

# Introduction of Islamic-based Mathematics Learning Model

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**Abstract---** Various ways, steps, and strategies to improve the quality of Islamic-based mathematics learning, continue to be developed and fully integrated, including innovative and integrated learning models to achieve more successful learning in the future. This study was conducted in Laboratorium School, Faculty of Education, University of Muhammadiyah Jakarta, using classroom action research. It aims to introduce the process and improve the quality of Islamic-based mathematics teaching and learning, specifically through the introduction of Islamic-based mathematical learning with a realistic approach. The results of this study showed that students learned more about mathematics from the Islamic perspective, had a better understanding of the topic, and participated more actively in the learning activities. Test results obtained from pre-cycle, cycle 1 and cycle 2 was 2.02%, and the testing through cycle 3 yielded 1.01%. As for students' responses regarding Islamic-based mathematical learning, the students mentioned that, in general, they understand and know more about religious-based mathematics after getting involved in several cycles. It was found that they were getting used to the concept, being able to understand and knowing more about Islamic-based mathematics.

**Keywords---** Introducing Mathematics Learning Model, Islamic-based.

## I. Introduction

Introducing Islamic-based mathematics learning models should be done through a process with continuous improvement in accordance with the current subjects taught in the classroom and by referring to Qur'an and Sunnah (Nursupiamin, 2014). The learning process also aims to show that the "Qur'an and Sunnah of the Prophet" contain mathematical data that comes from Allah and His Messenger '. In other words, mathematics in the Islamic perspective can be seen in numerical data from the Qur'an. For example, Muslims perform 2 *rakaat* of Subuh prayer, 4 *rakaat* of Dzuhur prayer, 4 *rakaat* of Asr prayer, 3 *rakaat* of Maghrib prayer, and 4 *rakaat* of Isya' prayer. The numbers of *rakaat* here are displayed in both odd and even numbers, which can be the basis of mathematical learning (Muniri, 2016).

The words of Allah SWT in surah al-Fajar in the Quran' read:

وَالْفَجْرِ {1} وَلَيَالٍ عَشْرٍ {2} وَالشَّفْعِ وَالْوَتْرِ {3}

"By the dawn (89:1), and by ten nights, (89:2), and by the even number and the odd (89:3)."

In verse above, the word *shaf'i* can be interpreted based on related words that go together with it. Meanwhile, the detailed meaning of the word *watr* can be seen in the *tafsir Jalalail*. According to "Ibn Kathir, *tafsir al-Qurtubi*," the word *syafi* and *watr* can be interpreted as the 9<sup>th</sup> day of *Arafah* and the 10<sup>th</sup> day of *Nahr*, which reveals both odd and even numbers. If we try to contemplate and think rationally, we may be aware that Allah creates all of His creatures on this earth in pairs. This is in line with Surah Adz Dzuriyat verse 49, which reads:

فَقَرُّوا إِلَى اللَّهِ إِنِّي لَكُمْ مِّنْهُ نَذِيرٌ مُّبِينٌ

"And of all things We created two mates, perhaps you will remember"

Islamic-based mathematics has been learned and understood as the truth of the Qur'an. However, Western scientists further prove through scientific research the benefits of prayer and fasting for physical health. The development of mathematics in the Islamic perspective supports the data in the Qur'an. For example, the theory of "binary system," which means there are 2 types of numbers, namely odd and even numbers, explains what has been mentioned in the Qur'an. Indeed, Qur'an contains mathematics. Among others are calculations in inheritance law,

the decision of prayer times, and measurement of the degree of slope to determine kibat for prayer. All of which include mathematical calculation.

It is essential to include Islamic-based mathematics in classroom learning. Along with the progressive development of learning models, a teacher must be able to present innovative teaching materials so that students can be more active in classroom learning. A teacher must also be able to communicate well and effectively. This way, students will be more confident and have a better understanding of the materials presented by the teacher, especially related to the introduction of Islamic-based mathematical learning.

