**Scientific Horizon: Basis for Developing Basic Mathematics Teaching Materials**

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**Abstract**

Teaching materials have an important role as the main source of learning in addition to references in one course. The Mathematics Education Study Program of FTK UIN Mataram with its core scientific development integrated with Islamic values ​​known as the concept of scientific horizon, requires every lecturer to facilitate the learning process while instilling religious values ​​in every course, including in basic mathematics courses. The research on scientific horizon: the basis for developing basic mathematics teaching materials was carried out with the aim of obtaining practical guidance in implementing the mathematics learning process by integrating Islamic values. The development was carried out using the principle of learning mathematics with (with) and through (through) Islamic values. This study uses a research and development approach that is oriented towards producing products. To obtain research data, expert/practitioner validation instruments and questionnaires were used which were distributed to 50 students. The findings were that the teaching materials developed met the validity elements by obtaining an average expert/practitioner assessment score of 4.05 in the "valid" category and from the practicality element based on student responses using the teaching materials developed in following the learning process, 90% gave a positive response. Therefore, teaching materials based on representative scientific horizons are used as learning resources in higher education units.

***Keywords:****Scientific Horizon, Teaching Materials, Basic Mathematics*

***How to Cite:***

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**INTRODUCTION**

In the current context, the ability to correlate mathematics with all dimensions of human life (social, religion, culture, characteristics, and values) is a necessity, and can be used to create a meaningful learning context (Inci et al., 2023). This idea was born from the Realistic Mathematics Education (RME) approach that was proposed by Hans Freudenthal in the 1970s as a reaction to the traditional approach, and was formed based on Freudenthal's views on mathematics education (Freudenthal, 1968). For Freudenthal, mathematics is a human activity that cannot be abstracted from real life. Mathematics is used to solve everyday problems. Even someone who has the ability to communicate and connect mathematics to real life will improve the quality of mathematics learning itself. In the teaching process with this approach, several opinions such as (Rusbult & Van Lange, 2003), and (Van den Heuvel-Panhuizen & Drijvers, 2020), states that to build relationships with everyday life activities and use materials related to the process of teaching mathematics. Cultural richness provides an opportunity to create a learning environment that encourages students to acquire and rediscover formal mathematical concepts.

Several other opinions can be used as references, for example: Bruner (Ruseffendi, 1988) stated that in mathematics every concept is related to other concepts. Ruseffendi stated that there is no concept or operation that is not related to other concepts or operations in a system. Kutz often emphasizes the importance of concepts in mathematics. He said that in every branch of mathematics, there are concepts that underlie understanding and problem solving that reflect how basic concepts help in solving complex problems and understanding the dynamics of larger systems (Kutz, et.al. 2016). With mathematical connections, mathematics lessons feel more meaningful and are a problem-solving tool. In addition, Bell (1978) emphasized the importance of connections in learning mathematics, connecting mathematical concepts with real applications, and to foster students' awareness of the need for connections in learning mathematics. This means that students must learn to see the relationship between various mathematical concepts and how they can be applied in real situations. In addition, he also emphasized that effective learning must include practical and contextual experiences to help students understand and apply mathematical concepts better. Thus, this approach not only improves students' understanding but also helps them develop critical and analytical thinking skills.

Furthermore, Johnson and Litynsky (1995) observed that most students view mathematics as a static science, meaning they see it as a collection of rules and formulas that do not change. They feel that the material learned in class is not relevant to everyday life. Therefore, students often lose interest and find it difficult to engage with the material presented. To overcome this view, Johnson and Litynsky emphasize the importance of showing how mathematics can be applied in various real-life contexts and how mathematics develops and changes along with new discoveries and innovations. To give students the impression that mathematics is a dynamic science, it is necessary to make connections between mathematics lessons and what mathematicians are currently doing or by solving real-life problems (breathe life) into mathematics lessons. For example, teachers can show how mathematical theories are used in technology, science, and even the arts to help students understand that mathematics is a dynamic and evolving discipline. In this way, students can better appreciate the relevance and usefulness of mathematics, and become more motivated to study it. This approach can also help students develop critical and analytical thinking skills that are very valuable in their lives.

