

Improving the Ability to Learn Math by Using *Rubu' al-Mujayyab* Media

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Abstract—This study (research) aims to determine whether there is an increase in the ability to learn mathematics by using *Rubu' al-Mujayyab* media on 9th grade students 48 Muhammadiyah Junior High School of Medan Year of learning 2015/2016. The study uses qualitative approach and the type of research used is classroom action research and has several stages which are the cycle. So that the problem is not too broad, the author limits his research in the subject of mathematics, “similarity” material by using *Rubu' al-Mujayyab* media. The result of this study show by using *Rubu' al-Mujayyab* media students mathematics learning ability increases, this can be demonstrated by the increase in learning mastery in the classical reaches 54% in 1st cycle increased to 70% in 2nd cycle the in 3rd cycle increased to 87%. Because of the level of mastery is 75% has been metclassically, it can be concluded that using *Rubu' Al-Mujayyab* media can improve students mathematics learning ability in 9th grade students 48 Muhammadiyah junior high school of Medan Year of learning 2015/2016.

Keywords—*mathematics learning ability, rubu' al-mujayyab*

I. INTRODUCTION

The effective learning is learning that can generate learning that is useful and focused in the learner through the use of appropriate procedures. Someone is said to have experienced the process of learning if in himself has been a change, from not knowing to know, from not understand to understand and so forth. In the learning process, the result of learning can be seen directly. Therefore in order to be controlled and developed optimally through learning in the classroom, then the learning program must be designed by the teacher by observing the principles that have been proven the superiority empirically.

The learning of mathematics should involve students in the filing of problems in daily of life that related to mathematics material so that the learners understand what relationship is learned with reality in their life that related to mathematics.

Considering the importance of mathematics in daily of life as well as in various sciences, that in order to advance the intelligence of his nation, the defence power of his country, the advancement of technology and its economy, it is necessary that humans who master mathematics.[1] The mathematics is an efficient tool and required by all science and without the help of mathematics, all science will not be a means of meaningful progress, the quality learning provided by the teacher is important to note, the selection of models and the media of mathematics learning that will make mathematics appropriateness by students and students will understand the math lesson.

The task as a school teacher is how to choose the right way of learning, it is the media in accordance with the subject matter, mathematics subjects are expected to become subjects favoured by learners as well as the ability of solving problems of mathematics by learners can increase which ultimately affect the results of learning at the school.[2]

A. *Rubu' al-Mujayyab* Media

Rubu' al-Mujayyab is a tool whose shape is a quarter of a circle useful for calculating and measuring the height of an object.[3] Until now, *Rubu' al-Mujayyab* is still used by some (Muslims) people in Indonesia to calculate and determine the direction of qibla, longitude ekliptika and declination of the *Rubu' al-Mujayyab* sun is part of the astronomy program taught in traditional of Islamic boarding school. Even today, *Rubu' al-Mujayyab* is produced for educational purposes.[4]



Fig. 1. *Rubu' al-Mujayyab* year 1038 M made of wood, leather and ink. 12,3 cm in size, currently in the Fez Tradition and Art Museum, Maroko.

Historical records show that the early period of *Rubu' al-Mujayyab* creation has been begun since the 3/9th century, precisely in the city of Baghdad that survived a thousand years more. Thus again in Syria, this tool existed and continued to be used until the 8/14th century. Al-Khawarizmi, the inventor of algebra, is thought to be the first person to use the tool. As noted earlier, the initial use of this tool was initially limited to timing based on the position of the sun. But entering the 4/10th century its use began to expand and increase in the solving of astronomical problems. Through this tool has been found the formulations of the ball triangle, with this tool also appeared popular terms in the world of modern mathematics such as sine, cosine, tangent, cotangent. The function of this tool is also seen in the solution of geometric problems numerically.[5]

The main parts of *Rubu' al-Mujayyab* are as follows:

- *Markaz* : the central point of the *rubu'* where there is a small hole attached to it a thread.
- *Qaus Irtifa'* : the main arc that surrounds the *rubu'* that is given a scale of 0 to 0 degrees (from right to left).
- *Jaib Tama'm* : the right side where connect the *markaz* to the beginning of *qaus*. *Jaib Tama'm* is given a scale from 0 to 60 degrees. Each point of the scale unit is drawn a straight line up to the *qaus*. The lines are called *jujub al-mankusah*.
- *Sitti'ni* : the left side where connect the *markaz* to the ending of *qaus*. This part is given a scale from 0 to 60 degrees, each point of the scale unit is drawn a straight line up to the *qaus*. The lines are called *jujub al-mabsuthah*.
- *Hadafah*: the reconnaissance hole that is found on the *rubu'* and its position is parallel to *sitti'ni*.
- *Khaith*: fine yarn mounted on *markaz*.
- *Sya'qu'l*: pendulum mounted as ballast *khaith*.
- *Mury* : short thread tied to *khaith* and can be shifted up and down.
- *Tajyi'b* : bow semi-circular with radius $\frac{1}{2}$ times the main arc radius. If the center of *tajyi'b* lies in the *jaib tama'm* on 30 *jaib*, it is called as *tajyi'b ula*, and if the center of

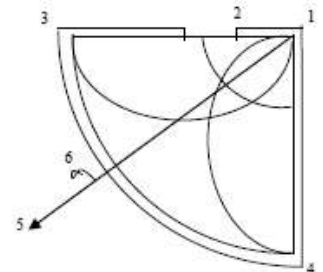
tajyi'b lies in *sitti'ni* on 30 *jaib*, it is called as *tajyi'b tsani*.

- *Qaus'ashr*: the curved line that is drawn from the beginning of *qaus* to the *sitti'ni* on the 42,3 *jaib*.
- *Da'irah mail a'zha'm* : $\frac{1}{4}$ circular arc representing the maximum sun declination of $23^{\circ} 27'$ ($23^{\circ} 45'$). [3]

Explanation:

Keterangan:

- 1 = Markaz
- 2 = Hadafah
- 1-3 = Sittini
- 1-4 = Jaib Tamam
- 1-5 = Khoit
- 5 = Syakul
- 6 = Muri
- 4-3 = Qous Irtifa'



Though simple, it keeps a great treasury of scholarship. This instrument counts as the first astronomical instrument to emerge in human civilization along with astrolabe instrument. Before the list of logarithms, astronomical calculations are generally done with this tool.

In its use *Rubu' al-Mujayyab* can be installed vertically or horizontally depending on the necessary. Functionally, *Rubu' al-Mujayyab* has three main functions as a :

1. Calculating tool
2. Measuring instrument
3. Astronomical table.

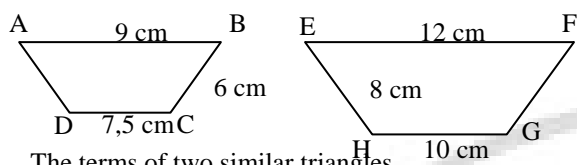
The main function *Rubu' al-Mujayyab* is as an angle count tool or known as orthogonal grid which can be processed by using a certainly that suits the necessary of user.[6]

B. Application of *Rubu' al-Mujayyab* media to mathematics learning

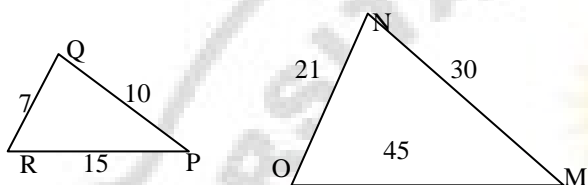
The media of *Rubu' al-Mujayyab* is a classical tool that will help students in understanding similarity concept and expected to improve the ability to learn.

The similarity is the one of the most important mathematics concepts to learn. In the daily of life, there are many applications about the concepts of similarity, include the making of floor plans or replicas of buildings, making batik patterns, calculating the height of unreachable buildings and so on. But in the reality, some people especially the students, don't understand the concept of similarity, so they have difficulty to solve problems that related to the concept of similarity.[7]

The terms of two similar wake flats Similar, "two wake flats are said to be similar if the corresponding angles are equal and the corresponding sides are proportional."