By integrating Islamic-based mathematics, students can have a more comprehensive understanding of the materials, develop their critical thinking and creativity, and turn various ideas into practical works. Learning will be meaningless if students are passive or not doing activities. The concept of realistic learning should be implemented in mathematics class through effective learning.

Unfortunately, some teachers deliver the materials without using teaching aids or appropriate methods and approaches that can motivate students to actively participate in the learning process. It is crucial for teachers to prepare teaching media that suits the school's condition. In introducing Islamic-based mathematics, the teacher must focus on the Islamic-based concepts and master the content of the materials, so the students have a comprehensive understanding of the Islamic-based mathematical formulas.

## II. Research Method

The research method used in this study is classroom action research developed by Kemmis & Taggart involving several stages: planning, implementation, observation, and reflection. These components can be seen as a cycle process in this research, namely how to better introduce Islamic-based mathematical learning models, especially for students at the Laboratorium School, FIP-UMJ. Data were presented in tables or graphs, and at the final stage, conclusions were drawn from the research findings. Also, descriptive data were presented in detail to answer the research problems and come to a conclusion relevant to the purpose of the study.

## III. Literature Review

### *Introducing Mathematics Learning*

Through the process of introducing Islamic-based mathematics learning, students are expected to have special skills and become someone who excels in maths, has good reasoning power, morality, and integrity. It is also expected that the students will be useful for the family, nation, community, state, and other people. With the introduction of Islamic-based mathematical learning models, students will understand and recognize language, symbols, and ideas more accurately. They will also understand the deductive theory based on the defined elements, axioms, traits, and theories, which can be verified based on mathematical theories that continue to be developed and taught in schools.

In general, the concept of learning in Islamic education is an educational process with the integration between *hablum minallah* highlighting the relationship between humans and the Creator (Allah SWT) and *hablum minannas*, which underlines the relationship among humans and with their surrounding (including other creatures and animals). The introduction of mathematics learning should be designed to cater to students' needs so that students can understand the materials, and develop their potential naturally and optimally. Islamic education appreciates people who have knowledge that is useful for other people. Indeed, Allah knows what we are doing, as stated in *Surah Mujadalah* verse 11 below:

يَا أَيُّهَا الَّذِينَ ءَامَنُوا إِذَا قِيلَ لَكُمْ تَفَسَّحُوا فِي الْمَجَالِسِ فَافْسَحُوا يَفْسَحِ اللَّهُ لَكُمْ وَإِذَا قِيلَ انشُرُوا فَانشُرُوا فَإِنَّ اللَّهَ يَرْفَعُ الَّذِينَ ءَامَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

*“O you who have believed, when you are told, "Space yourselves" in assemblies, then make space; Allah will make space for you. And when you are told, "Arise," then arise; Allah will raise those who have believed among you and those who were given knowledge, by degrees. And Allah is Acquainted with what you do (58:11)”.*

Islamic education institutions should be able to offer curriculum designs that combine science and charity, fikr, zikr, and heart, to prepare students with strong character who have the ability to see the reality of life. The introduction of mathematics uses Qur' an as the primary source, which can provide guidance to those who believe.

Therefore, they will be given guidance through the right paths in the blessing of Allah SWT. Qur'an is a source of science and knowledge, which has been confirmed by many studies that continue to be carried out over time.

### ***Mathematics Role and Purpose***

In the introduction of the Islamic-based mathematics learning process, one of the indicators is that students have the ability to understand and share information, create thought patterns, and sound reasoning of mathematics concepts. Besides, students are expected to master the mathematics concepts and learn well, then implement them in everyday life. It is also expected that students have a sense of curiosity and feel motivated and enjoyable when learning mathematics. The introduction of Islamic-based mathematical learning help students to be more confident in solving problems. All of these will be achieved if teachers can deliver materials well, master mathematical concepts, solve problems, and communicate well with students, so the mathematics learning can easily be applied in everyday life.

