

The Validity Of The Integrated Physics Ebook On Landslide Disaster Mitigation Materials Based On A Problem Based Learning Model

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Abstract – Education aims to prepare students to have a number of competencies and abilities to face life's challenges. One form of life's challenges is the threat of natural disasters from the environment where students live, such as landslides disaster. Landslides have a bad impact on the environment and can even threaten survival. The impact of landslides can be minimized by mitigating disasters. Mitigation is an effort made to reduce and minimize the consequences of a disaster, which includes preparedness, alertness and capability. Mitigation activities can be carried out through education in schools by integrating landslide disaster mitigation materials into teaching materials for physics subjects. This study aims to determine the validity of the integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model. This research uses the research and development (R&D) method with the Plomp model which is limited to the second stage, namely the development or prototyping phase. The developed physics ebook was tested for validity by experts. The instrument used in this study was a validity questionnaire consisting of four aspects, namely the feasibility of the content, the feasibility of presentation, the feasibility of language and the feasibility of graphics. The results showed that the integrated physics ebook on landslide disaster mitigation materials based on the problem-based learning model was in the valid category so that it could be used in physics learning in schools.

Keywords – Validity, Physics Ebook, Landslides, Problem Based Learning, R & D.

I. INTRODUCTION

Education is an effort made so that humans have a number of competencies and life skills. Education is a conscious and planned effort in providing the widest possible opportunity for students to be able to develop their potential so that they have strength and skills [1]. Education is also carried out to form a tough attitude in students in facing life's challenges. Students need to have the life skills to deal with this situation, including in dealing with the threat of natural disasters which are areas's potential where students live. In this case, teachers' creativity is needed to equip students in responding to potential natural disasters in their respective areas. Teachers can innovate to develop learning materials according to potential, local uniqueness and local problems [2].

One of the local uniqueness and regional problems is the potential for landslides disaster to occur. Landslides occurred in parts of West Sumatra. This is because the West Sumatra region has uneven land contours due to the Bukit Barisan mountain range traversing. One area in West Sumatra that often experiences landslides is the city of Sawahlunto. Most of the people of Sawahlunto

city live in the hills. In the past 10 years, there have been more than 56 landslides in the city of Sawahlunto out of 165 total landslides in the West Sumatra region [3].

Landslides have a devastating impact on the environment and can even threaten survival. The impact of landslides can be minimized by mitigating disasters. Mitigation is an effort made to reduce and minimize the effects of a disaster, which includes preparedness, alertness and capability [4]. The implementation of natural disaster management can be done through disaster mitigation. One form of mitigation activities that can be carried out is in the form of education and training [5].

Education is an effective vehicle for building student behavior in dealing with disasters. In the education sector, disaster mitigation efforts can be carried out by integrating disaster knowledge into learning materials. The disaster integrated education strategy that is implemented can increase the knowledge and skills of students in dealing with disasters which will be transferred to the family, so that it will maximize community resilience in the face of disasters [6]. One of the subjects that can be integrated with landslide natural disaster mitigation materials is physics.

Physics is a branch of natural science that studies natural phenomena. Physics examines a collection of knowledge about natural objects and events. Natural disasters are one of the natural phenomena. Landslide disaster mitigation materials can be integrated into physics materials. Departing from the problem of landslides as a fact that occurs, students can learn the physics concepts that exist in the landslide event. Learning that begins with a problem will challenge the curiosity of students by knowing directly the application of physics material in everyday life. This learning also leads students to be able to understand the material for landslide disaster mitigation.

One of the learning models that begins with problems in accordance with physics subjects is Problem Based Learning (PBL). Problems in PBL can generate curiosity, practice problem solving skills and the creativity of students in carrying out investigations. PBL is a learning model suggested in the 2013 curriculum. The 2013 curriculum emphasizes learning that can motivate students, provide inspiration as well as challenges and encourage the creativity of students [7].

