

# *The Validity of the E-Book on Integrated Physics for Earthquake Disaster Mitigation Materials*

Fitrah Ayu<sup>1</sup>, Ahmad Fauzi<sup>2</sup>

<sup>1</sup> Students of physics education post graduate program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang.

<sup>2</sup> Lecturer of physics education post graduate program, Faculty of Mathematics and Natural Science, Universitas Negeri Padang.

Prof. Dr. Hamka Street, Air Tawar Padang, Sumatera Barat. Indonesia



**Abstract—** Physics is a branch of natural science that studies natural phenomena and their changes. Earthquakes are one of the natural phenomena that often hit parts of Indonesia, especially the city of Padang. Earthquakes have an impact on the sustainability of society. The purpose of this study was to determine the validity of the e-book on integrated Physics disaster mitigation materials based on discovery learning. Research and Development / R&D is the method used in this research. Research and development methods are used to produce products and test these products. The validity questionnaire is an instrument used in this study. This validity questionnaire includes five aspects, namely content feasibility, presentation feasibility, language feasibility, graphic feasibility, and media feasibility. Earthquake disaster mitigation needs to be integrated into the Physics e-book considering that Indonesia is a region prone to earthquakes. So that the development of an integrated Physics e-book with valid discovery learning-based earthquake mitigation material is carried out. *E-book* Integrated physics of valid discovery learning-based earthquake disaster mitigation materials can be used in the learning process in schools, to reduce the impact caused by earthquake disasters.

**Keywords —** E-Book, Validity, Earthquake, Mitigation

## I. INTRODUCTION

Indonesia is one of the areas that has a very high earthquake activity. This is because Indonesia is located in the most active earthquake route in the world because it is located on three plate piles, namely, Indo-Australia from the south, Eurasia from the north, and the Pacific from the east [1]. Earthquakes are natural phenomena that are very difficult to predict how and when they occur [2]. Earthquakes are vibrations that spread across the earth's surface. Earthquakes are generally caused by the release of energy generated by moving plates due to pressure [3].

The city of Padang, West Sumatra was again hit by a tectonic earthquake on Wednesday, September 30, 2009 which had a power of 7.6 on the Richter scale. The location of the earthquake was approximately 57 KM Southwest Pariaman with a depth of 71 km. The earthquake caused severe damage, collapsed buildings, and dozens of people were trapped in the rubble [4]. Earthquake disaster mitigation is needed to reduce the impact of an earthquake disaster. Earthquake disaster mitigation according to Law Number 24 Year 2004 Article 47 aims to reduce the risk of earthquake disasters for people living in earthquake-prone areas [5]. This mitigation activity can be carried out in formal education institutions, namely schools.

Schools are formal educational institutions that can become a means of providing knowledge to students about earthquake disaster mitigation. The integration of earthquake disaster mitigation can be provided during the learning process in schools. Based on Government Regulation Number 32 of 2013 concerning the National Education System, it explains that each education unit contains content and learning processes about regional potential, local uniqueness, and regional problems [6]. The consequence of implementing the 2013 curriculum requires the integration of regional potentials into learning. One of the regional potentials in Padang City is the occurrence of an earthquake.

Earthquake disaster mitigation materials can be integrated into Physics subjects. Physics is a natural science that analyzes and describes the structure of events that occur in nature based on cause and effect, which eventually emerge rules or laws in physics [7]. Physics learning can be supported by using teaching materials. Teaching materials are defined as a learning resource used by teachers in the learning process to support the learning process [8]. Teaching materials are also defined as learning resources to support the learning process in schools [9]. Teaching materials are anything that is used to support, facilitate, influence or encourage the achievement of student competencies [10]. E-books are one of the teaching materials that are in accordance with the demands of the 4.0 industrial revolution. E-books are textbooks that are converted into digital format, e-books also have a meaning as a learning environment that contains a database that stores topics in a lesson [11]. In general, the structure of an e-book contains an initial section, a content section, and the end. The initial part of the e-book consists of a title page, a publisher page, a foreword page, a table of contents page, a list of figures page, a table list page, and page numbering. The contents of the e-book consist of core and basic competencies, competency achievement indicators, materials, videos, exercises, and competency tests. The final part of the e-book consists of a glossary, bibliography, and index [12]. Physics e-book developed using a learning model. The learning model is defined as a plan for the implementation of the learning process that is applied by the teacher during the learning process at school [13].

