**ELECTRONIC MAGAZINE DEVELOPMENT IN MATHEMATICS LEARNING**

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|  |  | **ABSTRAK** | |
| **Article History:**  Received: …-…-…  Revised: …-…-…  Accepted: …-…-… |  | **Abstrak:** Tujuan penelitian ini adalah untuk mengembangkan sebuah bahan ajar berupa majalah elektronik dalam pembelajaran matematika. Penelitian ini menggunakan metode penelitian dan penembangan. Prosedur pengembangan yang digunakan adalah prosedur model pengembangan ADDIE. Teknik pengumpulan data yang digunakan adalah observasi, penyebaran angket dan tes. Sampel yang digunakan adalah siswa kelas VII SMP di Bandar Lampung. Tehnik analisis data yang digunakan adalah uji-t. Berdasarkan hasil validasi yang dilakukan media yang dikembangkan memperoleh kriterian sangat layak oleh para ahli (ahli media dan ahli materi). Ditinjau dari kemenarikan hasil yang dperoleh dari 2 kali uji coba skala besar dan skala kecil majalah elektronik yang dikemengkan memperoleh kriteria sangat menarik. Berdasarkan hasil uji-t diperoleh bahwa hasil belajar siswa dengan menggunakan majalah elektronik matematika lebih baik dari pada hasil belajar siswa yang tidak menggunakan majalah elektronik matematika. Berdasarkan hal ini dapat disimpulkan bahwa majalah elektroknik dalam pembelajaran matematika yang dikembangkan dapat digunakan sebagai alat bantu pembelajaran matematika.  **Abstract:** The purpose of this study was to develop teaching material in the form of an electronic magazine in mathematics learning. This study uses research and development methods. The development procedure used is the ADDIE development model procedure. Data collection techniques used were observation, questionnaires, and tests. The sample used was class VII in Bandar Lampung Junior High School. The data analysis technique used is the t-test. Based on the results of the validation carried out the media developed obtained very appropriate criteria by experts (media experts and material experts). Judging from the attractiveness of the results obtained from 2 large-scale trials and small-scale electronic magazines that were obstained very interesting criteria. Based on the results of the t-test it was found that the learning outcomes of students using electronic magazines were better than the learning outcomes of students who did not use mathematical electronic magazines. Based on this, it can be concluded that electrochemical magazines in mathematics learning developed can be used as mathematical learning aids. | |
| **Kata kunci:**  Pengembangan;  Majalah Elektronik;  Efektifitas.  **Keyword:**  Development;  Electronic Magazine;  Effectivenes |
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1. **INTRODUCTION**

Developments in the 4.0 era today demanded an extraordinary change in education (Komarudin and Permana 2019; THAHIR, KOMARUDIN, and HASANAH 2019). Without education, the human beings who live in it will not grow in quality (Idris and Tabrani 2017; Kawiyah 2015; Muchith 2016). The Dictionary of Education mentions that one's process in developing its capabilities such as attitudes and other forms of conduct in the communities where it lives, the social process by which one is faced with the influence The chosen and controlled environment, especially the school, to the development of social skills and individual abilities experienced by him is the optimum called education (Happy and Widjajanti 2014; Hartinah et al. 2019; Ihsan 2005). One of the learning materials taught in school is the field of mathematics lessons.

Mathematics has an important role as the basis of logic and reasoning, as well as the quantitative completion that can be used for other lessons (Hidayah 2018). In addition, mathematics is also important as a tool, as a science, as a guide to thinking patterns, as well as forming attitudes. Therefore we must encourage students to learn mathematics well (Riana and Ibrahim 2019; Rodiah 2019; Soviawati 2011).

