



# Validity Study: The Development of Mathematics E-Module for Remedial Learning

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**Abstract.** Remedial learning is a learning activity needed by students to help achieve the expected mastery. Remedial learning can be carried out independently by students through interactive learning resources, these learning resources are modules. The use of electronic modules (e-Module) is very suitable to be applied in the current era of technology, so it is necessary to develop e-Module for remedial learning. This research aims to develop mathematics e-Module for remedial learning that meet valid criteria. The research method used is Research and Development with reference to the ADDIE development model, that's Analyze, Design, Development, Implementation, and Evaluation. However, this study is limited only to the development stage to obtain the validity quality of the e-Module. This validity test is a theoretical validity involving experts in the fields of material and media. The results of this study obtained a mathematics e-module for remedial learning that meets the valid criteria. It was obtained on the basis of comments from the experts on aspects of content, construction, language, appearance, and technical adequacy. The implication of this research is that the mathematics e-module for remedial learning is suitable for testing on students and can be implemented in remedial mathematics learning.

**Keywords:** validity, e-Module, remedial learning.

## 1 Introduction

The impact experienced by students at the time of study from home during the pandemic, resulted in a lack of students' understanding of mathematical concepts. [1]. Learning loss is defined as a situation where students do not understand content and skills at the same level as usual [2]. Learning loss has an impact on student learning completeness, students will find it difficult to learn advanced material if the basic material has not been mastered well.

Algebra is one of the basic topic in mathematics. It is prerequisite topic material for advanced mathematics. However, students have difficulty understanding the use of algebraic symbols [3]. Student scores on the ability to represent algebraic are in the low category, students have difficulty with symbolic representation in completing algebraic multiplication [4]. Another error that occurs after learning algebraic expression was difficulty in the concept of solving algebraic equations and algebraic operations, such as algebraic addition and subtraction [5][6].

Efforts to overcome learning loss, incomplete learning, misconceptions, or overcome students' difficulties in achieving learning goals, require teachers to carry out remedial activities. Remedial activities are a service in learning that is implemented for students to improve their learning achievement, so that they can achieve the predetermined criteria for completion [7]. Mastery of learning emphasizes that students must achieve the first learning goal before they move on to learning new lessons, this will continue to depend, mastery of the first learning objective is a prerequisite for the second learning goal and so on.

Remedial improves students' math skills and can increase the probability of passing the final math exam [8]. To improve mathematical skills through remedial studies requires adequate instruction and considering individual needs. Remedial activities will be successful if they can provide direct feedback to students [9]. *The National Association of EMS Educators* mentioned the implementation of remedial learning through three processes, starting with identifying student problems or difficulties, retraining students on the difficulties experienced, and the last is to carry out an evaluation [8].

Remedial learning can be done independently by students. This will have an impact on the effectiveness of the time required, by not disturbing the effective hours of regular learning. Therefore, interactive learning resources are needed [10]. According to the Ministry of National Education, learning resources can be presented in various forms. Interactive learning resources must be designed systematically and completely so they can be used effectively [11]. One of the interactive learning resources is the module.

Modules provide stronger integration by substantially minimizing the instructor's role [12]. There are two main components in fulfilling module requirements, that is the content and the presentation component. Assessment of the validity of the module in terms of content components is about aspects of the material in the module. The module contains at least learning instructions, competencies achieved, supporting information, exercises, worksheets and evaluation [13]. Meanwhile, the presentation aspect stated that the display setting involves a short title and is accompanied by an illustrative design [13].

The development of mathematics modules in Indonesia is widely used at all levels of educational institutions, so it is recommended to develop e-modules to support distance learning during Covid-19 [14]. Today's digital era, it can be designed into electronic modules that provide easy access to users, thereby contributing to achieving distance learning goals. E-Module is the term for electronic modules, or modules in electronic format that are run via a computer, smartphone, or something like that. E-Modules are a good and flexible alternative to provide individual learning opportunities [15].

The development of e-Modules has been carried out by Wahyuni and Ananda [16], this research carries out the development of Android-based interactive mathematics learning media. The media used in development is audio visual which is equipped with enrichment questions and algebra quizzes. However, the e-Module that has been developed is not specifically for remedial learning. Therefore, it is necessary to

develop e-Module that support the implementation of remedial learning in algebra. The mathematics e-module for remedial learning in this research presents questions, summaries, and learning videos. This e-Module presents the test at the beginning of the activity. After passing the initial test, the student will be directed to re-study the unfinished sub-matter. The aim of this research is to develop a mathematics e-module for remedial learning on algebraic that meets valid criteria.

