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# Improving mathematic communication ability through islamic math e-comic media: A study on building flat sides

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### ABSTRACT

Media Islamic Math e-Comic is a mathematical comic with Islamic nuances that has mathematical problem solving with clear illustrations and problem-solving methods according to indicators that can improve students' mathematical communication skills. This study aims to determine how much the increase in mathematical communication skills in the use of Islamic Math e-Comic media on the subject of flat side space for class VIII. The media is developed through stages in the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). This type of research is Quasy Experiment by giving pretest and posttest questions on small-scale tests and large-scale tests. Then, the effectiveness test of the use of Islamic Math e-Comic media was carried out using the Effect Size test, obtaining results of 0.53 with the "medium" criteria. This shows an increase in the value obtained by students after using the Islamic Math e-Comic media on the flat side space building material.

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### INTRODUCTION

Mathematics is generally identical with the calculation of numbers and formulas, giving rise to the assumption that communication skills cannot be developed in learning mathematics. Communication skills are very important in learning mathematics. Because this ability is closely related to students' ability to express mathematical ideas, understand, interpret, assess or respond

to mathematical ideas and use terms, notations, and symbols to present mathematical ideas (Pratiwi, Inganah, & Putri, 2020; Purbaningrum & Palupi, 2022; Rohid & Rusmawati, 2019).

Mathematical communication skills are an important part of mathematics education as a means to exchange ideas and a tool to clarify understanding (Maulya, Annizar, Hidayati, & Mukhlis, 2020; Perwitasari & Surya, 2017; D. P. Putri, Ferdianto, & Fauji, 2020).

Mathematical communication skills must be developed as explained by previous researchers that communication in mathematics learning contributes to deeper mathematical analysis between teachers and students (Asikin, 2021; Y. U. Putri, 2020; Tong, 2021; 2019, 2020).

Mathematical communication ability at least refers to students' ability to: (1) organize and connect their mathematical thinking through communication; (2) communicate logical and clear mathematical thinking to friends, teachers, and others; (3) analyze and assess the mathematical thinking and strategies used by others; and (4) using mathematical language to express mathematical ideas correctly (NCTM, 2000).

The current pandemic era has had a considerable impact on the education sector. One of the most visible impacts is the change in the learning system in schools. Currently in Indonesia implementing limited face-to-face learning (PTMT) (Mulyono & Saskia, 2021; Murad, Hassan, Heryadi, & Wijanarko, 2020; Trinova, Iskandar, Fathurrochman, Damayanto, & Fatmawati, 2022). This has a great impact on students, including their mathematical communication skills (Astuti & Purwanto, 2021; Lubis, Harahap, & Tarihoran, 2021; Sumayanti & Siswanto, 2021). Because the lack of interaction that occurs makes students less able to explore their communication skills, this is an obstacle to the achievement of learning objectives, even though the achievement of learning objectives can be obtained if the learning atmosphere created by educators makes students actively involved in interacting during the learning process (Sri Anggoro, Bidayati Haka, & Hawani, 2019).

This situation is demanded by all parties including schools to create interesting learning situations by utilizing innovative learning media, one of which is comics (Adi Widodo, Turmudi, Afgani

Dahlan, Istiqomah, & Saputro, 2018; Angela, Maimunah, & Roza, 2021; Komarudin & Thahir, 2019; Rakhmayanti, 2021). Comics are visual learning media that can convey material in different ways, the explanation of the material is not only in the form of text but the delivery of material is presented through conversations between characters in the form of images (Ilamsyah, Wulandari, & Fahreza, 2020; Sari, Prasetyo, & Kuswanto, 2020; Suri, Astuti, Bhakti, & Sumarni, 2021). Studies on learning comics have been conducted several times and there is a tendency to use math learning comics without integrating them with other fields (Hidayah, 2019; Mamolo, 2019). This tendency shows that the existing studies have not accommodated problems in daily life (realistic) and Islamic values. Even though both of them are very closely related to the lives of students, especially Indonesian students as a country with the largest number of adherents of Islam in the world (Nilan, 2021; Nurlatifah, Saefuddin, Nanere, & Ratten, 2022). Therefore, researchers will develop learning media innovations in the form of Islamic Math e-Comic. Islamic Math e-Comic is a mathematical comic that integrates a realistic mathematical approach and Islamic values. It aims to improve students' communication skills.

