. By collecting data through various sources such as interview transcription and documentation, qualitative method is appropriate to describe how students who hate mathematics solve the mathematical problem. Students who hate mathematics, they hate mathematics is not simply because mathematics is difficult for them, rather their awareness toward mathematics itself. Roughly speaking, what they consider as not mathematics is mathematics. From several respondent who involve in this research, all of them have their own way in solving mathematical problem. In other way, all students who hate mathematics can solving mathematical problem, even all the answer is not match with the real needs of an *Utoh*. *Utoh* is a professional worker who expert in counting the total weaved *rumbia* leaves to cover whole roof of *Rumoh* Aceh. Students who consider mathematics as their enemy which means they hate mathematics cannot be said that they cannot solve mathematical problem at all, but they have the strategy to solve it, although they face some problem in the process of solving it. All of students' answer called as alternative solution for solving mathematical problems. Finally in this research, students who hate mathematics has a good ability in making the representation of mathematical expression and this is a good information for teachers and researchers who conduct learning and research in mathematics at school.

ABSTRACT

Penelitian ini bertujuan untuk mengidentifikasi siswa yang membenci matematika dalam menyelesaikan masalah matematis dimana budaya menjadi konteksnya. Dalam penelitian ini yang menjadi konteks adalah Rumah Aceh. Data dikumpulkan melalui berbagai sumber, seperti transkrip wawancara dan dokumentasi, sehingga metode penelitian kualitatif lebih cocok untuk mendeskripsikan bagaimana siswa yang membenci matematika menyelesaikan masalah matematis. Siswa yang membenci matematika, mereka membenci matematika bukan dikerenakan matematika itu sulit bagi siswa, melainkan kesadaran mereka terhadap matematika itu sendiri menjadi alasannya. Singkatnya, apa yang mereka sangka bukan matematika padahal itu adalah matematika. Dari para siswa yang menjadi responden pada penelitian ini, semuanya memiliki cara mereka masing-masing dalam masalah matematis. Dengan kata lain, semua siswa yang

membenci matematika sebenarnya bisa menyelesaikan masalah matematis tersebut, meskipun jawabannya tidak sesuai dengan kebutuhan real dari seorang Utoh. Utoh merupakan seorang yang professional yang ahli dalam hal menghitung jumlah rumbia rajut untuk menutupi atap dari Rumah Aceh. Siswa yang mengangap matematika sebagai musuhnya yang bermakna bahwa mereka membenci matematika tidak bisa dikatakan bahwa mereka tidak mampu untuk menyelesaikan masalah matematis sama sekali, mereka memiliki strategi masing-masing dalam menyelesaikannya walaupun mereka menemukan hambatan tersendiri dalam proses penyelesaian masalah tersebut. Jawaban siswa dengan keadaan yang telah dideskripsikan dinamakan sebagai sebagai solusi alternatif dalam menyelesaikan masalah matematis. Pada akhirnya dalam penelitian ini, siswa yang membenci matematika ternyata memiliki kemampuan yang bagus dalam hal membuat representasi dari ekspresi matematis dan hal ini merupakan temuan berupa informasi yang sangat baik bagi para guru dan peneliti yang melaksanakan pengajaran dan penelitian matematika di sekolah.

INTRODUCTION

Mathematics as one of difficult subject in school in one of fact which faces by many students around the world. In this research mathematical problem means as problem which related to mathematics and culture as its context. Putra and Novita (2015) stated that even student with high mathematics ability has difficulties in solving mathematical problem. It means that mathematical problem for those who has moderate or low understanding in mathematics need to do extra to solve it. Now, what about student with has emotion toward mathematics? For example, they like math or they love math. Probably the tendency conclusion is that student who hate mathematics could not solve mathematical properly and respectively for those who love mathematics. However, it is not the conclusion, because of emotion in solving mathematics (España, 2023) could lead to embedded discussion in mathematics education.