Discovery learning model is a learning model that is in accordance with the 2013 curriculum. Discovery learning model is a learning model that occurs when students are not presented with learning in the final form, but it is hoped that students organize their own knowledge [14]. Physics e-book integrated with earthquake disaster mitigation material based on discovery learning discovery learning which is suitable for use in the learning process is a Physics e-book which has a valid category. Validity comes from the word validity, which means the extent of accuracy and accuracy of a measuring instrument in performing its measuring function [15]. Validity is also defined as a standard measure that indicates the accuracy and validity of an instrument [16].

The validity of the e-book Physics integrated with discovery learning-based earthquake disaster mitigation material is very necessary to reduce the impact caused by earthquake disasters. The formulation of the problem in this study is what is the level of validity of the integrated Physics e-book material on earthquake disaster mitigation based on discovery learning? Based on the formulation of the problem, the purpose of this study is to determine the validity level of the integrated physics e-book on earthquake disaster mitigation based on discovery learning.

## II. METHODS

Research and development / R&D is a research method used in this research based on the problems and objectives that have been stated. Research and development is a research method used to produce certain products, and to test the products that have been produced [17]. Physics e-book integrated with discovery learning-based earthquake disaster mitigation material is a product that is produced and tested.

The stages of developing an e-book on Physics integrated with discovery-based earthquake disaster mitigation materials using the Plomp development model. The Plomp development model consists of three stages, namely the preliminary research phase, the development or prototyping phase, and the assessment phase (Tjeerd Plomp, 2013). However, this research has been limited to the second stage, namely the development or prototyping phase of the expert review section. The instrument used at the expert review stage was the product validity instrument. This instrument is a validation questionnaire. This validation questionnaire is used to determine the validity level of the e-book being developed. This validation questionnaire contains a list of questions covering five aspects, namely content feasibility, presentation feasibility, language feasibility, graphic feasibility, and media feasibility. This validation questionnaire is filled in by expert validators,

This research was conducted in January-June 2020. The product assessment based on a questionnaire that was filled in by expert validators was analyzed to determine the level of validity of the *e-book* that was developed. The validity analysis used a Likert scale

with the following steps. 1) giving a score for each answer item strongly agree (4), agree (3), disagree (2), and strongly disagree (1), 2) add up the scores of each expert validator for all indicators. Giving validity values using the Aiken's v formula, namely:

$$v = \frac{\sum s}{[n(c-1)]} \quad \dots (1)$$

Information :

v = validity value

s = r - I0

r = number given by validator

I0 = the lowest number of validity assessments, namely 4

c = the highest number of validity assessments, namely 1

n = number of validators

Determining the level of validity, that is, the range of "v" numbers obtained will be obtained from 0.00 to 1.00. The following is Table 1, the validity range of the Physics e-book.

Table 1. Validity Category

| No. | Achievement Indicators | Category |
|-----|------------------------|----------|
| 1   | 0.6-1.00               | Valid    |
| 2   | <0.6                   | Invalid  |

Source: [18]

### III. RESULT AND DISCUSSION

Physics e-book integrated discovery learning-based earthquake disaster mitigation material consisting of an initial section, a content section, and an end section. This is in accordance with the theoretical study that in general e-books must contain a beginning, a content section, and an end. The data obtained in this study is the validity data of the integrated Physics e-book disaster mitigation material based on discovery learning. This validity data consists of five aspects, namely content feasibility, presentation feasibility, language feasibility, graphic feasibility, and media feasibility. The results of the analysis of the validity test for the content feasibility aspect can be seen in Figure 1.