## 2 Method

This research uses the Research and Development (R & D) method. Development is a complex activity process and has the aim of organizing activities and supporting learning design. This research was designed using the ADDIE development model, that is Analyze, Design, Development, Implementation, Evaluation [17].

At the analysis stage, an analysis of the need assessment for remedial learning e-Module. At the design stage, a flowchart and draft of the e-Module are designed. At the development stage, the draft design is realized into a product prototype, then its quality is tested through validity testing. At the implementation stage, the learning environment is prepared and involves students. The last one is the evaluation stage, where an assessment of the quality of the product being developed is carried out.

This research was carried out up to the validity testing stage. The validation performed is the theoretical validation used to determine the quality of the e-Module in terms of eligibility for use. The validation process involves material experts and media experts. Aspects of material validity include content, construct, language and appearance, while aspects of media validity include technical adequacy, appearance, content and language. The research instrument is a validation questionnaire.

Nieveen [18] states that the product is said to be valid if the expert states that the product being developed is suitable for use. The possible results of the analysis that occur at the validity stage are:

- 1 = Not yet suitable for use and there are still many requires consultation
- 2 = Suitable for use with major revisions
- 3 = Suitable for use with minor revision
- 4 = Suitable for use without revision

If the results of the analysis of the designed remedial e-Module are suitable for use without revision, then it can then be tested or implemented. If the analysis results are suitable for use with minor revisions, then revisions need to be made based on the expert's recommendations before being tested.

Meanwhile, if the results of the analysis indicate a major revision then the revision should be repeatedly carried out. Whereas if the analysis results show that the product is not suitable for use, further consultation is needed regarding the remedial e-Module product being designed.

Nieveen's criteria [18] state that the product being developed is valid if the experts declare it valid and the product is suitable for use which is based on strong theory, good consistency and the components developed are interrelated. Referring to Nieveen's criteria, the valid criteria for remedial e-Module products in this research are that they

are said to be valid if all experts state that the product is suitable for use without revision or suitable for use with minor revision. The type of data obtained is qualitative in nature which comes from comments and suggestions from experts.

### 3 Result and Discussion

The remedial learning e-Module development process in this research refers to the development stages of the ADDIE model. The product quality obtained is a remedial e-Module that has achieved valid criteria. The e-module developed is in accordance with the learning resource criteria mentioned by Mudlofir [19], namely various forms of materials that can be used by educators to assist the learning process.

The results at the analysis stage show that there is a demand for complete understanding of students' concepts in algebraic material, this is because algebraic material is one of the prerequisite materials for advanced mathematics [20]. Based on the independent curriculum, students are required to take part in re-learning or remedial learning if they have not achieved the desired learning goals. However, learning resources devoted to remedial implementation are still limited.

At the design stage, the researcher designed a flowchart for the remedial learning e-Module that would be developed. The development of this remedial e-Module does not present material at the beginning of learning, but learning begins with the completion of an initial test, so that students can get feedback from the initial test results.

At the development stage, the e-Module design was developed into a complete product, then validity tested. The aspects measured in e-Module validity follow the validity aspects in Adora's [21] research regarding assessment criteria for technology-based learning media. The validity aspects to be measured are material and media. Valid on material aspects if the experts state that the e-module was appropriate in terms of content, construction, language and appearance of the e-remedial module application. Whereas, valid on the media aspects if the experts state that the e-module was appropriate in terms of technical competence, appearances of the improved e-module application, content and language.

#### 3.1 Material Validity

This validation was carried out by four material experts. The material based expert results indicate that this e-Module has been eligible for testing based on four aspects. Details of the process and results of material validity can be seen below.

##### a) Content

The validity of content measured in this study consists of 11 aspects. Based on the validation results, the four experts stated that several aspects were quite good and appropriate, namely aspects (iii) Completeness, (iv) Coherence, (v) Conformity of the content of the e-Module with the learning material, (vii) Accuracy of the integration of the e-Module according to with remedial learning needs, (viii) Systematic content of e-Modules according to student uniqueness, e-Module stages help students (ix) achieve learning goals, (x) foster interest in learning, and (xi) increase independence.