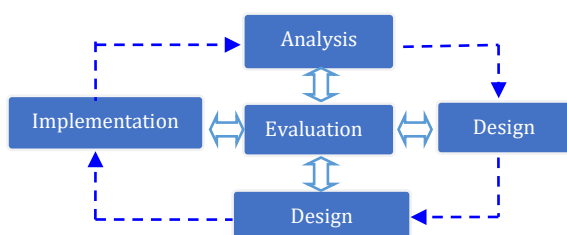
There are several previous studies regarding the development of learning media, including the Islamic math comics media in improving students' mathematical understanding and character (Basir, Alif Hazira, & Kusmaryono, 2020), the development of e-comics as a learning medium for the class VIII flat-sided space building material, and comic applications. as a learning medium (Saputro, 2015), the effectiveness of using comics as a medium for learning mathematics (Subroto, Qohar, & Dwiyan, 2020).

Some of these studies show that existing studies have not accommodated

the use of Islamic Math e-Comic in improving mathematical communication skills. Therefore, the purpose of this research is to see the effectiveness of Islamic Math e-Comic media in improving students' communication skills in the material of flat-sided shapes.

## METHOD

The type of research used is Research & Development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model (Branch, 2009; Komarudin, Arsita, Budiman, & Puspita, 2022; Vejvodova, 2015). Research & Development (R&D) is a type of research that produces a particular product. Product development is carried out at all stages of ADDIE to see the effectiveness of the product.



**Figure 1.** ADDIE Model Model

The population in this study was class VIII students with a research sample of class VIII students at MTs Negeri 2 North Lampung in the even semester 2021/2022 academic year.

After the product is designed, it is then validated by media experts, material experts, and religious experts. The validation criteria are presented in Table 1 (Ambo, Siew, & Han, 2019; Wan, So, & Zhan, 2020; Yennita, Zulirfan, Hermita, & Hakim, 2022).

**Table 1.** Scoring and Validation criteria

Score	Criteria	Information
$3,26 < x \leq 4$	Valid	No Revision
$2,51 < x \leq 3,26$	Quite valid	Minor revision
$1,76 < x \leq 2,51$	quite valid	Major revision
$1,00 < x \leq 1,76$	No valid	Revisi total

During the validation process, the final results were obtained from media expert validators 3.72 with "valid" criteria, material experts 3.82 with "valid" criteria and religious experts 3.63 with "valid" criteria.

After the product is declared valid by the three validators, it is continued with the product attractiveness test. The product is tested on a small scale and a bear scale. On a small scale, a score of 3.52 was obtained with the criteria of "very interesting" and the large-scale test with the criteria of "very interesting". Answer assessment scores and media eligibility criteria scores are presented in Tables 2 and 3 (Sipnaturi & Farida, 2020)

**Table 2.** Scoring of the Answer Choices

Score	Criteria
4	Very Attractive
3	Attractive
2	Less attractive
1	Attractive

**Table 3.** Student Response Criteria

Quality Score	Attractiveness Criteria
$3,26 < x \leq 4,00$	Very Attractive
$2,51 < x \leq 3,26$	Attractive
$1,76 < x \leq 2,51$	Less attractive
$1,00 < x \leq 1,76$	Unattractive

The next step is to measure the effectiveness level of using Islamic Math e-Comic media by giving pretest and posttest questions which are then analyzed by Effect Size test. The effectiveness test formula used is the Effect Size formula (Astika, Anggoro, & Andriani, 2019).

$$d = \frac{M_{posttest} - M_{pretest}}{\sqrt{\frac{SD^2_{posttest} + SD^2_{pretest}}{2}}}$$

Description:

$d$ : effect size;  $M_{pretest}$ : mean Pre-test;  $M_{posttest}$ : mean post-test;  $SD^2_{pretest}$ : Pre-test standard deviation;  $SD^2_{posttest}$ : post-test standard deviation.

To find the Standard Deviation (SD) on the Pre-test and Post-test use the following formula:

$$SD = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

Description:

$x_i$  : the number of student scores;

$\bar{x}$  : average;

$n$  : the number of students who took the Pre-test and Post-test

The results obtained, in the Effect Size category, can be classified in Table 4.