The relationship between social activities in education is described by Murpy & Hall (2008:51) who explain that "values ​​about social relationships influence people's responses to cognitive questions". This statement shows that a child will be influenced by the values ​​that develop in social relationships when they want to find answers to the problems they face. He emphasized the importance of social activities in education. The basic assumption is that learning occurs through social interaction and participation in the community. In other words, students learn better when they are involved in social activities that allow them to use the cognitive tools of their cultural community. In addition, students' identities and agencies develop through participation in social activities. This means that students not only gain knowledge, but also learn to use that knowledge in their social and cultural contexts. Furthermore, Bruner's Theory contains one theorem in mathematics learning, namely the construction theorem, which states that:

*The construction theorem says that the best way for a student to begin to learn a mathematical concept, principle, or rule is by constructing a representation of it. older students may be able to grasp a mathematical idea by analyzing a representation which is presented by the teacher; However Bruner believes that most students, especially younger children, should construct their own representations of ideas* (Bell, 1981:143).

According to Vygotsky (in Berger, 2005)and (in Stefe, et al. 1996) stated that "in classroom life, the meaning of mathematical concepts and the validity of mathematical statements are socially accomplished". This means that in classroom life, the meaning of mathematical concepts develops through social interactions and student experiences. He believes that learning is a social process, where students learn through interactions with teachers and classmates. In this context, mathematical concepts are not only passively accepted, but also interpreted and changed according to the experiences and understandings of individual students. Sometimes when mathematics teachers want to make it easier to provide understanding of mathematical concepts to students, they use social terms or concepts so that students can understand them more quickly. For example, in explaining whole numbers (Whole Number) the teacher uses the term bad activity to indicate negative numbers (Negative Number) and good activity to indicate positive numbers (Positive Number), through terms that are often heard in everyday interactions can sometimes make it easier for students to understand integer operations, Cognitive Development Theory proposed by Piaget views that knowledge is a continuous interaction between individuals and the environment, "Piaget argued that children construct their own understanding through interaction with their environment-that is, through their actions on objects in the world (what we call constructivism)". (McInerney, 2014:39). The environment in question includes all aspects that exist around students including social, cultural, and religious aspects.

The purpose of learning mathematics in schools is to: (a) prepare students to be able to face changes in life circumstances that are always developing, through practice acting on the basis of logical, rational, critical, efficient and effective thinking; and (b) prepare students to be able to use mathematics in everyday life and in studying science (Depdiknas, 2003: 3). By understanding that mathematics is part of community life and part of social, cultural, and religious, mathematics teachers in developing mathematics learning materials should also pay attention to socio-cultural factors as an effort to develop students' character including integrating religious values ​​and activities in explaining the material to be taught to their students. However, considering that the elements of religious values ​​and activities are very complex, this effort will be a process that is not easy to do. For that, innovation is needed so that mathematics learning that is integrated with social, cultural, and Islamic religious activities can be implemented properly.

The integration of science with religion is an effort to restore the nature of science to be able to respond to developments in the era (Abdullah, 2017) Amin et al., 2014.). The importance of scientific integration is carried out so that humans do not fail to understand the development of human life (Mahzar, 2014; Kartanegara, 2005). Efforts to integrate science with Islam can also be a step to find an organic relationship between Islam and science (Bakar, 2008), because all knowledge must make humans better understand and believe in evidence of God's greatness (Faruqi, 1982; Barbor, 2000), science should not be infiltrated by group interests so as to distance humans from their God (Attas, 2010; Barizi, 2011; Isgandi, 2021, Marvavilha & Suparlan, 2018), especially if scientific knowledge is allowed to develop in such a way that it grows to be powerful enough to criticize the order of human civilization with its religion, then integrating science with religion becomes an effort that must be carried out continuously so that the development of knowledge can bring benefits to all mankind (Haught, 1995) as is the purpose of humans being created on earth.