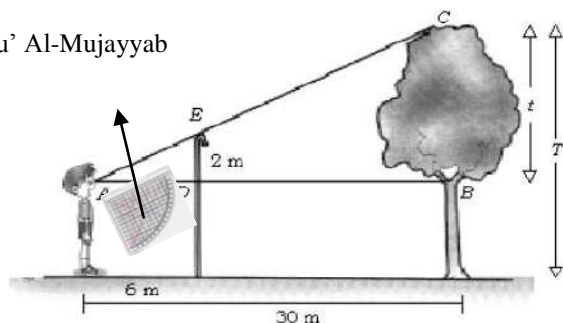
The terms of two similar triangles
Similar triangle, if the two triangles of corresponding angles are equal, so the two triangles are similar.



Therefore the application of similarity material by using the media of *Rubu' al-Mujayyab* is done with the following stages:

1. The teacher starts the explanation of the similarity material to students by explaining the benefits of learning the material.
2. The teacher explains the similarity material and its operations.
3. The teacher introduces the media of *Rubu' al-Mujayyab* to students.
4. The teacher explains the concept of similarity that often found in the natural surroundings with the settlement using the media of *Rubu' al-Mujayyab*.
5. Students are asked to make a replica of *Rubu' al-Mujayyab* with simple materials.
6. Teacher with students practicing *Rubu' al-Mujayyab* is related to the completion of the concept of similarity.
7. Teacher provides tasks that related to the concept of similarity often found in the nature around individually.

Rubu' Al-Mujayyab



II. METHODOLOGY

The type of research is Classroom Action Research. The approach used is a qualitative approach that aims to describe the process and the result of *Rubu' al-Mujayyab* media in an effort to improve the ability to learn mathematics on similarity material. The location of this study was carried out

at 48 Muhammadiyah Junior High School of Medan. This location is located on the street of TanggukBongkar, Mandala by pass Medan. This time of this study was carried out on December until March 2016 in the 9th grade of 48 Muhammadiyah Junior High School of Medan. As for who will be the subject of this study are the students of 9th grade of 48 Muhammadiyah Junior High School of Medan who numbered 32 students, consisting of 17 female students and 15 male students. The object of this study is the using od *Rubu' al-Mujayyab* media on similarity material on the students of 9th grade Of 48 Muhammadiyah Junior High School of Medan Years of Learning 2015/2016.

According to this type of research is classroom action research, so this research has several stages which are a cycle. Each cycle is implemented in accordance with the changes to be achieved. In this study, if the 1st cycle is not successful is the teaching process does not run well, so implemented 2nd cycle and so on. The cycle will cease if the logical reasoning of a student math has been completed classically.

III. THE RESULT AND THE DISCUSSION

Before the implementation of the action done, firstly held the initial test to the students who numbered 32 students, consisting of 17 female students and 15 male students as many as 5 questions to determine the ability of students before the lesson learned by using *Rubu' al-Mujayyab* media. After the initial test result obtained the level of mastery learning with the results of the average score of 41% of students from 24, 7 students achieve mastery learning. To improve the students mathematics learning ability, it is designed in a cycle, initially this research is planned to be done is several cycles until the research goal is achieved, it turns out that in 3 cycles of students score has reached the established classical completeness of 75%.

TABEL I. VALUE PERCENTAGE INITIAL TEST, CYCLE I, CYCLE II, AND CYCLE III

No	Test Results	Average Value	Mastery by classical	Information
1.	Initial Test	61.66	41%	Incomplete
2.	Cycle I	68.2	54%	Incomplete
3.	Cycle II	74.16	70%	Incomplete
4.	Cycle III	80.62	87%	Complete

Source : Author

IV. CONCLUSION

It can be seen by using *Rubu' al-Mujayyab* media, the students mathematics learning ability increases, this is indicated by the increases of learning mastery results in the classical reach 54% in 1st cycle increased to 70% in 2nd cycle then in 3rd cycle increased to 87%. Because the level of mastery by classical that is 75% has been completed, thus it can be concluded that by using *Rubu' al-Mujayyab* media can improve students mathematics learning ability of 9th grade of

48 Muhammadiyah Junior High School of Medan Years of Learning 2015/2016.

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