As an archipelago country, Indonesia has very huge diversity in terms of social and culture and this condition leads to classroom diversity in learning mathematics. Therefore, a crucial problem is to develop a social climate where cultural diversity much more worthy and seen as a resource for peaceful coexistence including in the education area (Civitillo et al, 2017). Moreover, this kind of diversity should be a big opportunity to enlarge mathematical context for a better mathematics education in future.

I remember two of the articles in FLM which talk about students feeling toward mathematics and personification is the tool to explain who is mathematics? Zaskis (2015) in the articles talk about mathematics as monster which means that student hate

him/her/it. In later, Cohen (2016) also discuss about mathematics condition in a personification way. In fact, he focuses on the term hate. However, both of paper only talk about mathematics in general which means the personification that they used is not merely for solving a problem, rather showing students feeling about mathematics. Therefore, bringing personification in solving mathematics can be considered as creating a new nuance in mathematics education.

Students who hate mathematics even consider mathematics as a monster are not merely hard to solve mathematics problem, rather they have a lot of idea to face mathematical problem, but the idea sometimes did not reach the only one correct answer in mathematics. After that since they cannot reach the answer, then they consider themselves as bad in mathematics that later, this leads to mathematics anxiety (Zanabazar, et al, 2023). Therefore, identifying student who hate mathematics in solving mathematical problem is very critical issues to tackle as well since it is not about, they cannot do mathematics, rather how they appreciate kind of mathematics that they have.

Moreover, ethnomathematics (D'Ambrosio, 1985; Ascher and D'Ambrosio, 1994 & D'Ambrosio, 1997) as an approach to know how culture interact with and within the mathematics can be a good tool to explore alternative solution by students. It could help them solving mathematical problem where culture as the context. Alternative solution also contributes for constructing the new finding of knowledge, although the alternative solution could not refer to a correct answer. However, researchers have to realise that the alternative solution could be contributed to strengthen students' both mathematics and mathematical understanding.

RESEARCH METHOD

Qualitative descriptive method was implemented in this research (Cresswell, 2018). Research gathers the information from various sources such documentation artefact and interview transcription. One class of secondary education SMP N 1 Darussalam in Aceh, Indonesia was taken as the participants in this research. all students were given a piece of paper which consist of two questions. First question is related to an option for student to declare whether mathematics as friends or their enemy. If students consider mathematics as their friends, then it means that they like or love mathematics. But if mathematics is their enemy, then it means that students hate mathematics. After all students responds toward the questions, three students answer sheet who hate mathematics was explored to identify how student who hate mathematics solve a

mathematical problem. After students finished their answer, a short interview to verify what they have been doing is conducted. From the statement test and interview are used to identify students who hate mathematics in solving mathematical problem.

Objective

To identify students who hate mathematics in solving mathematical problem where culture is the context.

Research Question

How do students who hate mathematics solve mathematical problem with culture as the context?

RESULT AND DISCUSSION

Before reaching the answer about the question, some clarification was needed as the way to avoid misunderstanding. The term of ethnomathematics is developed by the time going and many researchers interpret what ethnomathematics is? Some interpretation could miss the intention of the ethnomathematics, some others in line with ethnomathematics and for some others develop the ethnomathematics itself. For example, between an anthropological perspective and educational perspective. Both ethnomathematics has different interpretation. In one hand, the terms of an anthropological perspective, ethnomathematics tries to reveal the truth behind what already happen previously, which can be said archaeologist one of a man who play an important role. However, ethnomathematics based education on the other hands, has different focus on ethnomathematics which put the bridging process on how informal and formal mathematics can be integrated as the focus (Putra, 2018 & 2022). In another word, process how culture's role in bridging informal and formal mathematics at school is the core focus on ethnomathematics based education.

Based on the explanation above, it can be said that ethnomathematics anthropological base is informal mathematics as the element within the learning proses. Meanwhile the formal mathematics is mathematics that delivered in school which was rigid. The following problem related to the daily activities which is very close to the student in this area. this problem was given after three student who hate mathematics selected and they have good communication in responding any kind of questions during the test session.