PBL is characterized by real problems as a context for students to learn problem solving skills and gain knowledge [8]. PBL is scientific and inquiry-based learning so that it can develop 21st century skills. PBL is able to equip students with 21st century skills [9]. The application of PBL has an influence on students to obtain higher learning achievement in physics [10]. Problems related to landslides and physics materials can be stated in the teaching materials used in the learning process.

Teaching materials are all forms of materials used to assist teachers in carrying out teaching and learning activities in the form of written and unwritten materials [11]. Teaching materials are a set of materials arranged systematically so as to create an atmosphere that allows students to learn well [12]. Teaching materials will encourage teacher efficiency and can improve student performance because their use will make learning more practical and interesting [13]. One of the teaching materials that is in accordance with the current development of information technology is an electronic book (electronic book).

Electronic books (ebooks) are digital versions of books that generally contain text, images, and videos [14]. Ebooks have advantages over printed books such as being simpler, cheaper and easier to obtain. Another advantage of ebooks that they are more durable because they can be operated via digital devices such as computers or laptops and the appearance of ebooks is more attractive than printed books [15]. Ebooks are very practical to use in learning because of the easy way to access ebooks and an attractive ebook appearance [16]. The other of advantages ebooks are the ease of searching and reading them, saving paper material, and easy transfer of text [17]. Ebooks are able to integrate sound, graphics, images, animation, and video shows so that the information presented is richer than conventional books [14].

The systematics of the ebook at the beginning contains the title page, publication page, preface, table of contents, table list, list of figures, and page numbering. In the content section of the ebook consists of chapters which are divided into sections and subsections of material [18]. The content section contains core competencies, basic competencies, competency achievement indicators, mind/concept maps, material coverage, material exposure, worksheets, practice questions, and assessment or competency tests [19].

From the above explanation, it is necessary to develop an integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model. Physics ebook that is designed needs to be tested for its validity so that it is categorized as suitable for use in learning. Validity shows suitability, meaningfulness [20]. Validity can be interpreted as a measure of accuracy or truth [21]. An instrumen is said to have high validity or is called valid if the instrumen can measure what will actually be

measured [22]. Through the validity test, a physics ebook can be produced that qualify the valid criteria. The component of the validity test regarding the development of teaching materials in general includes a content feasibility component, a linguistic component, presentation component, and a graphic component [11]. This is in accordance with [23] which stipulates the quality standards (feasibility) that the ebook must have is content / material, language, presentation and graphics

After producing a valid physics ebook, then the ebook can be used in physics learning. By using a valid physics ebook, it is hoped that students can master physics material and also understand landslide disaster mitigation so as to reduce losses from the impact of landslides.

The the problem in this study was how the level of validity of the integrated physics ebook on landslide mitigation materials based on a problem-based learning model. The purpose of this study was to determine the validity level of the integrated physics ebook on landslide mitigation materials based on a problem-based learning model.

II. RESEARCH METHODS

This research method is a Research And Development method (R&D). This type of development research is a process used to develop and validate educational products [24]. Development research is a research method used to produce certain products and test the effectiveness of these products [22]. The product developed in this study is an integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model.

The development model used in this research is the Plomp model. The Plomp model consists of 3 stages, namely preliminary research, development or prototyping phase, assessment phase [25]. The stages in this study were limited to the second stage, namely the development or prototyping phase in the expert review section. The product produced after this stage is called prototype II. Expert review is the stage where the designed physics ebook is assessed by experts. This assessment includes four aspects of the feasibility of the ebook, namely the feasibility of content, presentation feasibility, graphic feasibility and language feasibility. The instrument used is a validity questionnaire which contains statements based on indicators on each aspect of the ebook's feasibility.