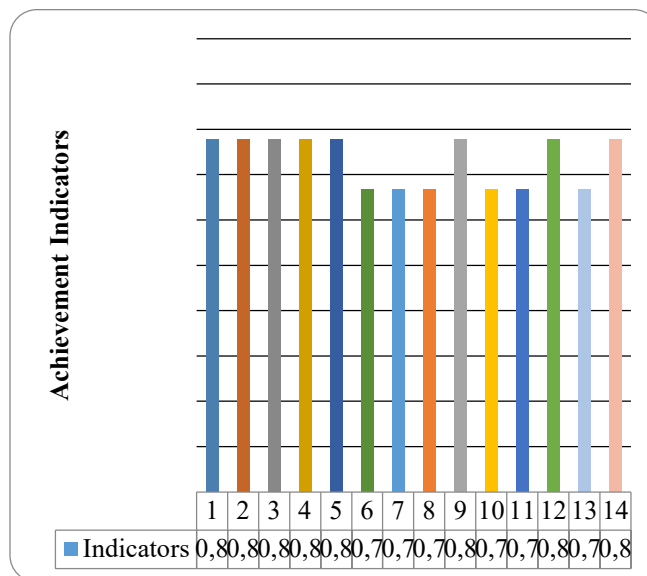


Figure 1. Content Feasibility Aspects

Figure 1 is the result of the analysis of the validity test for the content feasibility aspect. The content feasibility aspect consists of fourteen indicators. The first indicator is the material in the e-book according to the 2013 curriculum with the achievement of the indicator 0.8 being in the valid category. The second indicator is the material in the e-book in accordance with the core competencies

of SMA class XI Physics with the achievement of the indicator 0.8 is in the valid category. The third indicator is the material presented in the e-book in accordance with the demands of the indicators formulated from the basic competencies of 3.8 class XI with the achievement of indicators 0.8 being in the valid category. The fourth indicator is the formulation of competency attainment indicators according to basic competencies with the achievement of indicators 0.8 being in the valid category.

The sixth indicator, namely the cases given is relevant to the daily life of students, living things, and technology with the achievement of the indicator 0.7 being in the valid category. The seventh indicator, namely the facts in the presentation of the problem according to the topic in the material with the achievement of the indicator 0.7 is in the valid category. The eighth indicator is a concept presented in accordance with the applicable definition in the field of physics with the achievement of the indicator 0.7 being in the valid category. The ninth indicator is the procedure that is presented coherently and correctly with the achievement of the indicator 0.8 being in the valid category. The tenth indicator is the earthquake material presented in accordance with the formulation of disaster indicators with the achievement of the indicator 0.7 being in the valid category.

The eleventh indicator, namely the integration of earthquake disaster mitigation material in the e-book in accordance with the Physics material with the achievement of the indicator 0.7 is in the valid category. The twelfth indicator is learning activities in accordance with the discovery learning model with the achievement of indicators 0.8 being in the valid category. The thirteenth indicator is a description of the material presented in the e-book up to date with the achievement of the indicator 0.7 being in the valid category. The last indicator for the aspect of content feasibility is a description of the material presented in the e-book from a reliable source with the achievement of the indicator 0.8 being in the valid category.

The average indicator achievement in the content feasibility aspect is 0.7 with the valid category. This is in accordance with the theoretical study that the Physics e-book is said to be valid in terms of the feasibility of the content having the achievement of indicators > 0.6, so that this Physics e-book is valid from the aspect of content feasibility. The second aspect assessed by expert validators is the aspect of presentation feasibility. The results of the analysis of the validity test for the feasibility aspect of presentation can be seen in Figure 2.

