

# Electronic Magazine Development in Mathematics Learning

Komarudin<sup>1\*</sup>, Suherman<sup>2</sup>, Laila Puspita<sup>3</sup>, Indy Alda Savitri<sup>4</sup>

<sup>1,2,3,4</sup> Pendidikan Matematika, Universitas Islam Negeri Raden Intan Lampung, Indonesia

<sup>1</sup>[komarudin@radenintan.ac.id](mailto:komarudin@radenintan.ac.id), <sup>2</sup>[suherman@radenintan.ac.id](mailto:suherman@radenintan.ac.id),

<sup>3</sup>[lailapuspita@radenintan.ac.id](mailto:lailapuspita@radenintan.ac.id), <sup>4</sup>[indyaldas@gmail.com](mailto:indyaldas@gmail.com)

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## ABSTRACT

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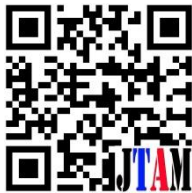
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The purpose of this study was to develop a teaching material in the form of an electronic magazine in mathematics learning. This study uses research and development methods. The development procedure used is the ADDIE (Analyze, Design, Development, Implementation, Evaluation) development model procedure. Data collection techniques used were observation, questionnaires and tests. The sample used was class VII SMP (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 obtained obtained very interesting criteria. Based on the results of the t-test it was found that the learning outcomes of students using electronic 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.



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## A. INTRODUCTION

Developments in the 4.0 era today demanded an extraordinary change in education (Komarudin & Permana, 2019; Thahir, Komarudin, & Hasanah, 2019). Without education, the human beings who live in it will not grow in quality (Idris & Tabrani, 2017; Kawayah, 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 & Widjajanti, 2014). One of the learning materials taught in the 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 (Giarto, 2016), 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 (Rodiah, 2019; Soviawati, 2011). According to one of mathematics learning objectives according to Permendiknas No. 22 year 2006 is using reasoning on patterns and properties, conducting mathematical manipulation in making generalization, drafting evidence or explaining ideas and Mathematical statements (Anggoro, 2016; S. 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, & Suherman, 2020; Sulistyaningrum, Karyanto, & 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 (Masykur, Nofrizal, & Syazali, 2017; Putra, 2017; Sholihah & 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. (Indaryanti, Hartono, & Aisyah, 2008) also stated that students ' saturation in the teaching was carnated and never felt a thing in the learning process.

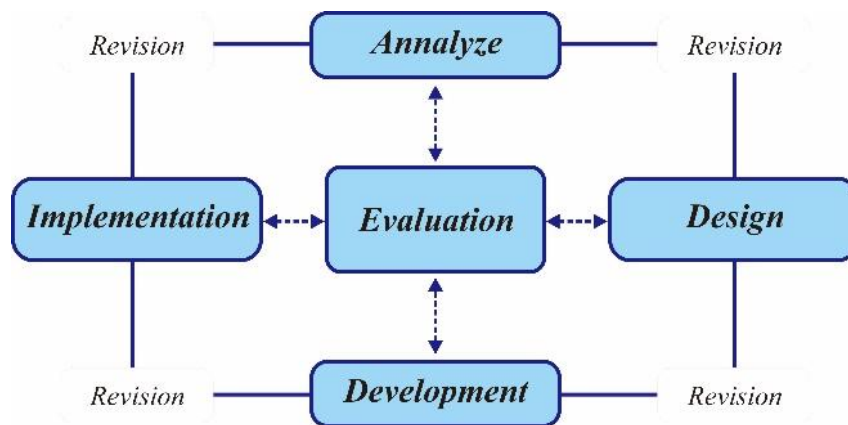
According to (Trilaksono, Darmadi, & Murtafi'ah, 2018) the fatigue and boredom of students in learning can impede the creativity of students in learning. According to (Pornamasari, 2017) displayed in the results of his observation that a less varied learning model was used so as to make the students 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 & Komsiatun, 2018; Ekawati, Anggoro, & Komarudin, 2019) that the use of learning media can improve students ' mathematical skills. According to (Lasmiyati & Harta, 2014) he use of learning media can improve the ability to understand the mathematical concept of students. According to (Angraini, Komarudin, & Istihana, 2019; Najihah, 2014) According to (Angraini, Komarudin, and Istihana 2019; Najihah 2014) the use 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 newness 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 a valid, attractive and effective electronic mathematics magazine to improve the learning outcomes of grade VII students in junior high school.