Physics ebook was assessed based on a questionnaire that had been filled in by experts. The questionnaire uses a Likert scale with a scale of 1-4. The steps taken in the validity analysis carried out were: a) giving a score on each answer item, namely 4) strongly agree, 3) agree, 2) disagree, 1) strongly disagree; b) add up the scores of each expert validator for all indicators; c) providing validity values using the Aiken's V formula, namely:

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

Annotation:

V = validity value

s = r - I₀

r = number given by validator

I₀ = the lowest number of validity assessments

c = the highest number of validity assessments

n = number of validators

The range of numbers V determines the level of validity obtained. Value $V \geq 0.6$ is defined as a high enough coefficient so that it is in the "valid" category. The validity category of the physics ebook can be seen in Table 1 [26].

Table 1. Validity Category

No.	Value	Category
1	0,6 – 1,00	Valid
2	< 0,6	Invalid

III. RESULTS AND DISCUSSION

The data in this study is the validity data of the integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model. Data validity consists of four aspects, namely content feasibility, presentation feasibility, language feasibility and graphic feasibility. The results of data analysis on the content feasibility aspect are presented in Figure 1.

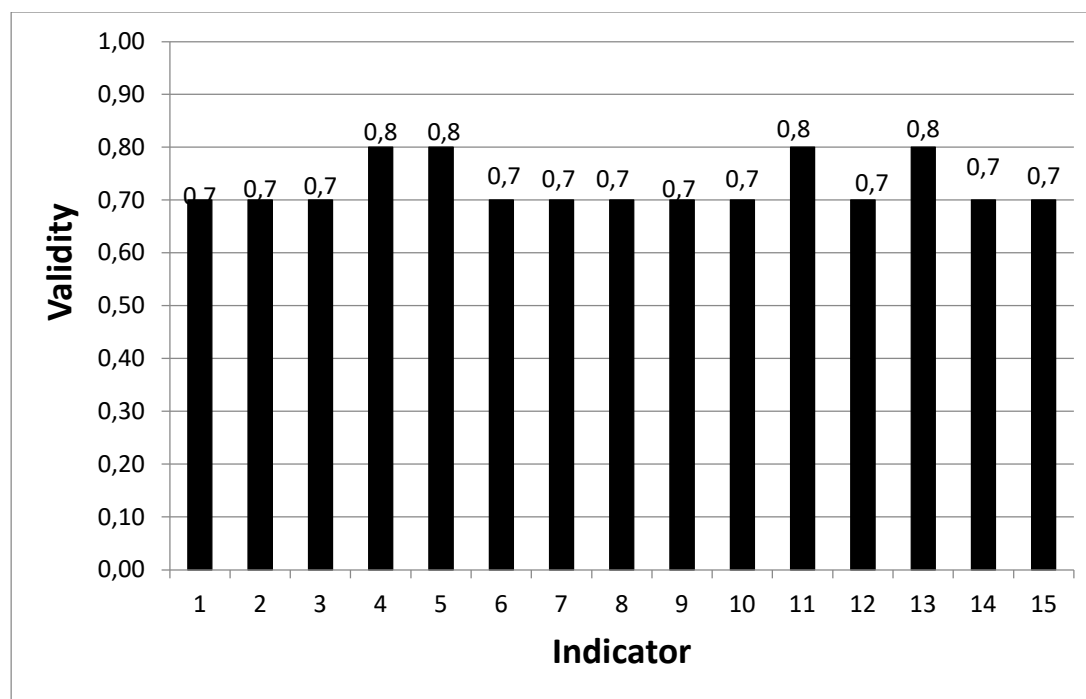


Figure 1. Feasibility Aspects of Contents of Indicators 1-15

Figure 1 shows an assessment of the feasibility aspect of the content on the accuracy and correctness of the physics ebook component with indicators, namely: 1) the material presented in the ebook is in accordance with the demands of KI, KD, and formulated indicators; 2) the material in the ebook is described completely; 3) the depth and breadth of the material in the ebook is presented accurately; 4) the facts presented in the ebook correspond to the topics in the material; 5) the facts presented in the ebook are in accordance with reality; (6) the facts presented can improve students' understanding; 7) the concept material in the ebook is in accordance