Mathematics in the context of learning can make Islamic values ​​the object of study, as the Qur'an presents various forms of numbers to be studied as objects of mathematical learning (Huda & Mutia, 2017). Changes in the educational paradigm also require all teachers to not only develop students' knowledge, but to educate children to be better, integrating mathematics with Islam can increase children's religious insight in addition to teaching mathematical material (Maarif, 2015). In addition, in order for students to grow with the belief that science is inseparable from religion, mathematics learning must be integrated with Islamic values ​​because it can affect our level of understanding of religion (Nasarudin, 2014). The Mathematics Education Study Program of FTK State Islamic University of Mataram based on its vision is as a place to produce mathematics teachers with Islamic characteristics. For that, the formulation of the concept of implementation has been carried out continuously and the establishment of the concept of scientific horizon as the principle of organizing all academic activities in the State Islamic University of Mataram environment including in classroom learning. The main concept offered in the scientific horizon is the realization of education that can develop the potential of ratio, feeling, and body so that State Islamic University of Mataram students can develop into complete human beings in accordance with the concept of Ki Hajar Dewantara.

Ki Hajar Dewantaraview human existence ascreatureconsisting of physical, psychological, and spiritual quantities. In these quantities there are universality, freedom, and dignity. These quantities also contain complex human potential (nature), namely creativity, will, and work.This means that in everyday life, every individual should have an attitude and behavior that upholds the values ​​contained in the surrounding environment. This is what reflects the essence of education because education is essentially a process of forming one's character to uphold all the noble values ​​contained in the midst of society.

Efforts to achieve these educational goals are certainly not easy. Along with the development of the times, educational challenges are also getting harder. This was also stated by Tilaar (2006: 140-141) "that the challenges for Indonesian people in the era of globalization include three major forces, namely civil society, nation-state, and globalization". Globalization itself marks world competition, especially in the economic sector. Its impact can cause inequality in various countries, such as poverty which can influence behavior that does not respect each other's existence or dehumanization.

Education must be able to become a vessel to form the noble attitudes or characters of everyone involved in it. Because character begins by itself including all knowledge about goodness that will give rise to a commitment to do goodness itself. According to Thomas Lickona (1991:51) that character refers to a series of knowledge (cognitive), attitudes (attitudes), and motivations (motivation), as well as behaviors (behaviors) and skills (skills). This goal is certainly not easy to achieve, but education must continue to strive continuously to achieve it so that education is truly able to create humans who respect each other and have good scientific insight.

The development of basic mathematics teaching materials based on scientific horizons which are the characteristics of the scientific development of State Islamic University of Mataram students is carried out as one of the efforts to realize the real form of the concept of scientific horizon education. The teaching materials developed are expected to be able to provide a deep understanding of mathematical problems that are integrated with various aspects that are included in the activities and values ​​of goodness that exist in the midst of society. This research is important to do because the concept of scientific horizons that are used as the principle of organizing education in the State Islamic University of Mataram environment has not been derived in a practical form that can be used as a guideline for direct lectures in class. Therefore, developing mathematics teaching materials in accordance with the demands of the scientific horizon built at State Islamic University of Mataram through research is interesting to do and at the same time stimulates researchers to conduct more in-depth research development studies.

**METHOD**

This research is a development research that is oriented to produce a product in the form of basic mathematics teaching materials based on Islamic values. The development was carried out by following the Plomp development (model, 1997) which consists of 5 (five) steps, namely: initial investigation, design, development, evaluation, and dissemination. This research did not go as far as dissemination, field trials were carried out to obtain input for product improvement and to determine the level of feasibility of the product being developed.

The data obtained were analyzed and directed to answer the question of whether the developed teaching materials meet the criteria of validity and practicality. The source of research data was obtained from expert/practitioner assessments and field trials. Expert/practitioner assessments were collected to determine the level of validity of the developed product using a product validation instrument, while data from field trials (in class) were used to answer the criteria for the practicality of the developed teaching materials.The trial was conducted on 50 students in the first semester of the Mathematics Education Study Program at State Islamic University of Mataram who were taking basic mathematics courses. The field trial was conducted by distributing questionnaires to determine students' responses to the practicality of the developed teaching materials in understanding mathematics materials integrated with Islamic values.