### ***Mathematics Learning Process***

Mathematics learning can be classified into *a. Mechanistic*, using the traditional approach, generally based on drilling practice or "human treated like a machine"; neither horizontal nor vertical mathematical approach is applicable; *b. Empiristic*, learning approach that sees the world as very realistic, students can be confronted with real-world problems, horizontal mathematical activities are used, but this approach is rarely used in mathematical learning; *c. Structuralistic*, this approach is based on modern mathematics, which adopts set theory and is vertically categorized; there are no common needs; *d. Realistic*, it uses a modern mathematics approach, includes horizontal equations, students organize problems and solve the vertical equation, and explore and form a concept (Treffers, 1987).

### ***Learning Process***

The learning process is an adaptation process between students and teachers. It is also an effort during the teaching and learning process in class. The learning process mentioned in the Qur'an also contains many mathematical aspects in religious acts, such as prayer times. There is also a transformation of *shalat* (prayer) or regular movements, for example, the *raka'at* in *shalat* is either odd or even with specific numbers of *ruku'*, *sujud*, or other movements, which reflects mathematical numbers or calculations. If we look deeper into the rotation of the earth and the sun, they do not collide as they rotate in their respective axes. Similarly, a teacher is required to choose appropriate learning models for optimal learning.

Through the introduction of Islamic-based mathematics learning, it is expected that in-depth comprehension of *al-qauliyah* verses is achieved, as it includes Qur'anic-based approach. It will teach the students that mathematics is not merely a Western product. There were some prominent Muslim mathematicians, including Abu Abdullah Muhammad Ibn. Musa al-Haytam, or referred to as Ibn Haytam. Abu Rayhan Muhammad Ibn. Ibrahim al-Khayyami or Umra Khayyam, and Muhammad Ibn. Al-Hasan Al-Tusi', or Al-Tusi.

In the Islamic perspective, science can strengthen the beliefs and faith of humans to think logically and be more religious. As a source of science, it has the secret of life, which can be explained through mathematics concepts using scientific and symbolic language to understand more deeply about Islam. Only Allah SWT knows the exact truth behind every science, as it is believed to be relative. However, as a Muslim, we must believe in the truth of Islam.

Through the introduction of Islamic-based mathematical learning models, a teacher must be able and willing to apply the concepts that have been prepared so the students can absorb and understand them thoroughly. The process of learning mathematics is methodological, that is, using the student-related approach. This way, materials can reach the student's cognitive structure. In this case, teachers' ability to deliver the materials well and make it easy to understand is paramount.

### ***Evaluating the Learning Outcomes***

Assessment and evaluation are used to measure whether or not the learning goals are achieved. A comprehensive and integrated evaluation must be carried out well, regularly, continuously, and based on the plan and schedule.

Evaluation of learning outcomes can be done in various ways, including written tests, questions and answers, group interviews, individual interviews, reports, worksheets, roleplay, or simulations. The evaluation process can also measure the success and performance of teachers and is useful in future materials preparation and teacher assignments. With evaluation, teachers can be assigned based on their expertise and mastery of the field.

**Realistic Approach**

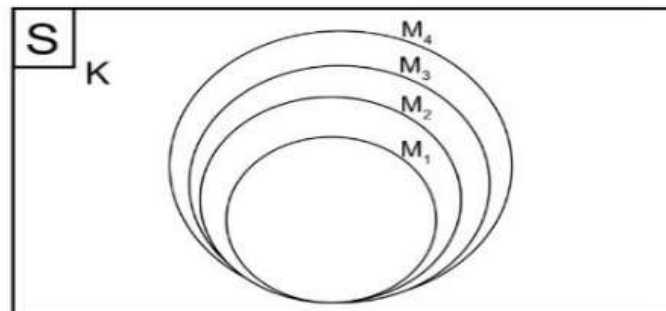
The introduction of the Islamic-based mathematical learning can adopt several theories developed by Freudenthal, who states that mathematics must be linked to reality; it is a human activity, which includes daily life and must be relevant to the lives of children and actual human activities. Treffers (1987) argued that based on mathematical theory, students are confronted with the realities of life because the objects are both abstract and concrete. The calculation of both odd and even number is a more concrete concept. A more realistic, rational, empirical, and logical mathematics approach (Bayani & Burhani) suggests that in horizontal mathematical models, students are facilitated with props as a medium to arrange, explore, and solve real problems.