In the aspect of (i) suitability and (ii) clarity of the content of the e-module with learning outcomes, two of the four experts stated that it was appropriate. Meanwhile,



one expert suggested adapting the story questions to the context being discussed, and another expert suggested improvements that were adapted to the variable concept (see Fig 1 and 2).

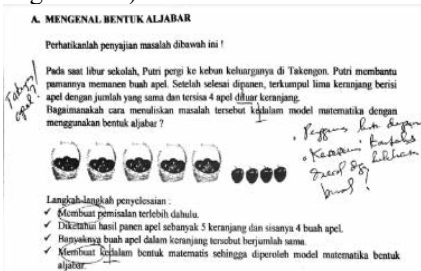


Fig.1. Draft of the story context



Fig. 2. Revision of story context

In the aspect (vi) Balance of the proportion of questions with e-Module content, two of the four experts stated that it was balanced. Meanwhile, the other two suggested adding several example questions related to the sub-topics being discussed.

The researchers performed the revision by adjusting the contents of the story and the concepts of variables, as well as added examples to specific sub-topic.

### b) Construct

The validity of the construct measured in this research consists of seven aspects. Based on the validation results, the four experts stated that several aspects were good and appropriate, namely aspects (i) Conformity and (ii) Clarity of competency levels in the e-Module with Learning Achievement levels, (iii) Completeness of competency levels in the e-Module in accordance with instructional level, (vi) Suitability of the level of the e-Module learning stages to the uniqueness of students, and (vii) Suitability of the level of the e-Module learning stages to increase student interest in learning.

In aspect (iv) Suitability of the question level in the e-Module according to the instructional objectives, three of the four experts stated that it was appropriate. Meanwhile, another expert suggested readjusting the indicators and distracting answers to the questions used. In aspect (v) Suitability of the level of learning activity instruction in accordance with instructional objectives, two of the four experts stated that it was appropriate. Meanwhile, another expert suggested adding several reminder notes, and another expert suggested adding sentences that could motivate students so that the level of learning activity instructions were easily understood by students.

The researchers did the revision by adding reminders at the beginning of the topic, as well as scratched a few sentences for motivation.

### c) Language

The validity of language measured in this research consists of three aspects. Based on the validation results, the four experts mentioned the assessment aspect (iii) The suitability of the use of punctuation marks is in accordance with good and correct Indonesian. In the assessment aspect (i) Suitability of the sentence structure used, which is simple and communicative, two of the four experts stated that it was appropriate. Meanwhile, the other two experts suggested changing several words to make the

sentences more communicative. In the assessment aspect (ii) Clarity of the language used, it is easy to understand, three out of four experts stated that it was clear. Meanwhile, another expert suggested re-examining some of the mathematical symbols used.

The researchers revised some of the sentences to make them more effective, as well as improved the writing of mathematical symbols.

**d) Appearance of the remedial e-Module application**

The validity of appearance of the remedial e-Module application measured in this study consists of 11 aspects. Based on the validation results, the four experts stated that several aspects were good and appropriate, namely aspects (ii) Accuracy of placement of instructions at the beginning of the e-Module menu, (iii) Accuracy of using symbols as instructions in the e-Module, (iv) Accuracy of design each page of the e-Module, (v) Continuity of transitions between pages, (vi) Appropriateness of the color composition used in the e-Module, (vii) Accuracy in the use of writing font types, (viii) Accuracy in the use of writing size, (ix) Neatness layout of the text used, (x) Suitability of image resolution displayed in the e-Module.

In aspect (i) Regularity of the e-Module menu design, three out of four experts stated that it was orderly. Meanwhile, another expert suggested adding a concept map menu. In aspect (xi) The suitability of images, illustrations and symbols does not interfere with the appearance, two of the four experts stated that they were appropriate, while the other two experts suggested readjusting the image size to the context of the e-Module display.

The researchers made the revision by adding a concept map to the main menu, as well as clarifying the size and revolution of the image on the module (see Fig 3 and 4).