"This is called *Rumoh Aceh*. Have you thought that the roof of building made of *rumbia* leaves? Can you calculate how many *rumbia* were needed to cover all the roof of

the building? You can us utoh's knowledge to solve the problem! The following picture were provided"

Picture 1: Rumoh Aceh (Aceh House)

Before the discussion about how students who hate mathematics response toward the problem above, firstly the reader needs to know what the meaning of Utoh here since, the word will much appear in the the discussion. Utoh is a person who apply traditional way in constructing a traditional house from a province in Indonesia, called Aceh Province. In simple word, Utoh's skill closely related to a carpenter. Therefore, Utoh's knowledge is refers to traditional skills in constructing a Rumoh (house) Aceh.

As the picture above shows the traditional house of Aceh, the construction in modern way is so simple to build a *Rumoh Aceh*, but the implementation is totally different. There are some special techniques in the construction of *Rumoh Aceh*. This technique which called as simple technology is the response of Acehnese toward nature. As well known that Aceh province is one of provinces in Indonesia which faced many kinds of disaster, recently flooding surrounding north aceh and some other districs. To build the *Rumoh Aceh* such as the pictures above some how it shows the construction mean to protect people from flood even earthquake. However, beside all the protection purposes of the building, *Rumoh Aceh* show some of relief which ignite the influence of culture in design of *Rumoh Aceh*. It can be seen from the wall of the house, windows and also doors shows some relief of which look like triangles, rectangular, circular etc.

Moreover, the construction of the roof also have special treatment in covering the *Rumoh Aceh*. The special treatment in covering the *Rumoh Aceh*, Acehnese usually know the rules, for example the setting system for the roof is depend on the thickness of the roof. The thickers the roof the better the roof in anticipating the rain when the rainy season come.

As the tropical country, the humidity of weather influences the character how the infrastructure built. One of the special techniques in building *Rumoh Aceh* is the technique in setting the roof's cover. Probably, if the engineer use computer in covering the roof of *Rumoh Aceh*, computer will automatically calculate the total roof cover by the division between the total area of *Rumoh Aceh*'s roof and the area of each roofing to cover the roof. In Aceh, to cover the roof of *Rumoh Aceh* named as weaved *rumbia* leaves which has special dimension. We need to double the total *rumbia* leaves as the result of devision between the area of the roof and the area of a single weaved *rumbia* leaves. For example, if the area of the *Rumoh Aceh*'s roof is 600 m2 and the area of a single weaved *rumbia* leaves is 6 m2, then the total weaved *rumbia* leaves to cover whole area of *Rumoh Aceh* roof are (600m2/6m2)x2 = 200 pieces of weaved *rumbia* leaves.

Of course, the estimation above based the condition that the information about the length and the width of each component of *Rumoh Aceh* and weaved *rumbia* leaves are given. The condition will different if the unit of measurement such as international standards is not used. How a *Rumoh Aceh*'s builder calculated the total *rumbia* leaves to cover whole the roof *Rumoh Aceh*? For students who learnt much about mathematics without a proper context, it will be challenging for them to know the total weaved *rumbia* leaves to cover *Rumoh Aceh*. The picture below shows the shape of weaved *rumbia* leaves and this kind of weaved *rumbia* leaves are used as the context how students solve a problem connected with this context.