According to one of the mathematics learning objectives according to Permendiknas No. 22 the year 2006 is using reasoning on patterns and properties, conducting mathematical manipulation in making a generalization, drafting evidence or explaining ideas and Mathematical statements (Anggoro 2016; Huda et al. 2019; Sari 2014). In addition, mathematics is also one of the subjects that must be implemented at every level of education ranging from elementary school to college (Komarudin, Rosmawati, and Suherman 2020a; Sulistyaningrum, Karyanto, and Sunarno 2015). Therefore, it shows that mathematics plays an important role in the world of education and technological developments. From the important role of mathematics, there are still many students who consider mathematics a difficult lesson (Komarudin, Rosmawati, and Suherman 2020b; Masykur, Nofrizal, and Syazali 2017; Putra 2017; Sholihah and Afriansyah 2017). It is suspected to occur because mathematics is abstract and must understand the concept so that students feel saturated and bored in learning mathematics. (Andriani et al. 2019; Indaryanti, Hartono, and Aisyah 2008) also stated that students' saturation in the teaching was created and never felt a thing in the learning process.

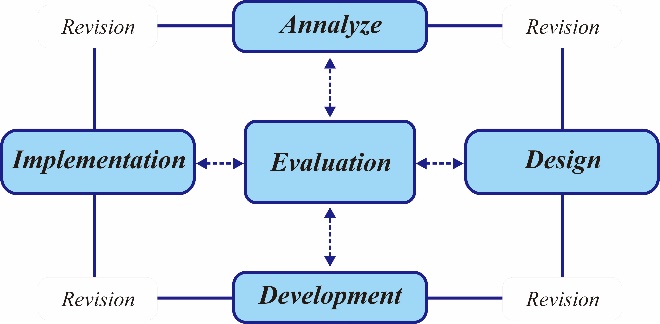
According to (Trilaksono, Darmadi, and Murtafi’ah 2018) the fatigue and boredom of students in learning can impede the creativity of students in learning. According to (Pornamasari 2017) displayed in the results of his observation that a less varied learning model was used so as to make the students saturated and bored that could lead to passive students.

Previous research has been a lot of development of learning media to overcome various problems that exist in mathematics learning. As disclosed by (Andari and Komsiatun 2018; Ekawati, Anggoro, and Komarudin 2019) that the use of learning media can improve students ' mathematical skills. According to (Farida, Suherman, and Zulfikar 2019; Lasmiyati and Harta 2014) he use of learning media can improve the ability to understand the mathematical concept of students. According to (Angraini, Komarudin, and Istihana 2019; Najihah 2014) the uses of learning media increases the motivation of learning students. Based on some of the research results it can be concluded that students ' saturation can be addressed by the use of learning media. But in the development of researchers doing Keterbaharuan is developing teaching materials in the form of electronic magazines in mathematics learning.

The electronic magazine is an electronic version of the magazine because it is electrically-based. Electronic magazines are no longer using paper raw materials in writing their articles like magazines in general, but rather in digital form that can be accessed through electronic media such as computers, laptops, mobile phones, Android, iPhone, iPad, and Other technology (Supriadi 2015). Electronic magazines can also reduce the cost of production and distribution of magazines. Helps reduce the impact of global warming with increasingly expensive paper and thinning supplies (Muhammad 2018). In addition, it is also the favorite of students in using electronics in the form of Android that can not be utilized by students in more positive matters. So researchers are interested in conducting research by developing electronic mathematics magazines.

1. **METHOD**

Research in this article uses research and development methods because this research will produce certain products. The procedure used in this research and development is the ADDIE procedure *(Analyze, Design, Development, Implementation, Evaluation)* (Branch 2009)*.*



**Figure 1.** Development Procedure of the ADDIE Model

The trial was conducted at Junior High School in Bandar Lampung. The data collection techniques used are observation, poll distribution, and test. Questionnaire for feasibility and student response to the media developed while the test is used Adala essay. The data analysis techniques used in the -test, but before the -test carried out is the prerequisite analysis test is conducted on the initial student's ability of each class of significance level 0,05. Interpret the poll results in table 1.