with the rules of physics; 8) the concept in the ebook supports the achievement of student competencies 7; 9) the concept presented has a single meaning (does not cause many interpretations); 10) equations / formulas are in accordance with the rules for writing physics formulas; 11) examples and cases in the ebook are in accordance with the reality of everyday life; 12) examples and cases in the ebook can improve students' understanding; 13) the procedure material presented in the ebook is in accordance with the learning topic; 14) the procedure material in the ebook is in accordance with the rules of physics; 15) procedure material in the ebook supports competency achievement. Indicators 1-15 are in the range 0.7-0.8 with a valid category. The validity value of other indicators on the content feasibility aspect is presented in Figure 2.

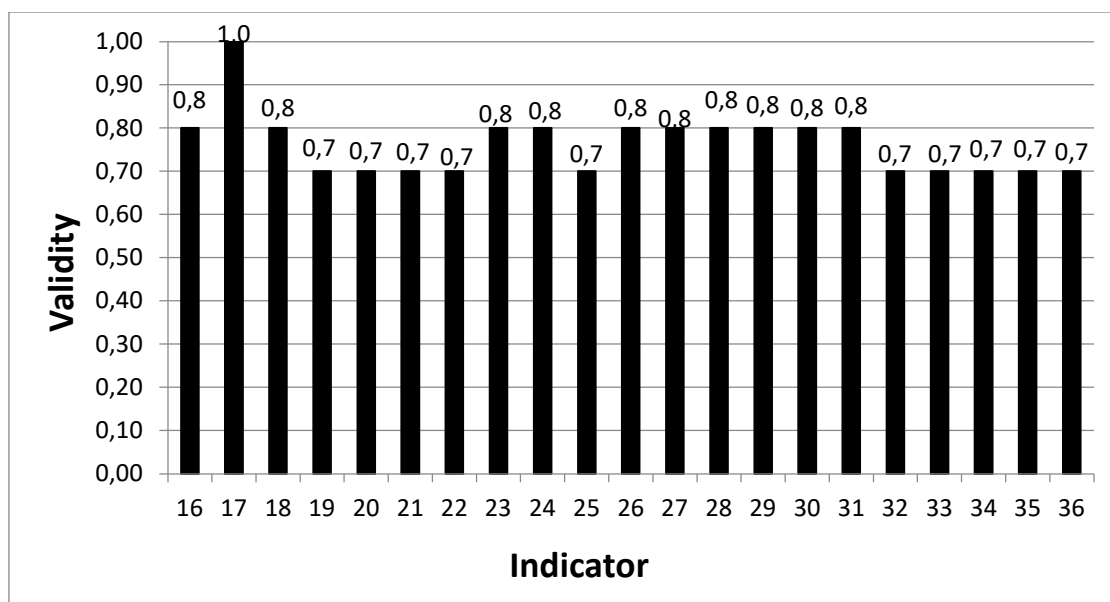


Figure 2. Feasibility Aspects of Contents of Indicators 16-36

Figure 2 shows an assessment of Indicators 16 to 36. Indicators 16-22 are an assessment of the validity of the content at the stages of the problem based learning model, namely: 16) the steps in the worksheet contain the stages of the problem based learning model; 17) worksheets in the ebook present contextual issues; 18) the problems presented lead students to start the stages of the learning model; 19) worksheets in the ebook contain steps to identify problems and how to solve problems; 20) worksheets in the ebook lead students to conduct investigations independently or in groups; 21) worksheets in the ebook contain activities to present the results of investigations by students; 22) worksheets in the ebook contain activity steps in the form of reflections on activities that have been carried out by students.

The indicators 23 to 25 are indicators of content validity assessment of the landslide components, namely: 23) the physics material in the ebook is integrated with the landslide material; 24) there is a relationship between examples of landslides and physics material in the ebook; 25) integration of physics material with landslide mitigation material has been made correctly.