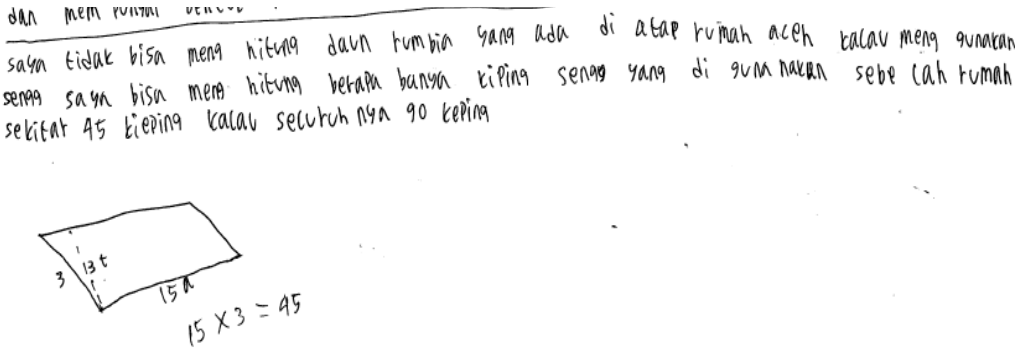
Give weaved *rumbia* leaves pictures as below. The weaved *rumbia* leaves in the area are common for those who live in Aceh, one of the provinces in Indonesia and probably it was also common for Indonesian since the *rumbia* tree can be found in each province in Indonesia. The shape of weaved *rumbia* leaves is rectangular, but the size depends on the request of people who like to cover the roof with the weaved *rumbia* leaves. Usually, the width of the weaved *rumbia* leaves are the same around 50cm, but the length is different depend on the request as explained before. However, the common size of weaved *rumbia* requested by the customers are 1.8 m length and 60 cm width. Therefore, the probability.

Picture 2: Weaved *Rumbia* Leaves

Based on the explanation above when the problem about how to cover the whole roof of *Rumoh Aceh* was brought into the classroom at secondary school level, their response toward the problem were amazing. Their responses somehow can lead to another critical finding on how informal mathematics can be integrated into mathematics learning process in the actual classroom at secondary level. Moreover, more than 50% of the student in the class did not like mathematics, they claimed that they hate mathematics because of the formula that need to be memorised and too much of counting for nothing. However, when student who hate mathematics faced the given problem in the classroom, their responses were different. The difference here means as the response that student gave show how good they are in solving a mathematical problem.

In this research, the mathematical problem is not just a mathematics questions, rather a daily life problem that connect with mathematics, thus in solving a mathematical problem, mathematics could provide several alternative in solving the problem. Putra (2018) & (2022) said that mathematics is a universal term for both informal and formal mathematics, where the use of mathematics itself to provide the insight and ideas in tackling or solving daily life problem. Mathematics inside of every solution the least use of mathematics is the reasoning ability to respond the problem is also mathematical things. Therefore, even a student who hate mathematics the probability for them to have a very good ability in mathematics is a inevitability. Mathematics as human activities by Frudenthal. Therefore, the result of this research will be beneficial for the insight and future mathematics research related to culture or informal kind of mathematics as mathematics that embedded in human life.

The following discussion is related to how students' who hate mathematics solve a mathematical problem with culture artefact as the context. There are three respondents called R1, R2 dan R3. All of them considering mathematics as they enemies, but they have good communication with friends and teachers. The first respondent is R1. The picture below is R1's response toward the given problem.