**B. 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). The ADDIE development Model is used due to its systematic pace, detail, and produce products with a specific context applied in Figure 1 below (A. P. P. Sari, Amin, & Lukiati, 2017).



**Figure 1.** Development procedure of Model ADDIE

The trial was conducted on students of grade VII at SMP in Bandar Lampung. The data collection techniques used are poll techniques and tests. As for the data retrieval instruments consist of (1) Eligibility poll, consisting of and a poll of electronic magazines developed while the test instrument in the form of essay, used to know the effectiveness of electronic magazines. The feasibility data analysis technique and the electronic magazine coordinating using the following test:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \tag{1}$$

Description:  $\bar{x}$  : the final average;  $x_i$  : The eligibility score/the frankness of each aspect;  $n$  : Number of statements.

Further to test the effectiveness of electronic magazines used *test – t*, but before the *t*-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.** Interpretation for eligibility and interesting scores

Percentage score	Expert interpretations	Student interpretation	Description
$3,26 < \bar{x} \leq 4,00$	Very decent	Very interesting	Worth using
$2,51 < \bar{x} \leq 3,26$	Worth	Interesting	No revision
$1,76 < \bar{x} \leq 2,51$	Not worth it	Unattractive	Partial revision
$1,00 < \bar{x} \leq 1,76$	Very unworthy	Very unattractive	Total Revision

Before Instrume test is used first Test instrument test, namely the test of normality and homogeneity. The normality test aims to determine whether the samples taken in the research

is a normal distribution or not, this test uses the Liliefors test as follows (E. Agustiana, Putra, & Farida, 2018; Hartinah et al., 2019; Zang, Yan, Dong, Huang, & Zang, 2012).

$$L = \max |F(x_i) - (x_i)| \quad (2)$$

Description:  $F(x_i) : p(z \leq z_i)$ ;  $z \sim n(0,1)$ ;  $S(x_i)$  : The proportion of the Count of  $z \leq z_i$  against the whole count of  $z_i$ ; and  $x_i$ : score respondents.

While the homogeneity test aims to determine whether the variants of a number of the population are equal or not, this test uses the Bartlett test, which is as follows (N. Agustiana, Supriadi, & Komarudin, 2019; Jayalath, Ng, Manage, & Riggs, 2017; Y. P. Sari & Masri, 2020).

$$\chi^2 = (\ln 10) \{B - \sum dk \log s_i^2\} \quad (3)$$

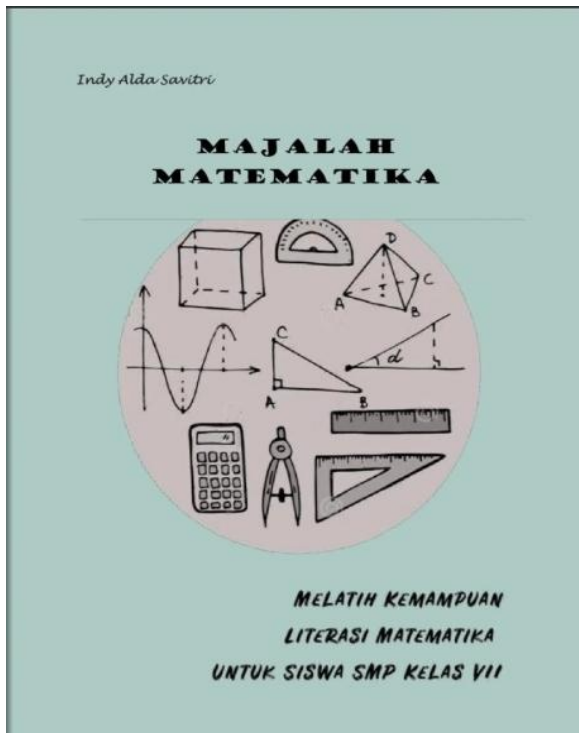
Description:  $s_i^2$ : combined variance; B: Bartlett value;  $dk$ : Degrees of Freedom ( $n - 1$ ).