Perhatikanlah tabel di bawah ini :

Nama	Barang yang dibawa	Pemisalan	Bentuk Aljabar
Rifki	 Keterangan : 3 tas 5 bola		$\left. \begin{matrix} 3 \cdot a \\ 5 \end{matrix} \right\} 3a + 5$
Sultan	 Keterangan : 3 tas 5 bola	Satu tas kandung : a Satu bola : b	

Fig. 3. Draft of image display

Perhatikanlah tabel di bawah ini :

*harus lebih!*

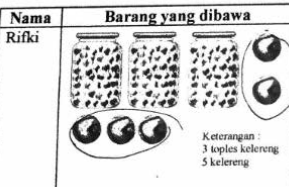
Nama	Barang yang dibawa	Pemisalan	Bentuk Aljabar
Rifki	 Keterangan : 3 tas 5 kelereng		$\left. \begin{matrix} 3 \cdot a \\ 5 \end{matrix} \right\} 3a + 5$

Fig. 4. Revision of image display

### 3.2 Media Validity

This validation was carried out by three media experts. The validation results of media experts based on the measured aspects show that this e-Module product is and worthy of being tested. Details of the media validity process and results can be seen below.

#### a) Technical adequacy

The validity of technical adequacy measured in this research consists of five aspects. Based on the validation results, the three experts stated that three aspects had met the criteria, namely aspect (ii) Easy access to all e-Module application pages was in accordance with good application standards. Aspect (iv) performance of button functions or navigation of e-Module applications in accordance with good application standards. For aspect (v) The page loading speed of the e-Module application is in accordance with good application standards.

In the aspect (i) Security of the initial installation of the e-Module application in accordance with good application standards, two of the three experts stated that it met good standards, while one another expert suggested avoiding several unnecessary permission requests for ease and security of access. The researchers did the revision by resetting the biodata page (see Fig 5 and 6).

Fig. 5. Drfat of the biodata page

Fig. 6. Revision of the biodata page

In aspect (iii) Conformity of the appearance of the e-Module application with good application standards, one out of three experts stated that the appearance of the application complies with the standards. Meanwhile, another one stated that the overall appearance of the application is quite simple, it should be able to vary between pages.

#### b) Appearance of the remedial e-Module application

The validity of the e-Module application display measured in this study consists of 11 aspects. Based on the validation results, the three experts stated for aspects (iii) Accuracy of using symbols as instructions in the e-Module, (iv) Accuracy of design of

each e-Module page, (v) Continuity of transitions between pages, and (x) Suitability of image resolution what is displayed in the e-Module is very good and quite appropriate.

In aspect (i) Regularity of the e-Module menu design, two of the three experts stated that the menu design was orderly. Meanwhile, other experts said the menu design was quite simple and could be modified with appropriate icon choices. In aspect (xi) The suitability of images, illustrations and symbols does not disturb the appearance and beauty, two out of three experts stated that the images, illustrations and symbols were appropriate. Meanwhile, another expert asked to readjust the image or symbol so that it does not interfere with the appearance of the application (see Fig 7 and 8).



Fig. 7. Draft of the home page



Fig. 8. Revision of the home page

In aspect (vi) Suitability of the color composition used in the e-Module, two of the three experts stated that it was appropriate. Meanwhile, another expert suggested that the writing of the questions should not be bolded, and in aspect (vii) Accuracy of using the type of writing font, two of the three experts stated that it was appropriate. Meanwhile, another expert suggested readjusting the font and writing spacing. In aspects (viii) Accuracy in the use of text size, and (ix) Neatness of the layout of the text used, two of the three experts stated that it was correct and appropriate. Meanwhile, another expert stated that adjustments to the size and layout of the e-Module were still needed (see Fig 9 and 10).

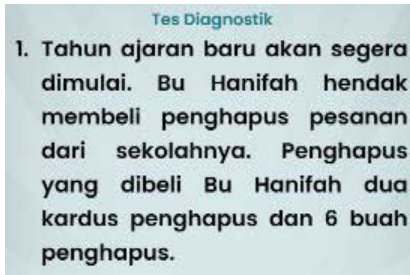


Fig. 9. Draft of the question writing format

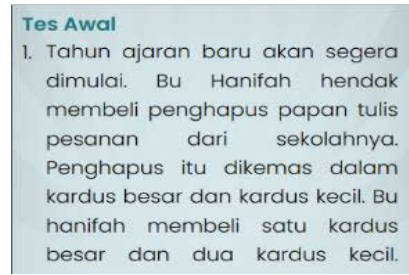


Fig. 10. Revision of the question writing format

In aspect (ii) Accuracy of placement of instructions at the beginning of the e-Module menu, two of the three experts stated that it was correct. Meanwhile, another expert suggested readjusting the contents of the instructions menu so that users can understand it more easily (see Fig 11 and 12).