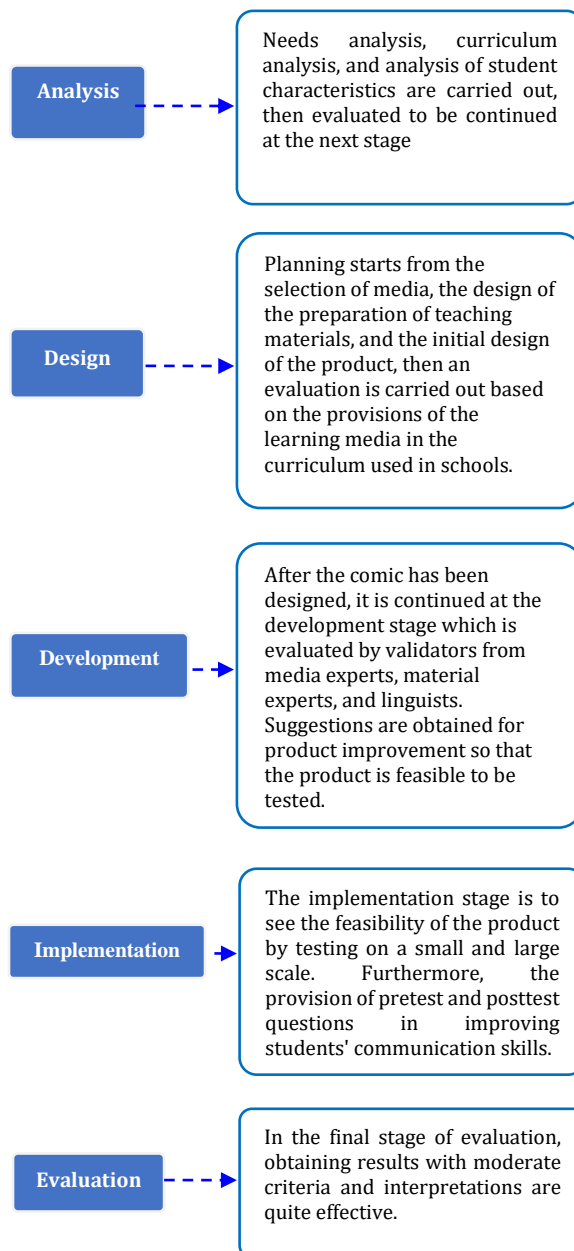
**Table 4.** Category Effect Size

Effect Size	Category
$0,2 \leq d < 0,5$	Low
$0,5 \leq d < 0,8$	Middle
$0,8 \leq d \leq 2$	High

Effect Size interpretation is presented in Table 5:

**Table 5.** Interpretation of Effect Size

Completeness Percentage	Criteria
$d \geq 1,0$	very effective,
$0,8 \leq d < 1,0$	effective
$0,5 \leq d < 0,8$	moderately effective
$0,2 \leq d < 0,5$	less effective



**Figure 2.** Stages of Islamic Math e-Comic media development

## RESULTS AND DISCUSSION

The product produced in this study was developed based on the stages of ADDIE model development which consists of five stages, namely Analysis, Design, Development, Implementation, and evaluation.

1. **Analysis stage**, including analysis of student needs, curriculum analysis, and analysis of student

characteristics. The needs analysis is intended to find out the obstacles experienced by MTs Negeri 2 North Lampung, curriculum analysis is used to determine the curriculum used, analysis of materials, models and learning media, as well as analysis of student characteristics. The analysis was carried out using the method of observation, interviews and tests. At this stage it is known that the value of students' mathematical communication skills is still much below the Minimum Completeness Criteria (KKM), this can be seen from the students' ability to answer the questions given. This is one of the reasons behind the need to develop Islamic Math e-Comic media which aims to improve students' mathematical communication skills, especially on the subject of flat side space, where this subject is one of the materials that must provide a more detailed explanation of the stages. in solving problem.

2. **Design stage**, the design of the comic is carried out starting from the storyline, display design, to the material and questions and answers that will be included in the comic.
3. **Development stage**, in this stage the process of developing Islamic Math e-Comic media is carried out on the subject of flat side space. The results of this development can be seen in Figure 3.

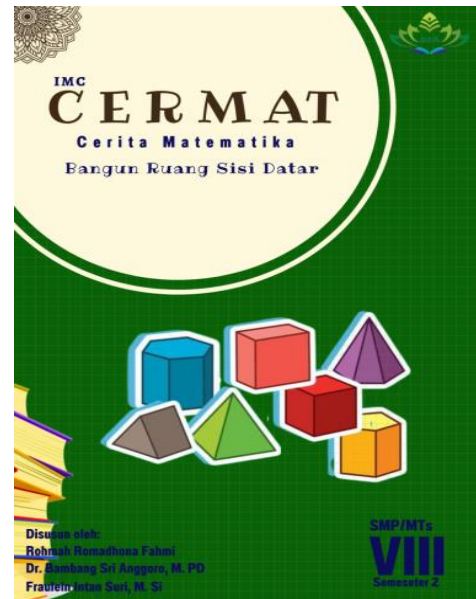


Figure 3. Cover Media Islamic Math e-Comic

Cover Media Islamic Math e-Comic gives an idea to the reader that this comic displays several forms of flat side space. The integration of Islamic nuances can be seen in the content of the Islamic Math e-Comic media. This can be seen in Figure 4.