**Table 1.** Interpretive Angket response

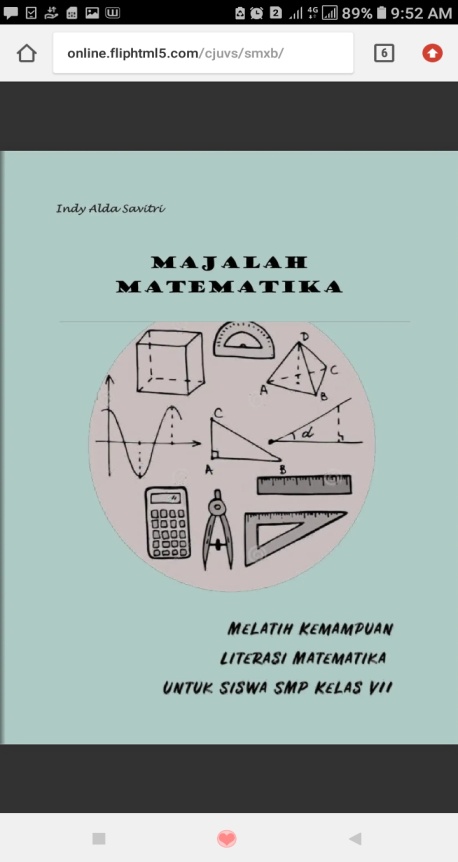
|  |  |  |  |
| --- | --- | --- | --- |
| **Percentage score** | **Expert Interpretations** | **Student Interpretation** | **Description** |
|  | Very decent | Very interesting | Worth using |
|  | Worth | Interesting | No revision |
|  | Not worth it | Unattractive | Partial revision |
|  | Very unworthy | Very unattractive | Total Revision |

1. **RESULTS AND DISCUSSION**

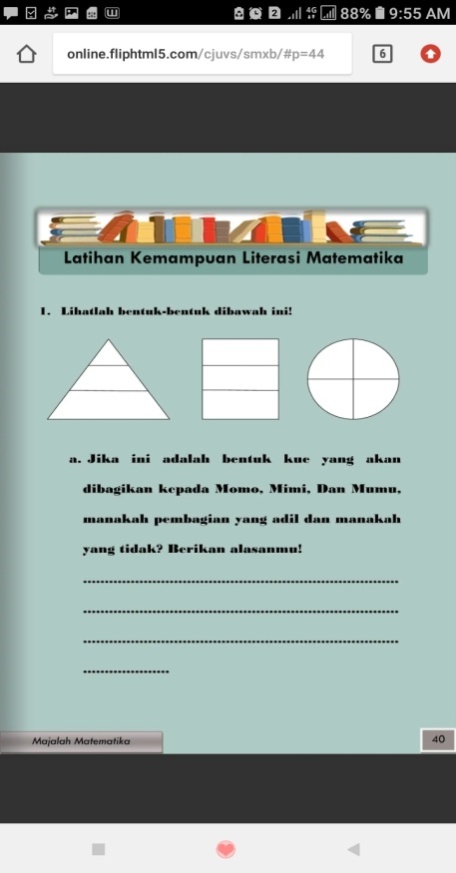
The results of the development of electronic magazines based on mathematics literacy have been researched in SMP in Bandar Lampung which has previously been validated by media experts and materials and has been tested to students. The development of this media is based on the analysis of students’ needs from the survey and filling questionnaire needs. The results of the charging analysis stated that 58% or the equivalent of 15 out of 25 students felt that the textbook used so far was mediocre. Responding to the results of the poll, researchers try to provide the latest innovations that can inspire students to learn mathematics. According to (Najihah 2014) in research reveal that 89.89% of students learn to use electronic-based learning media and able to improve student learning outcomes by up to 40%. This is in line with the phrase (Sari, Farida, and Putra 2017) that the learning media used as AIDS in the division received a very good response by the students. Based on this, it can be concluded that with media or other teaching materials that are expected to attract students in mathematics learning. Referring to this then researchers will develop electronic magazines in mathematics learning.

After the analysis was conducted and needed a teaching material in the form of electronic magazines, then the next stage is done media planning. This stage contains the design of electronic magazines such as intro cover, table of contents, foreword, and pages. For Content magazine contains subject matter. The material in the electronic magazines is tailored to the content of predefined literacy lessons. The material to be presented is taken from the Book of Guide packages from the school and from relevant sources about algebra. In this case, the contents of the magazine will be adapted to the content of mathematical literacy. Where such content includes space and Shape, related to the subject of geometry. Train students to recognize shapes, look for differences and equations in various dimensions and form representations. This electronic magazine is covered by training the ability of mathematical and closing ideation.