Picture 3: First Respondent's Answer

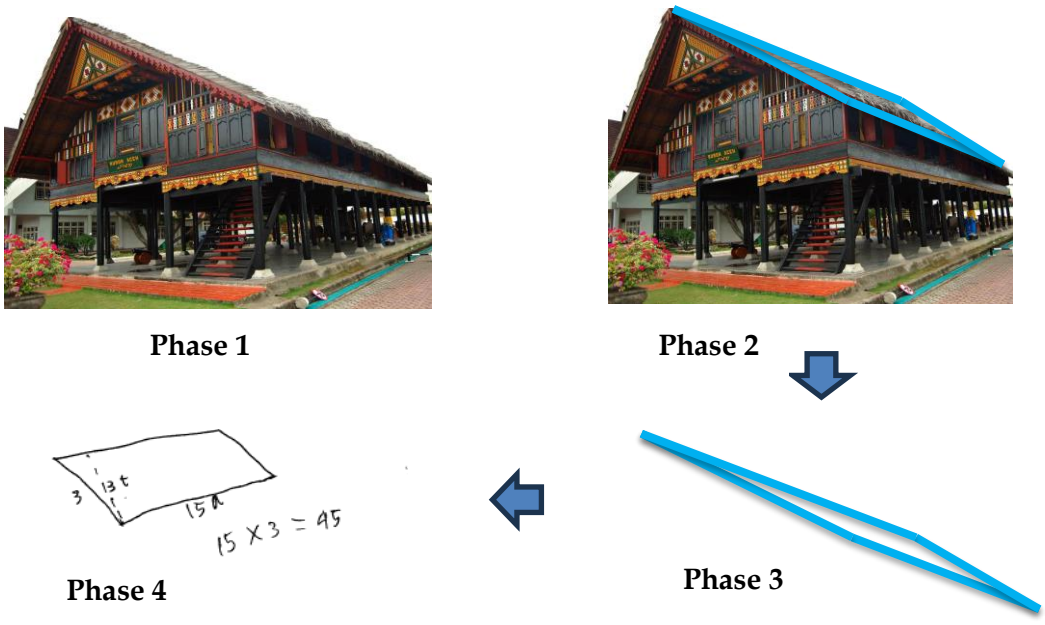
I cannot count how many rumbia leaves exist in the roof of Rumoh Aceh, but if I use roof tile, I can count how many roofs tile that I need to cover Rumoh Aceh's roof. For a half of the roof, it needs around 45 roof tiles, overall, we need 90 roof tiles.

The answer above was the beginning of a student who hate mathematics respond toward the given problem. As shown in the translation above about R1's response, the first chosen respondent stated that ***R1*** cannot count how many *rumbia* leaves that needed to cover the roof of *Rumoh Aceh.* He said "*I cannot count how many rumbia leaves exist in the roof of Rumoh Aceh*" R1 stated that R1 does not like mathematics by considering mathematics as his enemy in the learning process. Suprisingly, the respondent who hate mathematics as shown in the picture above could solved the problem, even R1 can made model in solving the problem. The model was made by making a condition where *weaved rumbia leaves* could be replace by a tile. In fact, it is what mathematicians did when they are solving the mathematical problems. It is something that he did not realise that he can solve the mathematical problem

In mathematics, every single step that probably not match with formal mathematics or the formula could be categorised as alternative solution in mathematics. Why it called as the alternative solution because the falseness cause does not match with formula now, could be the righteness in the future, at least in the suitable context. For example, find the solution from 1+1 ! the majority of the answer would be 2. What if a student answer 1+1 = 3. The 3 (three) is the alternative of the answer 1+1.

Regarding 3 (three) as the alternative, what if the student finds the context of 1+1? For example, in the clothes store written **"buy 1+1 get 1 free clothe with the lowest price"**. It means we buy two items we get three (3) items. This situation means, the alternative solution from "1+1" could be correct answer in other condition or context in mathematics. Thus, to connect with the discussion about the first respondent in solving mathematical problem, as explained previously about the size of *rumoh aceh* and size of *weaved rumbia leaves*, of course the total weaved rumbia leaves to cover the roof rumoh aceh is not 90 or even roof tiles since the size of roof tile is smaller than weaved rumbia leaves. However, 90 was the alternative solution for the given mathematical problem. For them the who think the context that student imagine while solving the problem, they will understand that the length of rumoh aceh roof is 20 m dan the width 10 m. with the size of weaved rumbia leaves 2mx1m, the total rumbia leaves needed with the condition the technic in covering the roof is exceptional, then the total weaved rumbia leaves are **((20mx10m)/(2mx1m)) x2 = 200** weaved rumbia leaves.