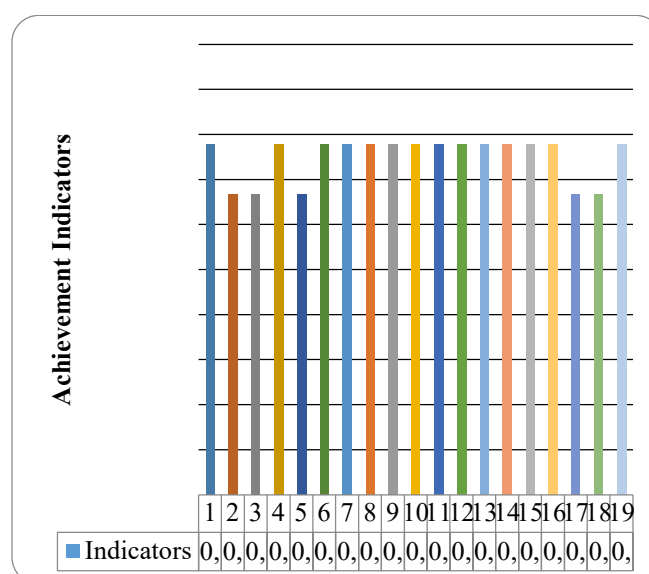


Figure 2. Presentation Feasibility Aspects

Figure 2 is the analysis result of the validity test for the feasibility aspect of presentation. The presentation feasibility aspect consists of nineteen indicators. The first indicator, the concept map, fulfills the relationship between factual, conceptual, and procedural with the achievement of the indicator 0.8 being in the valid category. The second indicator, namely the learning objectives in the e-book, is easy for students to understand, with the achievement of the indicator 0.7 being in the valid category. The third indicator, namely the systematic presentation in each e-book meeting, is compiled consistently with the achievement of the indicator 0.7 being in the valid category. The fourth indicator, namely e-books, helps students learn independently with the achievement of the indicator 0.8 being in the valid category. The fifth indicator is the presentation of a straightforward e-book so that it is easily understood by students with the achievement of indicator 0,

The sixth indicator, namely the presentation of the e-book is equipped with interactive buttons with the achievement of the indicator 0.8 being in the valid category. The seventh indicator, namely the presentation of an e-book, can increase the knowledge of students about earthquake disasters with the achievement of the indicator 0.8 being in the valid category. The eighth indicator, namely the presentation of e-books, can motivate student learning with the achievement of the indicator 0.8 being in the valid category. The ninth indicator, namely the presentation of e-books, can increase the creativity of students with the achievement of the indicator 0.8 being in the valid category. The tenth indicator, namely the numbering of images, is presented in order with the achievement of the indicator 0.8 being in the valid category.

The eleventh indicator, namely the numbering of the formula is presented sequentially with the achievement of the indicator 0.8 being in the valid category. The twelfth indicator, namely the presentation of images and videos in the e-book, clarifies the material of physics and earthquake disasters with the achievement of the indicator 0.8 being in the valid category. The thirteenth indicator, namely the exercise in the e-book, makes it easier for students to understand the integrated physics material for earthquake disaster mitigation with the achievement of the indicator 0.8 being in the valid category. The fourteenth indicator is the evaluation presentation in the e-book in accordance with the integrated physics material for earthquake disaster mitigation with the achievement of the indicator 0.8 being in the valid category.

The sixteenth indicator, namely the e-book presentation, facilitates students to measure their own competency achievements with the achievement of the indicator 0.8 being in the valid category. The seventeenth indicator, namely the e-book, provides a feedback evaluation with the achievement of the indicator 0.7 being in the valid category. The eighteenth indicator, namely the e-book presentation, helps students solve problems in everyday life with the achievement of the indicator 0.7 being in the valid category. The last indicator for the feasibility aspect of the presentation is that the e-book is presented using ICT with the achievement of the indicator 0.8 being in the valid category.

The average indicator achievement in the aspect of presentation feasibility is 0.7 with the valid category. This is in accordance with the theoretical study that the Physics e-book is said to be valid in terms of the feasibility aspect of the presentation having the achievement of indicators > 0.6, so that this Physics e-book is valid from the aspect of presentation feasibility. The third aspect assessed by the expert validator is the aspect of language eligibility. The results of the analysis of the validity test for the feasibility aspect of the language can be seen in Figure 3.