Once the media has been completed, then this stage of media development uses Microsoft Word to help Flip HTML 5 applications to make them look back and forth and can be accessed online. Some of the development results can be seen in Figure 2 below:



**Figure 2.** Electronic Mathematics Magazine Intro



**Figure 3.** Electronic Mathematics Magazine Cover

Once the media has been developed in accordance with the design and the created Racangan, then the media validation test is conducted to test the feasibility of the development that has been done. Validation is done to the material experts and media experts.

* + - 1. **The Validation Result of the Expert Material**

The validation of material experts is done to 2 competent members of the field of algebra subject of Universitas Islam Negeri Raden Intan Lampung. The results of the material expert validation can be seen in Table 2 as follows.

**Table 2.** The Result of Phase 1 Validation by the Material Expert

|  |  |  |
| --- | --- | --- |
| **Aspects** | **Average** | **Criteria** |
| Material suitability | 1,9 | Less feasible |
| Accuracy of materials | 2,3 | Less feasible |
| Material endings | 1,5 | Less feasible |
| Encouraging knowledge | 2,1 | Less feasible |
| Presentation techniques | 2 | Less feasible |
| Supporting presentation | 2 | Less feasible |
| Content Presentation | 2,5 | Less feasible |
| Thought Flow | 1,5 | Less feasible |
| Mathematical literacy | 1,5 | Less feasible |

Based on Table 2. Obtained the highest score of 2.5 and the lowest score of 1.5 with each aspect obtaining the validation criteria is less feasible in the sense of revision or improvement. Therefore, the full improvement and the destruction to the media that has been developed in accordance with input and advice by material experts until the media obtained the criteria worthy to be carried out field trials. Once the media is repaired according to the input and advice of the media experts then the validation is done Phase 2.

**Table 3**. The Result of Phase 2 Validation by the Material Expert

|  |  |  |
| --- | --- | --- |
| **Aspects** | **Average** | **Criteria** |
| Material suitability | 3,15 | Worth |
| Accuracy of materials | 3,5 | Very decent |
| Material endings | 3,3 | Very decent |
| Encouraging curiosity | 3,25 | Worth |
| Presentation techniques | 3,9 | Very decent |
| Supporting presentation | 3,75 | Very decent |
| Content Presentation | 3 | Worth |
| Thought Flow | 3,5 | Very decent |
| Mathematical literacy | 3,5 | Very decent |

Based on Table 3. The result of phase 2 validation experienced a very significant increase i.e. the average score of 3.9 and the lowest is 3, and reached the average of criteria "very decent ". Based on this, the media is very well worth the trial based on material experts.

* + - 1. **The Validation Result of the Media Expert**

Validation of the media members is done validation to 3 experts who are competent in the field of media experts learning from Universitas Islam Negeri Raden Intan Lampung. The validation results on the media experts can be seen in Table 4 as follows.

**Table 4.** The Result of Phase 1 Validation by Media Expert

|  |  |  |
| --- | --- | --- |
| **Aspects** | **Average** | **Criteria** |
| Design Intro Magazine | 2,5 | Worth |
| Magazine Content Design | 2,75 | Worth |
| Magazine size Design | 2,8 | Worth |

Based on Table 4. Showing the validation results of the first stage media expert that the media for every aspect gained the largest average score of 2.75 and 2.5 is still on the "feasible" criteria. These results have shown that the media is worthy of the assessment of media experts, but experts give input and advice so that the revision of the media in accordance with the input and advice of experts. After the media is repaired then the validation test is performed Phase 2. Phase 2 validation results can be seen in Table 5.

**Table** **5.** The Result of Phase 2 Validation by Media Expert

|  |  |  |
| --- | --- | --- |
| **Aspects** | **Average** | **Criteria** |
| Design Intro Magazine | 3,5 | Very decent |
| Magazine Content Design | 3,6 | Very decent |
| Magazine size Design | 3,5 | Very decent |

Based on Table 5. The result of phase 2 validation is increased which is the largest percentage is 3.6 and the smallest percentages are 3.5 with each of the criteria eligible. Based on this, it can be concluded that the media developed very well worth the trial based on the media experts.