Through a horizontal mathematical approach, students are given a mathematical medium that can help them organize and solve problems in real life. Whereas, vertical mathematics is a process of reorganization in a mathematical system, such as finding a direct relationship between concepts and strategies used, then applying the findings. Horizontal mathematics departs from a concrete and realistic domain to symbols and coding, while vertical mathematics includes symbols. The introduction of Islamic-based mathematical education to students in the Laboratorium School of FIP-UMJ aims to provide them with more concrete learning through traditional approaches in developing numeracy skills.

**Learning Model Design**

The introduction of mathematics from an Islamic perspective during mathematical learning in Laboratorium School is essential as the basis to study Islamic-based learning that integrates Islamic values. The process of applying realistic mathematical learning in Islamic-based educational institutions must be part of the curriculum in managing Islamic-based education. In this life, humans are classified into several *maqom* (levels), which is based on one’s level of faith. The levels include *Muttaqin*, *Mukhsin*, *Mukmin*, *Muslim*, and *Kafir*. Using the set analogy, the levels can be seen below.

**Diagram Venn**



- S = Orang Islam
- M<sub>1</sub> = Muttaqin
- M<sub>2</sub> = Mukhsin
- M<sub>3</sub> = Mukmin
- M<sub>4</sub> = Muslim
- K = Kafir

*S: Muslims, M<sub>1</sub>: Muttaqin, M<sub>2</sub>: Mukhsin, M<sub>3</sub>: Mukmin, M<sub>4</sub>: Muslim, K: Kafir- it refers to a Muslim who acts like a kafir (nonbeliever)*

Based on the Venn diagram above, it can be concluded that Muslims can be classified into several groups based on their level of faith, namely: *Muttaqin*, *Mukhsin*, *Mukmin*, *Muslim*, and *Kafir*. A Muslim is considered perfect when reaching the level of *Muttaqin*. *Muslim* is a person who performs *shahada* regularly and surrenders to the Creator. *Mukmin* is a person who is always *istiqamah* (consistent), *mukhsin* is someone who is devoted and always wants to give away his wealth, which is blessed by Allah SWT in the right way. *Muttaqin* is a person whose action is part of the embodiment and holds fast, is committed, and has good loyalty and morality. The process of introducing Islamic-based mathematical learning in Islamic-based educational institutions is generally carried out by designing learning models that present excellent characteristics with clear objectives, materials, methods, and evaluation.

**Learning Model Characteristics**

The introduction of Islamic-based mathematical learning models strengthens the identity of potential learners through the development of affective aspects and mindset, which aims to develop cognitive learning in order to perform good deeds from the psychomotor dimension. Learning abstract mathematics, which requires thinking and imagining things, can be done using the Ulul Albab paradigm with a systematic, logical, empirical method. Another way is by using Baby and Burhani’s approach, which is intuitive and imaginative. Metaphysical/ Irfani’s approach includes mathematical aspects contained in the Qur’an by discussing the concepts and challenging the belief that mathematics is a Western product. This includes the concepts of sets, numbers, measurements, statistics, estimations, and other miracles written in the Qur’an. Mathematics concept was first introduced by an Islamic scientist named Abu Abdullah Muhammad Ibn Musa al-Khwarizmi. The concept was commonly known as the algorithm in Europe.

**Learning Achievement**

Learning achievement is the work or result obtained from proper learning. For example, to find out the area of a circle, the measurement is called *phi*. It is calculated by the area of a circle with radius  $22/7 = 3.14$ . If examined more deeply in the Islamic perspective, numbers 22 and 7 have a relationship with people performing Hajj and the pillars of *thawaf*. The *surah* that is of relevance to the Hajj is *surah 22*, namely al-Hajj.