### C. RESULTS AND DISCUSSION

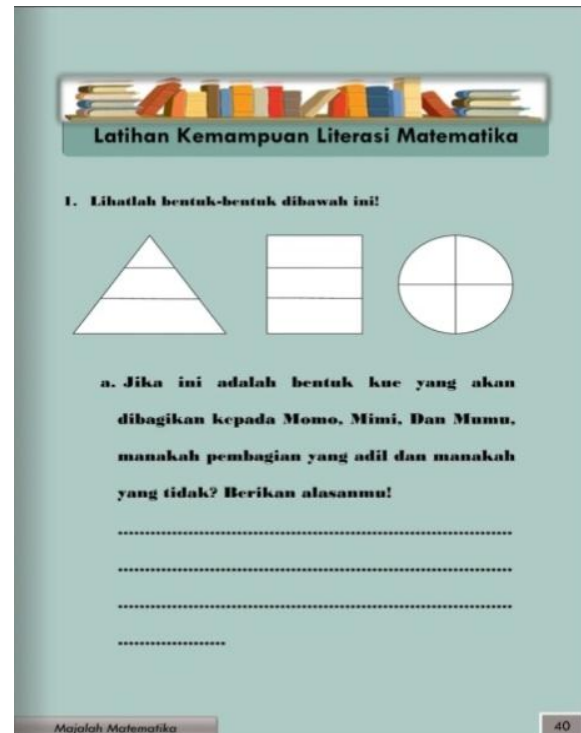
The results of the development of electronic magazines based on mathematics literacy have been researched in SMP in Bandar Lampung which has previously been validated by media experts and materials and has been tested to students. The development of this media is based on the analysis of students needs 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 a research reveal that 89.89% of students learn to use electronic-based learning media and able to improve student learning outcomes up to 40%. This is in line with the phrase (A. U. Sari, Farida, & 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 lideation.

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



**Figure 2.** Front Cover of Electronic Mathematics Magazine



**Figure 3.** Contents of Electronic Mathematics Magazine

Once the media has been developed in accordance with the design and the created *Rancangan*, 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 result of expert validation of phase 1 material 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 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 destroy 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 of 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.

**2. The Validation Result of the Media Expert**

Validation of the media members are done validation to 3 experts who are competent in the field of media experts learning from UIN 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 product, the trial 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 (Masykur et al., 2017) that learning media or teaching materials can eliminate the students' saturation and boredom in learning. Besides, also according to (Kurniawati, Hadi, & 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.

## 2. Test Result Learning

After the test was done small and large scale 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 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  $L_{count} = 0,1582$  dan  $L_{table} = 0,1772$ . Because  $L_{count} \leq L_{table}$  then  $H_0$  accepted, it means normal distribution data. For the control class, an average of 54.8 raw deviation of 18.73 with  $L_{count} = 0,1452$  dan  $L_{table} = 0,1772$ . Because  $L_{count} \leq L_{table}$  then  $H_0$  accepted, it means that data is also distribution 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. This test uses the Barlett test in the experiment 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  $F_{count}$  of 1.9041 and  $F_{table}$  of 2.0144. Because  $F_{hitung} \leq F_{tabel}$ , a test decision  $H_0$  received means that data comes from the same variance. Once known normal data and derived from the same variances then the next  $t$ -test.

Results of the  $t$ -test obtained that obtained  $t_{count} = 2.252 \geq t_{table} = 2.059$  then  $H_1$  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 the electronic magazine products are developed effectively and can be used in the learning process.



This results in showing the electronic magazines used are learning materials in the form of teaching material that contains mathematical literacy content. With the media in the form of electronic magazines, students are interested in conducting a classroom learning which during this time the study took place using a monotonous teaching book with a mediocre look. In addition, the advantage of this magazine itself is completed with interesting visualization that gives a new atmosphere in the learning process. Electronic magazines can also help reduce the use of paper and facilitate users in accessing it through electronic media such as computers, laptops, mobile phones, Blackberry, Android, iPhone, iPad and other technologies.

#### D. 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 effective test can be concluded that the learning outcomes of students who use electronic magazines based on mathematics literacy better than the results of learning students do not use for electronic magazines. By conclusion, 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 on other materials on other aspects of learning.

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