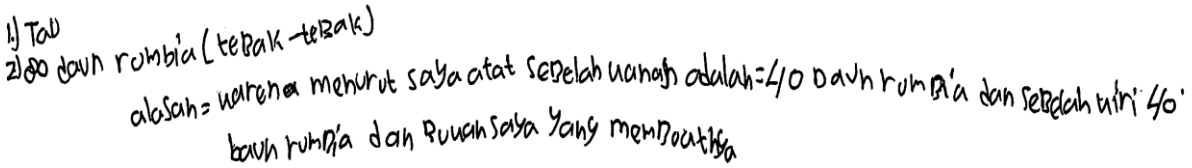
However, the respondent has different alternative answer. Based on the picture that he draws in the answer sheet, he does not see the roof of rumoh aceh as the rectangular shape, rather it is trapezoid shape. However, geometry perspective as one of non-euclidian geometry help him to understand how to draw *the roof of rumoh aceh,* so that the answer of the student can be accepted as the alternative solution. In the perspective solution, the student tries to create two-dimension model of roof *rumoh aceh* based on the given picture above. The two-dimensional process of the first respondent as follow:



Picture 4: Process on creating two-dimensional model of *Rumoh Aceh's* roof.

Based on the picture 4, the process on creating two-dimensional shape of the roof is clearly linked to trapezoid form from the roof. Therefore, the two-dimensional that R1 draw close to trapezoid shape. Based on the process above, it revealed that the notation of 15x3 means as the multiplication between length of the roof 15 (without unit of measurement) and the width of the roof 3 which equal 45 as the total weaved rumbia leaves for covering the roof of *rumoh aceh*. However, the R1 did not multiplied 45 by 2 as the roof has two sides. Beside the counting ability of R1, mathematical representation (Dwirahayu, Sandri & Kusniati, 2020) of R1 was sensational. R1 could make a representation of the roof into mathematical expression which the trapezoid. Although the researcher did not dig in deep about this ability, but R1 has already shown a good mathematical thinking in solving mathematical problem which close to R1's culture.

The second (R2), respondent has another alternative solution for the given mathematical problem. The respondent also considers mathematics as the enemy. When the respondent faced the given mathematical problem, R2's response as follow:



Picture 5: R2's Response

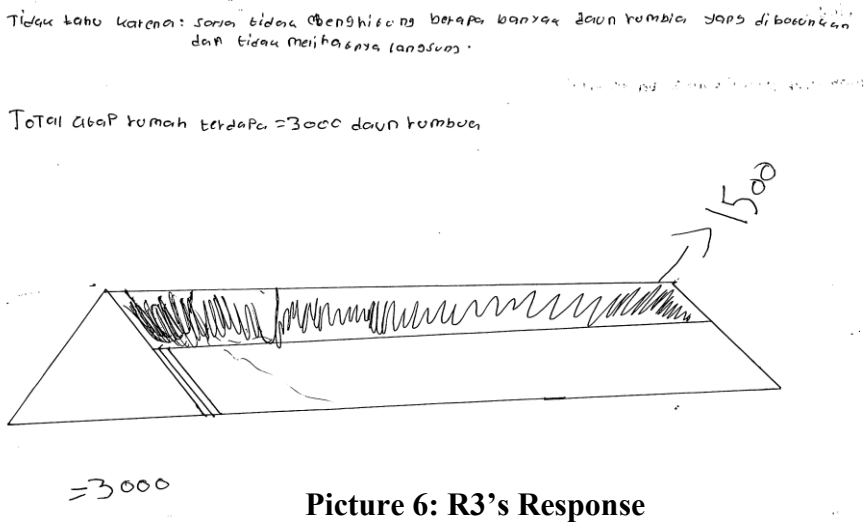
the translation in the box below

1) *I know.*
2) *80 rumbia leaves (guess). Reason= because I think right side roof need 40 rumbia leaves and the left side need 40 rumbia leaves, but It will be happen if I am the one who made the house (rumoh Aceh)*

The result above shows that R2 was very confident in responding the problem, although the total *weaved rumbia* leaves is not precisely calculate based on the reality of how *utoh* (lokal Profesional worker in covering the roof of *Rumoh Aceh)* sets up and covering the the roof. The R2 knew the answer, the total *rumbia leaves* to cover the roof is 80 roofs. R2 realised that the roof has two side which implies the importance of multiplying the 40 by 2 so that the total weaved rumbia leaves to cover the roof are 80. The R2 did not performed the model how the calculation process look like since it is just the guessing answer, but R2 is very confident with the answer unless R2 is the one who made the house where the roof should be covered.