Indicators 26 to 36 are indicators of assessing the validity of content in the contemporary components, namely: 26) illustrations in the ebook according to everyday life; 27) the images on the ebook correspond to everyday life; 28) videos on the ebook according to everyday life; 29) illustrations in the ebook support students to understand physics material; 30) pictures in the ebook support students to understand physics material; 31) video in the ebook supports students to understand physics material; 32) ebook can add insight to students; 33) ebook in accordance with the conditions of local problems and the environment of students; 34) ebook accompanied by examples of application / real cases that often appear in the environment around students; 35) presentation of ebook material encourages curiosity of students; 36) problems on the ebook worksheet encourage the curiosity and creativity of students to find solutions.

Indicators 16-36 are in the range 0.7-1.0 with a valid category. The indicators on the content feasibility aspect of the completeness of component the physics ebook are presented in Figure 3.

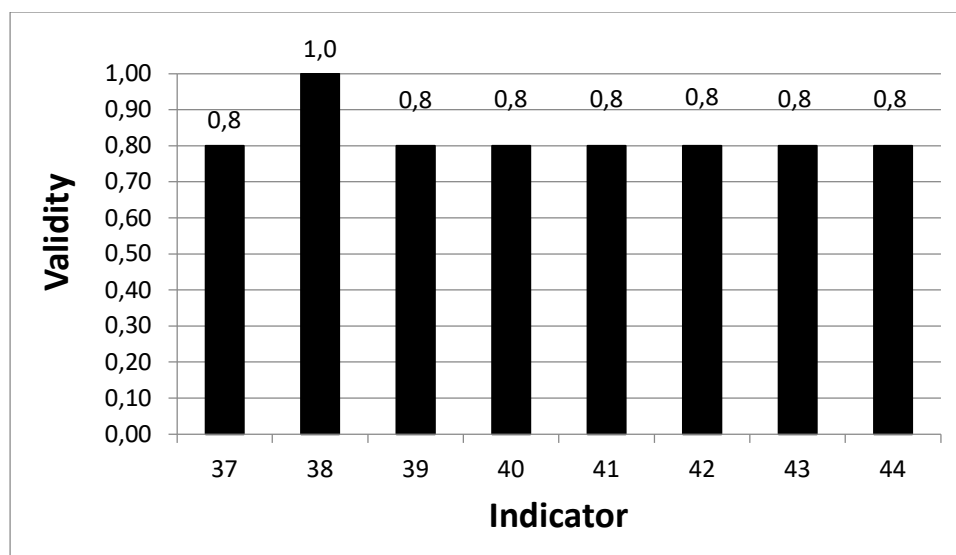


Figure 3. Feasibility Aspects of Contents of Indicators 37-44

From Figure 3 it can be seen that the content feasibility indicator in the completeness component of the physics ebook section consists of indicators 37-44, namely: 37) ebook cover provides an illustration of the ebook content; 38) title / ebook identity refers to basic competencies ; 39) the learning competencies to be achieved are derived from the content standards in the 2013 curriculum; 40) learning material refers to the basic competencies to be achieved; 41) the worksheet contains a problem based learning model; 42) instructions for carrying out work / activities are made clearly; 43) assignments or exercises are in accordance with the learning material; 44) the assessment in the ebook is carried out to measure the achievement of students' competencies. Indicators 37-44 are in the range 0.8-1.0 with a valid category.

All indicators on the content feasibility aspect consist of 44 indicators. The average achievement of all indicators in the content feasibility aspect is 0.8 with the valid category. This validity value > 0.6 . This shows that the developed physics ebook is valid in the aspect of content feasibility.

The second aspect that is analyzed in the validity of the physics ebook is the aspect of the feasibility of presentation. The results of the analysis on the aspect of presentation feasibility are presented in Figure 4.