Fig. 11. Draft of the instructions page



Fig. 12. Revision of the instructions page

The researchers performed the revision by customizing the display and improving the usage instructions, as well as re-adjusted the writing font.

### c) Content

The validity of content measured in this study consists of 11 aspects. Based on the validation results, the three experts stated that they were quite suitable for several aspects, namely aspects (i) Conformity, (ii) Clarity, (iv) Correspondence of the content of the e-Module with Learning Outcomes, (vii) Accuracy of the integration of the e-Module in accordance with remedial learning needs, (viii) Systematic content of e-Modules according to students' uniqueness, Stages of e-Modules help students (ix) Achieve learning goals, (x) Develop interest in learning, and (xi) Increase learning independence.

In aspects (v) Suitability of the content of the e-Module with learning material, and (vi) Balance of the proportion of questions with the content of the e-Module, two out of three experts stated that it was balanced. Meanwhile, another expert suggested readjusting the suitability of the content and proportion of the e-Module questions. In aspect (iii) Completeness of the content of the e-Module in accordance with the Learning Outcomes (CP) in the independent curriculum, two of the three experts stated that it was complete. Meanwhile, another expert suggested adding a concept map to show the urgency of e-Modules in learning. The researchers performed the revision by adding menus in the home page (see Fig 13 and 14).



Fig. 13. Draft home design with 2 menus



Fig. 14 Draft home design with 3 menus

#### d) Language

The validity of language measured in this research consists of three aspects. Based on the validation results, the three experts stated that (i) The suitability of the sentence structure used was very good, simple and communicative, (ii) The clarity of the language used was very good and easy to understand, and (iii) The appropriateness of the use of punctuation marks is very in accordance with Indonesian grammar.

The results of the mathematics e-Module for mathematics learning validation are in the form of recommendations based on qualitative data obtained from seven experts. Four of the seven experts stated that the e-Module was suitable for use without revisions, while the other three stated that it was suitable for use with minor revisions. Following Nieveen's [17] criteria which states that the product being developed is valid if the experts state it is valid with a recommendation that it is suitable for use without revision or suitable for use with minor revisions which is based on strong theory, good consistency and the components developed are interrelated.

A valid media will help students understand material from the media being studied [22]. The e-Module validation criteria according to the Directorate of High School Development, Directorate General of Primary and Secondary Education [23] include: The e-Modules used achieve basic competencies, are in accordance with learning objectives, are appropriate to the learning material, make it easier to understand the material, can increase interest, suit the needs and conditions of students, and can facilitate effective and efficient learning. In the development of this mathematics e-Module for remedial learning according to the experts, it has fulfilled the aspect criteria required by the Directorate General of Basic Education. This e-Module also contains learning videos, according to the Ministry of National Education [12] which states that images and videos that support the content of the material are very necessary, this is useful for clarifying the explanation of the material and being attractive.

The validity of the remedial learning e-Module has also been fulfilled in terms of technical adequacy, content, and appearance. Research by Aladwani and Palvia [24]

states three aspects of assessment as a test of the validity of media development, namely technical adequacy, content and appearance. There are six aspects that are assessed in the development of learning media, namely design, visuals, interactivity, audio, content and language [25].

The characteristics of mathematics e-Modules for remedial learning are also in accordance with those mentioned by Mulyasa [26], that is 1) provides clear information and instructions for use, initial instructions for the e-Module are presented on the home page making it easier for users, 2) involves the characteristics of students, it can be studied according to each students' basic abilities, 3) supports the achievement of learning objectives through active involvement of students. To achieve learning completeness, students carry out learning independently on the material presented, 4) The presentation of material is logical, coherent, and clear. That is in accordance with the learning objectives, and 5) There is feedback, with an evaluation menu provided to measure the achievement of students' understanding.

#### 4 **Conclusion**

This research produces a mathematics e-Module for remedial learning on algebraic that meets valid criteria. Validity is obtained through recommendations from material and media experts regarding the feasibility of remedial e-Modules carried out at the development stage. Obtaining theoretical validity includes aspects of validity: content, construct, language, appearance and technical adequacy. The seven experts involved stated that this product was valid and suitable for testing on students, this has reached the validity criteria. Therefore, the implications of this research can be continued with trials on students and it is hoped that they can implement e-Module products in remedial learning in schools.

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