In the Hajj ritual, *thawaf* is carried out by forming a circle seven times. The combination of number 22 and 7 is similar to *phi* (circle 22/7), which can be found in the Qur’an, which always commands people to think and learn about many things. Another related concept is *faraidh*, which is related to the regulation and distribution of inheritance. The inheritance received by the heirs is called 'furudhul muqarrah.'

The introduction of Islamic-based mathematical learning, the interaction between students and teachers, and the learning environment as part of the learning process and the measurement of student achievement can be influenced by various factors, such as learning methods, learning models, and effective classroom learning.

**IV. Research Findings**

The results of the classroom research, data analysis, and tests using the pre-cycle test approach, cycle 1, cycle 2, and cycle 3 can be seen in figure 1 below.

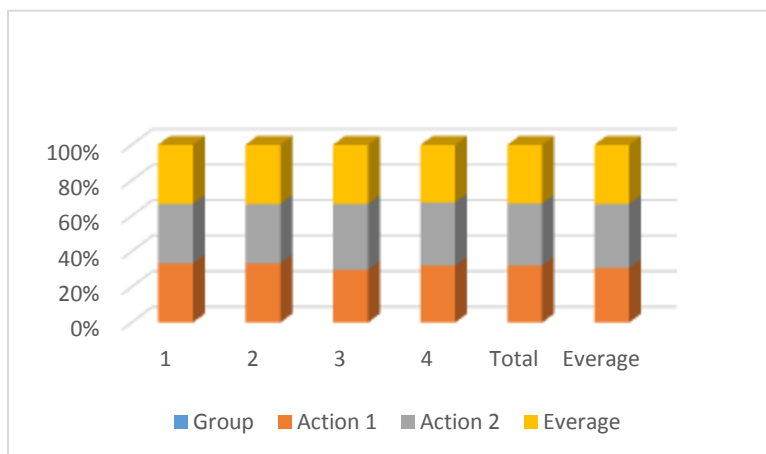


Figure 1: Scores Obtained in Cycle 1

Figure 1 shows that some students did not meet the required level of mastery. The next stage is to take action on students who had not met the mastery level of 75%. In this stage, 30% of the students discussed in groups. After being treated repeatedly and receiving guidance from collaborators in this study, the results increased to 85%. The next step is taking the second action in the teaching and learning process to achieve the mastery level. However, not all students met the minimum standard set.

In the group discussion, students were asked to discuss the materials, and the results show a 60.6% success rate. Subsequently, the researcher did a reflection in cycle 1, and the results show an increase in the teaching and learning activities and understanding of the application of Islamic-based mathematics. Efforts to improve the learning outcomes of students' mathematical recognition aims to encourage students to be more diligent and active in the

learning process. One of them is by using Venn diagrams in the learning activities. More positive results are revealed, including a good explanation from the teacher, which could be well understood by students.

**Planning**

In cycle 1, it was shown that the students learning outcomes had not met the minimum level of mastery in Islamic-based mathematics. Then the researcher continued with cycle 2, which included learning activities starting with giving motivation and appreciation to students for about 7 minutes, followed by a 40-minute group discussion. In cycle 2, students displayed higher mastery of the materials.

The subsequent learning process was based on the results obtained in cycle 1. The researchers took action regarding mastery level that had not been achieved by introducing Islamic-based mathematics learning. The results obtained from cycle 2 can be seen below.