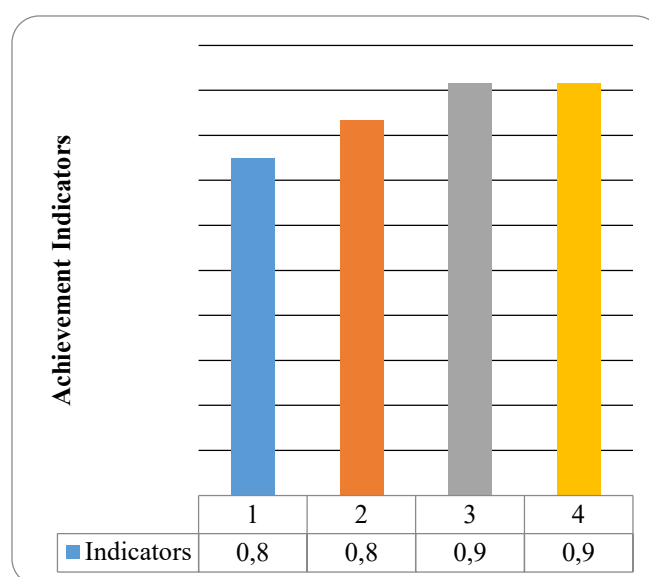


Figure 3. Aspects of Language Eligibility

Figure 3 is the result of the analysis of the validity test for the feasibility aspect of the language. The language eligibility indicator consists of four indicators. The first indicator is that the language used in the e-book is communicative with the achievement of the indicator 0.8 being in the valid category. The second indicator, namely the language used in the informative e-book with the achievement of the indicator 0.8, is in the valid category. The third indicator is the language used in the e-book in accordance with the rules of good and correct Indonesian with the achievement of the indicator 0.9 which is in the valid category. The last indicator

for the feasibility aspect of language is the language used in the e-book according to the rules of Enhanced Spelling with the achievement of the indicator 0.9 which is in the valid category.

The average indicator achievement in the aspect of language eligibility is 0.9 with the valid category. This is in accordance with the theoretical study that the Physics e-book is said to be valid in terms of the feasibility of the language if it has an achievement indicator  $> 0.6$ , so that this Physics e-book is valid from the aspect of language feasibility. The fourth aspect assessed by expert validators is the aspect of graphic feasibility. The results of the analysis of the validity test for the graphic feasibility aspect can be seen in Figure 4.

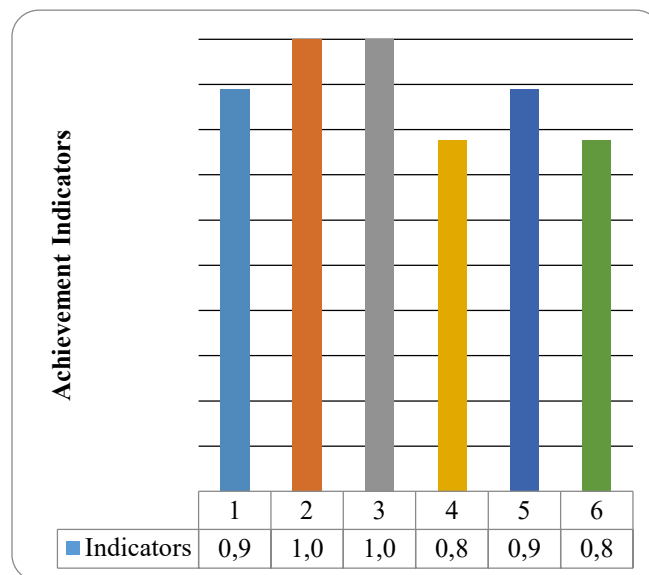


Figure 4. Aspects of Graphic Feasibility

Figure 4 is the result of the analysis of the validity test for the feasibility aspect of the graphic. The graphic feasibility indicator consists of six indicators. The first indicator, the e-book display, has attractiveness with the achievement of the indicator 0.9 being in the valid category. The second indicator, the size of the letters in the e-book, can be read clearly with the achievement of the 1.0 indicator in the valid category. The third indicator, which is the font in the e-book, can be read clearly with the achievement of the indicator 1.0 in the valid category. The fourth indicator, the color of the e-book, has attractiveness with the achievement of the indicator 0.8 being in the valid category. The fifth indicator, the cover, describes the contents of the e-book with the achievement of the indicator 0.9 being in the valid category.