The product in the form of electronic magazines that have been validated by experts then tested in junior high school students in Bandar Lampung class VII. The trial is conducted by conducting a product test.

1. **Test the Product**

The test of the product is done in 2 ways: small scale and large scale trials. Where small trials involve 6 class VII students, and large-scale trials involve 25 class VII students. Based on the trial of the Kemenarika trial product results showed that on a small scale obtained an average value of 3.43 with "very interesting" criteria and in large scale trials obtained an average value of 3.52 with "very interesting" criteria. Based on this, it can be concluded that the media that has been developed meets the criteria of the development and can foster the learning interest of students. This is due to the students requiring new things to stimulate the senses and the potential of learning. In addition, a new atmosphere in the process of learning students will overcome the saturation of students in the teaching process that is always encountered every day. As has been described by (Maskur, Nofrizal, and Syazali 2017) that learning media or teaching materials can eliminate the students ' saturation and boredom in learning. Besides, also according to (Kurniawati, Hadi, and Rulviana 2018) learning Media can increase the motivation of learning students. Based on this, it can be concluded that the learning media used in the learning process will get self-interest by students.

1. **Test Result Learning**

After the test was done small and large scales also charging the response of the responses, then carried out trials of learning outcomes of students. This trial was done to 2 classes, which are experimental classes (treatment using electronic magazine media) and control class (given the treatment of not using electronic magazines). The post-test result for students ' learning ability shows the average of the control class at 54.8 and for the experimental class obtained on average of the 74.8. As for the median, the control class was 50 and the experimental class was 70. The mode or value that often appears in the control class is 30, whereas for the experimental class it is 60. Based on this, it can be concluded that the student learning results of the experimental class are better than the learning outcomes of the control class. Furthermore, a prerequisite test is carried out by testing the normality and testing of homogeneity.

The normality test is performed to determine whether or not the two data are normally distributed. In the attached data indicates that the experiment class shows the average post-test of 74.8, the standard deviation of 13.57 with = 0,1582 dan **=** 0,1772. Because then accepted, it means normal distribution data. For the control class, an average of 54.8 raw deviation of 18.73 with = 0,1452 dan = 0,1772. Because then accepted, it means that data is also distributed as normal. Then the data of each class can be declared a normal distribution. To determine if the variants of a number of the population are equal or not, then a test of homogeneity is conducted. Test the homogenates using the Barlett test on the experimental class and the control class. In the attached data, the value of the experimental class variance is 184.333 while the control class is 351,000. With of 1.9041 and of 2.0144. Because , a test decision received means that data comes from the same variance. Once known normal data and derived from the same variances than the next -test.

Results of the -test obtained that obtained then received. It can then be stated that the average study results test of students using mathematics literacy-based electronic magazines that are developed are not the same as the average scores of student learning results that do not use electronic magazine products. There is a significant difference in learning outcomes between experimental classes and control classes. It can be said that electronic magazine products are developed effectively and can be used in the learning process.

1. **CONCLUSION AND SUGGESTION**

This research produces a product in the form of mathematical literacy-based electronic magazines (available at the following link: <http://online.fliphtml5.com/cjuvs/rntx/#p=8>). The development of the magazine was designed using ADDIE's development model. The material presented in this electronic magazine is focused on mathematical literacy which has space and shape, change and relationship (quantity) as well as probability and uncertainty. Based on the validation results of media experts, electronic magazines based on mathematical literacy get very decent criteria, and test students' response to electronic magazines based on mathematical literacy get very interesting criteria, subsequent results of an effective test can be concluded that the learning outcomes of students who use electronic magazines based on mathematics literation better than the results of learning students do not use for electronic magazines.

To sum up, it is expected to be used in schools as a media lesson that can help students learning activities in the classroom. For further researchers, it is recommended for other materials on other aspects of learning.

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