Figure 4. Islamic nuances in Media Islamic Math e-Comic.



Figure 4. Describes the nuances of Islam by showing Islamic symbols, such as the use of the hijab and stories that link mathematics with Islamic values. This also appears in other parts, for example as shown in Chapter 4 of the Islamic Math e-Comic Media which can be seen in Figure 5.

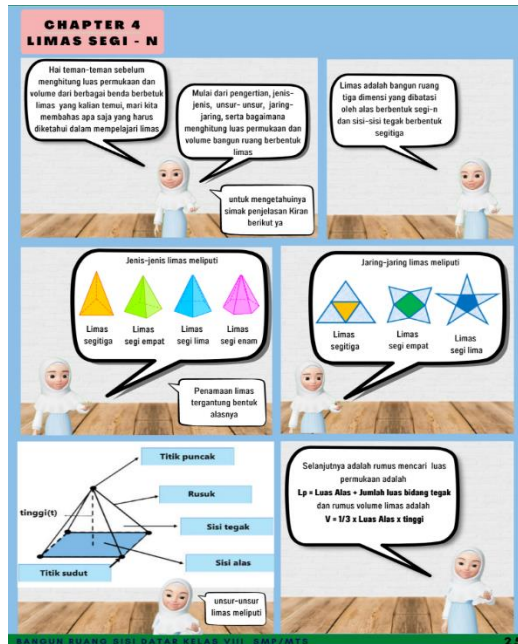


Figure 5. Contents of Media Islamic Math e-Comic.

In Figure 5, it is also seen that the material in the comic story is designed in an attractive manner, which can improve students' mathematical communication skills in mathematical problems.

4. **Implementation stage**, after the product has been developed, the next product is implemented to see the level of effectiveness of the use of the media. Obtaining the results in Table 3.

Table 3. Students' pre-test and post-test results

	N	$S_{max}$	$S_{min}$	Average	Deviation Standard
Pretest	36	63	8	50,3	50,65
Post-test	36	88	42	80,4	79,70

Based on table 3, it can be seen that the results obtained regarding the effectiveness test of the Islamic Math e-Comic media were obtained with moderate criteria. So that there is an increase in student outcomes in using the media.

5. **Evaluation stage**, this stage is evaluated starting from the analysis stage to the implementation stage. Improvements were made based on the validator's suggestions and student responses. All suggestions and improvements were made to improve the quality of the resulting Islamic Math e-Comic media.

The use of e-Comic in learning provides an increase in the results obtained by students, this is in line with research conducted by (Bintoro, Lestari, & Aini, 2022; Setyaningsih, Sakti, & Sudarwanto, 2022) obtaining the results that e-Comic is feasible and interesting to use as learning Media. The learning approach used in designing the Islamic Math e-Comic media in this study uses a Realistic Mathematics Approach (PMR), this type of approach is one approach that can make students better understand the material and solve problems in problems because it is associated with things that are real (real). Basir dkk. (2020) in his research obtained the results that Islamic Math Comic media can improve students' mathematical understanding. Based on this, the researcher wanted to know whether there was also an increase in students' mathematical communication skills. After the research was conducted,

the results showed that there was an increase in students' mathematical communication skills after using the Islamic Math e-Comic media.

Mathematical communication skills can be improved by understanding the material using media that are presented visually in the form of images such as the Islamic Math e-Comic media which is supported by a realistic approach. This is in accordance with indicators of mathematical communication skills that students can explain mathematical ideas through writing (Written text), drawing (Drawing), and mathematical expressions (Mathematical Expression) (Azizah, Usodo, & Saputro, 2020; Supandi, Rosvitasari, & Kusumaningsih, 2017; Viyani, Utami, & Pramasdyahsari, 2022).

The existence of this e-Comic learning media innovation can be a support for teaching materials used in schools, especially during the learning transition period from a pandemic situation which makes learning time less at school so it requires a learning media as a facilitator that can be used flexibly, interesting to learn, and easy. Understood (Ramdani, Nugraha, & Hadiapurwa, 2021).

## CONCLUSIONS AND SUGGESTIONS

Based on the results of research on the effectiveness of the development of Islamic Math E-Comic media in improving mathematical communication skills, it is in the "medium" criteria. This shows that there is an increase in the results obtained by students while using the Islamic Math E-Comic media and this media can be used or redeveloped in learning mathematics on the material of flat side space.

Based on the conclusions in this study, there are several suggestions that can be a reference for further researchers. Researchers are expected to be able to develop the Islamic Math E-Comic media to be even better in order to obtain a high level of media effectiveness with high criteria and deserve to be disseminated as

an innovation of mathematics learning media.

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