**RESULTS AND DISCUSSION**

Development horizon-based teaching materials are carried out by adopting the principle put forward by Goldberg (1997) which means that learning integrated with other aspects can be done in 3 (three) ways, namely with, through, and about with the explanation that learning with different objects, learning through different objects, and learning about different objects. In other words, the learning integration process can be done by (with) involving real and practical contexts, through (through) certain learning processes or methods, and about (about) the learning material or content itself. This reflects a comprehensive and holistic way of learning, where each aspect is interrelated and reinforcing.

Referring to the description of the integration of science contained in the book of integration and interconnection compiled by Riyanto (2013), there are several perspectives in carrying out integration, including philosophical and values. However, the development of mathematics teaching materials based on scientific horizons is carried out in two perspectives, namely: a) learning Thorugh (through) Islamic values, namely constructing mathematical concepts through Islamic values ​​and b) learning with (with) Islamic values, namely using Islamic values ​​in understanding mathematical concepts.

Based on this perspective, the development of mathematics teaching materials based on scientific horizons with the principles of integration and interconnection is carried out by placing Islamic values ​​as the basis for thinking about developing mathematical concepts, media in achieving learning objectives, and objects of study.

**Islamic thorugh mathematics**

The Islamic values ​​in question are the Islamic concepts contained in the Qur'an and Hadith, understanding mathematical concepts through the concepts contained in the Qur'an can be done, one of which is on the material of integers with the aim of identifying rational numbers. As in the excerpt of basic mathematical material contained in the developed teaching materials, namely:

***Examples of materials in teaching materials*:**

The knowledge possessed by a person in the Islamic concept is a small part of the knowledge given by Allah SWT, so that "even if sea water is used as ink, trees are used as pens and even added seven times more, we will not be able to master all the knowledge or words of Allah. (al-Luqman, 27 al-Kahfi, 109)".

Based on the verse, it can be interpreted that knowledge is infinite (limitless) and we only have a little ability to understand it all. In the concept of integers, when we are going to determine or identify rational numbers, then we will also not be able to determine them until they are exhausted, so that the rational numbers contained in integers are infinite (limited), as shown in the image below…

 -3 -2 -1 0 1 2 3

 **Figure 1. Biangan Line**

Identifying rational numbers on the number line is done by identifying all the numbers found at each point along the number line, for example: between 0 and 1 there is a rational number ½, between 0 and ½ there is a number ¼, and between 0 and ¼ there will be a number 1/8 and so on, you will get a rational number whose value is getting smaller between 0 and 1, you can also get 1/1000 between the numbers 0 and 1, but there will also be 1/2000 and so on and unlimited. Thus, the verse of the Qur'an that explains the limitations of a person in mastering knowledge which is concretely exemplified using trees and sea water as pens and ink, then God's knowledge is endless can be strengthened by the fact that no one can identify the rational numbers between 0 and 1, let alone between 0 and 2, between 2 and 3 and so on.

**Mathematics with Islam**

Learning mathematics with Islamic values ​​is emphasized in the context of learning mathematics that utilizes Islamic concepts or values ​​with the aim that students understand the meaning of learning mathematics is also inseparable from Islam. As an example of one of the excerpts of the content of the teaching materials that will be developed about modula numbers.

***Examples of materials in teaching materials*:**

Modula numbers are numbers that are multiples within certain value limits, understanding the material on modula numbers will help students predict several possibilities in future events. Example:

If Ani is currently praying Subuh, then in 2019 times the next prayer, what will Ani pray? By using the concept of modulus numbers (2019 modulus 5) or in mathematical form 2019 (5), the solution to the problem is 2019 divided by 5, then the remainder will be 4, if we count Ani's prayers starting from Subuh, then the next 4 prayers are Zohor, Ashar, Maghrib, and Isa. So the answer to the question above is, in 2019 times the next prayer, Ani will pray Isha.