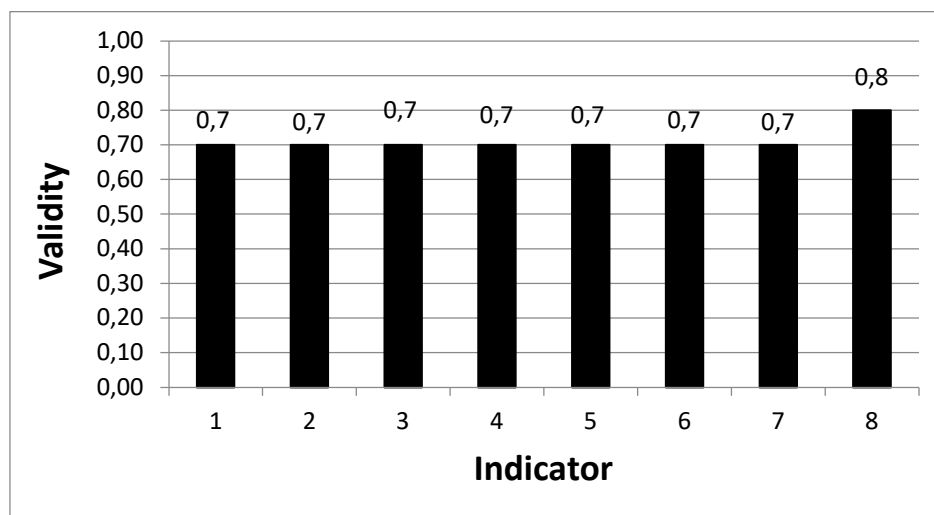


Figure 4. Aspects of Presentation Feasibility

From Figure 4 it can be seen that the presentation feasibility aspect has 8 indicators, namely: 1) presentation in accordance with the standard ebook sequence; 2) ebook facilitates students to investigate by themselves; 3) ebook facilitates students to identify problems relevant to learning materials; 4) ebook facilitates students to collect relevant data and information to prove hypotheses; 5) ebook facilitates students to process data; 6) ebook facilitates students to do careful examination to prove the hypothesis; 7) ebook facilitates students to draw conclusions; 8) the ebook developed has made use of ICT.

All indicators in the aspect of presentation feasibility are in about 0.7-0.8 with a valid category. The average achievement of all indicators in the aspect of presentation feasibility is 0.8 with the valid category. This validity value > 0.6. This shows that the developed physics ebook is valid in the aspect of presentation feasibility.

The third aspect analyzed in the validity of the physics ebook is the aspect of language feasibility. The results of the analysis on the aspect of language feasibility are presented in Figure 5.