The average indicator achievement in the graphic feasibility aspect is 0.9 with the valid category. This is in accordance with the theoretical study that the Physics e-book is said to be valid from the aspect of graphic feasibility if it has an indicator achievement  $> 0.6$ , so this Physics e-book is valid from the aspect of graphic feasibility. The final aspect assessed by expert validators is the feasibility of the media. The results of the analysis of the validity test for the feasibility aspect of the media can be seen in Figure 5.

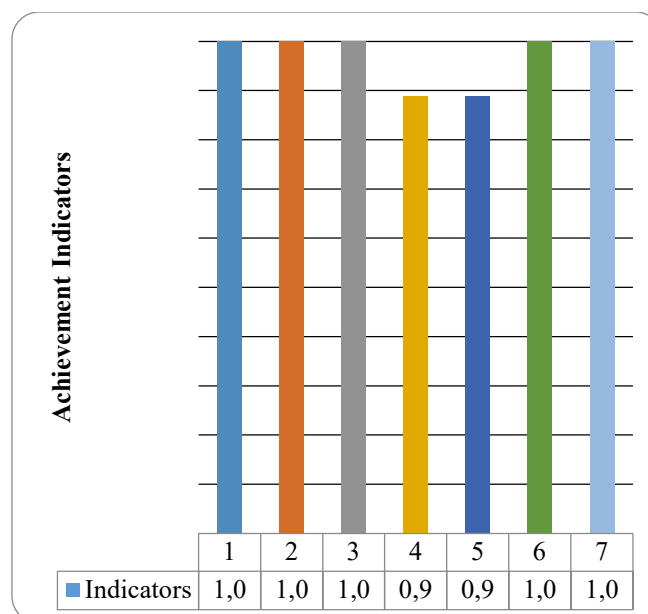


Figure 5. Aspects of Media Feasibility

Figure 5 is the result of the analysis of the validity test for the feasibility aspect of the media. The media feasibility indicator consists of seven indicators. The first indicator, the e-book, can be used at any time with the achievement of the 1.0 indicator being in the valid category. The second indicator, the e-book, can be used anywhere with the achievement of the indicator 1.0 being in the valid category. The third indicator, namely learning e-books in accordance with the development of science and technology with the achievement of indicator 1.0, is in the valid category. The fourth indicator, namely the e-book is easily accessible by learning, with the achievement of the indicator 0.9 is in the valid category. The fifth indicator, namely e-books, can be installed easily with the achievement of the indicator 0.9 being in the valid category. The sixth indicator is the provision of feedback with the achievement of indicator 1, 0 is in the valid category. The last indicator for the media feasibility aspect is the e-book which can be operated easily with the achievement of indicator 1.0 in the valid category.

The average indicator achievement in the media feasibility aspect is 0.9 with the valid category. This is in accordance with the theoretical study that the Physics e-book is said to be valid in terms of the feasibility aspect of the media if it has indicator achievement  $> 0.6$ , so this Physics e-book is valid from the aspect of media feasibility. So that the Physics e-book is integrated with earthquake mitigation material discovery learning-based development is declared valid both from the aspects of content feasibility, presentation feasibility, graphic feasibility, language feasibility, and media feasibility, so that e-books can be used in the learning process in schools, to reduce the impact caused by the earthquake disaster.

#### IV. CONCLUSION

Based on the results and discussion in this study, it can be concluded that the integrated physics e-book on discovery learning-based earthquake disaster mitigation material is in the valid category and can be used in the learning process in schools, to reduce the impact caused by earthquake disasters.

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