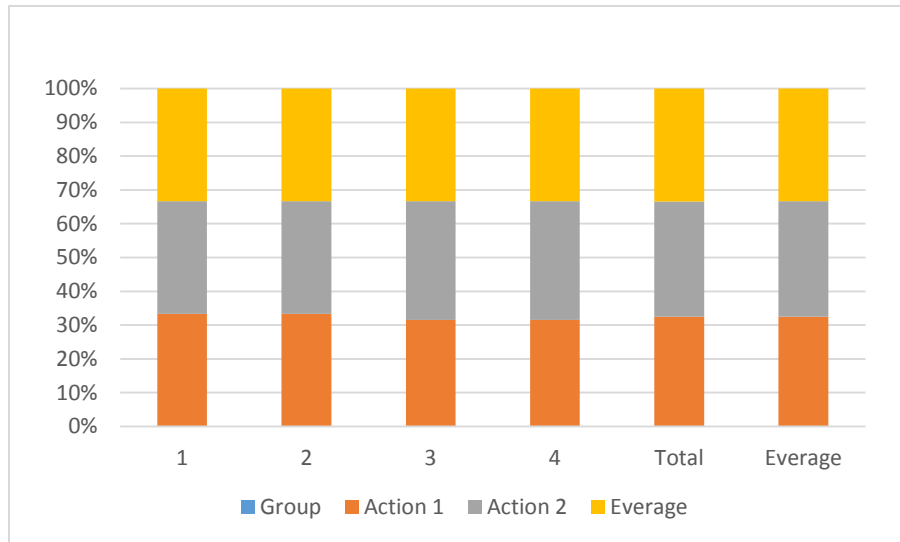


Figure 2: Scores Obtained in Cycle 2

Figure 2 shows an improvement in which students had a better understanding of the materials in action 1. The group discussion in class yielded a score increase to 95%. At the action stage carried out by the researcher, the learning outcomes of Islamic-based mathematics show a maximum score of 100. This indicated that the results of discussions conducted repeatedly in the classroom led to excellent grades of 100%.

The introduction of Islamic-based mathematics learning continued until cycle.3. The results are shown below.

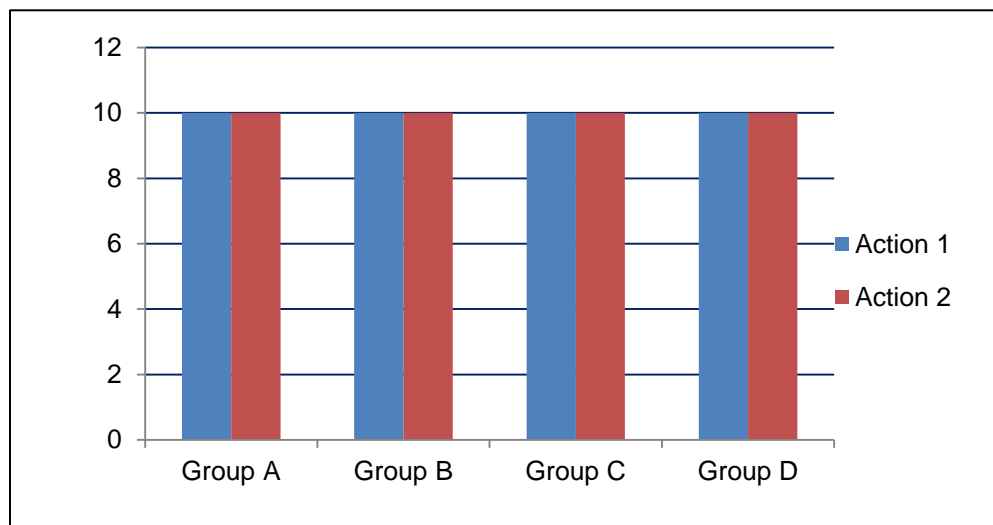


Figure 3: Scores Obtained in Cycle 3

### **Reflection of Cycle 3**

The results of data analysis in cycle 3 related to the introduction of Islamic-based mathematics learning show that almost all students were very responsive, and their abilities continuously improved, especially in group discussion. It was revealed that the introduction of Islamic-based mathematics learning was easily understood by students, so the individual abilities of each group continued to show better results.

## **V. Conclusion**

Based on the data analysis, it can be concluded that:

1. In the introduction of Islamic-based mathematics learning, it is expected that teachers motivate the students to be more confident so they have a better understanding of the concepts and theories of Islamic-based mathematics learning. This can improve student achievement, which was proven by the results of the analysis in cycle 1 and cycle 2. In these cycles, students' scores increased significantly.
2. The introduction and the application model of the Islamic-based mathematics learning to the students in the Laboratorium School of FIP-UMJ led to an increase in the learning outcomes, which was revealed in cycle 3 with excellent results.