Through the explanation of the material above, in mathematics learning, a teacher can use the Islamic context in explaining mathematics material, so that in addition to teaching mathematics, teachers can also convey the values ​​that students must have related to Islamic values. The excerpts of the material that are included in the mathematics teaching materials based on the scientific horizon above, in general, aim to integrate mathematics with Islamic values. The hope is that through mathematics learning it can be used to convey messages or develop students' religious understanding.

**Product Development Validation**

The validation data of basic mathematics teaching materials were collected using teaching material validation sheets that have been assessed as suitable for use by experts/practitioners. The data are as follows:

**Table 1. Teaching Material Validation Data**

|  |  |  |
| --- | --- | --- |
| No | Component | Average validator rating |
| 1 | 2 | 3 | 4 |
| 1 | Introduction | 4.00 | 4.00 | 4.00 | 4.50 |
| 2 | Technical instructions for implementation | 3.60 | 4.00 | 3.60 | 4.00 |
| 3 | Book structure | 4.20 | 4.40 | 3.80 | 4.60 |
| 4 | Organization of writing materials | 4.00 | 4.50 | 3.67 | 4.00 |
| Average | 3.95 | 4.25 | 3.76 | 4.27 |

The average validation value based on the validation results carried out by experts/practitioners is 4.09. These results indicate that the level of validity of basic mathematics teaching materials developed based on scientific horizons or integrated with Islamic values ​​is in the "valid" category. This shows that the developed teaching material products can be used as learning resources in basic mathematics courses.

**Practicality of Teaching Materials**

Practicality data is collected based on student responses to teaching materials using questionnaires after using teaching materials in following the learning process. The data is shown in the following table:

**Table 24. Student response data to learning models**

| No | **Rated aspect** | student response |
| --- | --- | --- |
| Like | Not happy |
| 1 | **Rated aspect** | New | Not New |
|  | **What do you think about :** |  |
|  | 1. Subject matter
 | 40 | 10 |
|  | 1. Material Presentation Structure
 | 45 | 5 |
|  | 1. Discussion of material
 | 47 | 3 |
| 2 | **Rated aspect** | Interested | Not interested |
|  | Are you interested in participating in further learning activities using teaching materials like those used now? | 45 | 5 |
| 3 | **Rated aspect** | Yes | No |
|  | **Your opinion about the teaching materials developed** |  |
|  | 1. Can you understand the language used in the teaching materials?
 | 45 | 5 |
|  | 1. Are you interested in the appearance (writing, illustrations, images and image placement) contained in the Teaching Materials?
 | 48 | 2 |

From the data above, it was found that the percentage of students who responded positively to the developed learning model after they participated in learning using the developed teaching materials was 90%. Thus, students who responded positively to the developed model were declared to have met the criteria for the effectiveness of the developed model.

**CONCLUSION**

The development of teaching materials based on scientific horizons that are developed is carried out through integration or interconnection to develop teaching materials, namely through two principles, namely mathematics through Islam and mathematics with Islam. The purpose of developing mathematics teaching materials based on scientific horizons is to obtain practical guidance in implementing the scientific core developed by State Islamic University of Mataram even though it is not yet in an ideal form. Specifically to show that through learning mathematics can also be used to convey and become students' understanding of Islamic values.

The developed teaching materials meet the validity elements by getting an average expert assessment score of 4.05 which if confirmed with the product validation level category guide, the developed teaching materials meet the validity in the "valid" category and from the practicality element based on student responses using the developed teaching materials in following the learning process 90% of students gave a positive response. Based on these results, the basic mathematics teaching materials based on the scientific horizon developed are declared feasible to be used as a source of mathematics learning integrated with Islamic values.

**RECOMMENDATION**

Based on the research results obtained, it needs to be further developed and cover broader mathematical material. Thus, for further researchers, it is expected to be able to conduct development research on learning based on scientific horizons or integrated with Islam to measure variables of knowledge, skills, mathematical thinking, or the achievement of other mathematical learning variables, so that the ideal form of implementation of the scientific core carried by State Islamic University of Mataram in the practice of mathematics learning is found.

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