Even though, it is just guessing but this student has a reason why it is a guessing which means it is not guessing rather estimating. In the perspective of respondent's answer, guessing same as estimation. In fact, the estimation is one of important skills for a student in learning mathematics. Besides, estimation (Andrews, Xenofontos & Sayers, 2022) itself divides into 4 (fours) forms of estimation, which are computational estimation, measurement estimation, number line estimation, and Quantity estimation. In brief, computational estimation is one of kinds that R2 use to solve the given mathematical problem since R2 give reasonable estimation before doing calculation (Dowker, 1992).

The final respondent was R3. R3 also student who hate mathematics because of too many formulas to be memorised that it is boring activities. The following picture identify how R3's response in solving mathematical problem.



Picture 6: R3's Response

"*I don't know because I don't calculate how many rumbia leaves were needed and I didn't see the rumbia leaves directly*"

The total rumbia leaves to cover the roof = 3000 leaves.

Based on the information from R3 and the picture above shows that estimation is the way how student who hate mathematics solve the mathematical problem. R3 did not know how to calculate the total rumbia leaves to cover the roof since R3 cannot see the rof directly such as the way how the builder set up the rumbia leaves for covering. However, R3 realised that there are two side that already covered, thus by doing estimation for one side of the roof there are 1500 rumbia leaves, then it needs to be multiplied by 2. Hence the total rumbia leaves for covering the *Rumoh Aceh* **1500x2 = 3000** rumbia leaves. Based on the information how students R3 solved the problem, the estimation answer by R3 is the biggest total of rumbia leaves for covering the roof compared with the other two student who hate mathematics in solving mathematical problems. To sum up, although

the solution of R3 is not precisely approaching the total rumbia leaves for covering *Rumoh Aceh,* but the R3's answer was the closest one. Moreover, R3's to represent the roof of *Rumoh Aceh* like the picture above also shown that R3 also has a good mathematical ability, especially in counting ability.

CONCLUSION

To conclude the whole information from three respondents of this research, student who hates mathematics, they hate mathematics is not simply because mathematics is difficult for them, rather their awareness toward mathematics itself. Roughly speaking, what they consider as not mathematics is mathematics. From several respondent who involve in this research, all of them have their own way in solving mathematical problem. In other way, all student who hate mathematics can solve mathematical problem, even all the answer is not match with the real needs of an *utoh. Utoh* is a professional worker who expert in counting the total weaved *rumbia* leaves to cover whole roof of *Rumoh Aceh.*

Students who consider mathematics as their enemy which means they hate mathematics cannot be said that they cannot solve mathematical problem at all, but they have the strategy to solve it, but still there are some problems in the process of solving. All of students' answers called as alternative solution for solving mathematical problems. Based on the description and discussion above, student who hate mathematics also could solve mathematical problem, although their responses cannot be said as the correct answer, rather alternative solution for the problem by considering the problem in different context depend on student experience toward the faced problem. Moreover, students who hate mathematics has a good ability in making the representation of mathematical expression and this is a good information for teachers and researchers who conduct learning and research in mathematics at school. As known that mathematical expression related to making natation in mathematics. Therefore, in line with Hottinger (2016) to invent the mathematician in the future, the consideration of a student's successfully understand mathematics with their own culture is the essential requirement for the development of mathematics. So, mathematics it is not only for those who like it, but for them who hate it as well.

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