## **VI. Suggestion**

1. As an effort to further introduce Islamic-based mathematics learning, teachers should continue to improve their ability and awareness that Islamic-based mathematics is fundamental in schools. The results of this study can be used as a reference for future researchers. However, deeper investigation of the aspects that have not been included in this study may be necessary. Continuous development in Islamic-based mathematical learning models among students, especially in the FIP-UMJ school laboratory, is of high importance.
2. New findings that have not been revealed in this study are expected so that education observers and practitioners can continue to socialize the introduction of Islamic-based mathematics learning in educational institutions. It can be done through a simple example of the set of Venn diagrams presented to students, which proved to motivate them to get to know more about mathematics. This way, students can improve their mathematical understanding and gain better achievement in mathematics.

## **References**

- [1] Abdusyagir. (2006). There is Mathematics in the Koran. *Publisher: UIN Malang Press. Indonesia.*
- [2] Basya. Fahmi. (2003). Al-Quran Mathematics. *Publisher: Quantum Prima Library. Indonesia.*
- [3] Ding. M. and Carlson, M.A. (2013), Elementary Teachers Learning to Construct High Quality Mathematics Lesson Plans, A use of the IES Recommendation, the Elementary School Journal.
- [4] Heruman. (2007). Mathematics Learning Model in Elementary Schools. Bandung. *PT. Teen Rosdakarya. Indonesia.*
- [5] Kasbolah. S. (1998). Malang Classroom Action Research. *Ministry of Education and Culture. Director General of Higher Education Training National Mathematics PGSD Project. BEM Himatika. UPI Bandung. Indonesia.*
- [6] Muftie.Arifin. (2004). Universe Mathematics Codification of Prime Numbers in the Koran. *Publisher: PT. Qibla Main Book. Bandung. Indonesia.*
- [7] Maulana.(2002). The Role of Student Activity Sheets in Learning Social Arithmetic Based on Realistic Approaches. *Proceeding Seminar Paper.*
- [8] Naution, S. (1992). Various Approaches in Teaching and Learning. *Jakarta; Earth Literacy. Indonesia.*
- [9] Panhuizen. M. (2003). The Didactic Use of Models in Realistic Mathematics Education: An Example from a Longitudinal Trajectory on Percentage Educational Studies in Mathematics.
- [10] Prabawanto, S. (2001). The Role of Context in Mathematics Learning with a Realistic Approach. *Bandung: Indonesian Education University.*
- [11] Sri Subarinah. (2006). Innovation of Elementary School Mathematics Learning in the Ministry of Education and Culture Director General of the Republic of Indonesia Directorate General of Higher Education.
- [12] Streefland, Leen. (1989). Realistic Mathematics Education in Primary school. *Freudenthal Institute. Netherland.*

- [13] Dabbour. L. M. (2012). Geometric Proportions: The underlying structure of the design process for Islamic geometric patterns. *Frontiers of Architectural Research*, 1(4), 380–391.
- [14] Muniri. M. (2016). Contribution of Mathematics in the Jurisprudence Context. *Ta'allum: Journal of Islamic Education*, 4(2), 193–214.
- [15] Nursupiamin. (2014). Mathematical Structure in the Qur'an (Study of Abdussyakir's Book). *Al-Khwarizmi*, 2(2), 69–84.
- [16] Treffers. A. (1987). Three dimensions A Model of Goal and Theory Description in Mathematics Instruction - The Wiskobas Project. In *D Reidel Publishing Company*. [https://doi.org/10.1007/978-3-319-05957-0\\_4](https://doi.org/10.1007/978-3-319-05957-0_4)
- [17] Turmudi. dkk. (2001). Development of Mathematics Learning Strategies with a Realistic Approach in Junior High Schools, Routine Fund Research Report, Universitas Pendidikan Indonesia Bandung; Unpublished
- [18] Zulkardi. (2001). Learning Environment for Realistic Mathematics Education for Prospective Teachers. Paper at the RME National Seminar at Surabaya State University; Unpublished