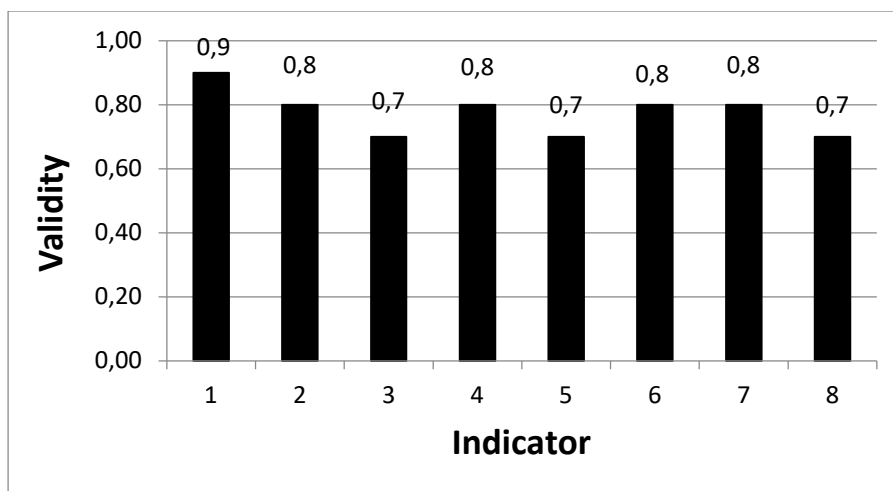


Figure 5. Aspects of Language Feasibility

From Figure 5 it can be seen that the feasibility aspect of language has 8 indicators, namely: 1) the language used is in accordance with the level of cognitive development of students; 2) the language used is in accordance with the emotional maturity level of students, 3) the message or information is conveyed in communicative language; 4) the language in the ebook encourages students to be actively involved in learning activities; 5) conjunctions used in the ebook in accordance with the writing rules; 6) sentences presented in the ebook are effective; 7) the terms used in the ebook are consistent; 8) the language used refers to the rules of Indonesian which are good and correct.

All indicators on the aspect of language feasibility are in about 0.7-0.9 with a valid category. The average achievement of all indicators in the aspect of language feasibility is 0.8 in the valid category. This validity value > 0.6. This shows that the developed physics ebook is valid in the language aspect.

The fourth aspect analyzed in the validity of the physics ebook is the aspect of feasibility of graphics. The results of the analysis on the feasibility aspect of graphics are presented in Figure 6.

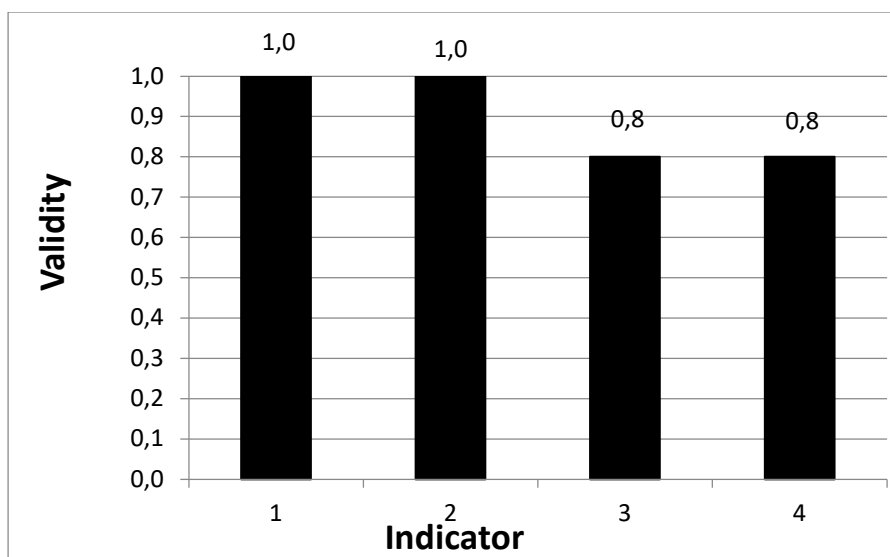


Figure 6. Aspects of Graphic Feasibility

From Figure 6 it can be seen that the aspects of the graphic have 8 indicators, namely: 1) the ebook uses clear and legible fonts, 2) the ebook has an orderly layout; 3) the placement of image captions in the ebook is correct; 4) the illustrations presented in the ebook can build students' understanding.

All indicators on the feasibility aspect of graphics are in the range 0.8-1.0 with a valid category. The average achievement of all indicators in the graphic feasibility aspect is 0.9 with the valid category. This validity value > 0.6. This shows that the developed physics ebook is valid on the feasibility aspect of graphics.

The results of the validity analysis on the four aspects show that the integrated physics ebook of landslide disaster mitigation materials based on the problem-based learning model can be declared valid in the aspects of content feasibility, presentation feasibility, language feasibility and graphic feasibility. The developed physics ebook has met the assessment criteria on all validity indicators of the physics ebook development. This shows that the physics ebook can be used in physics learning in schools.

IV. CONCLUSION

Based on the description of the results and discussion, it can be concluded that the integrated physics ebook of landslide disaster mitigation materials based on the problem-based learning model is valid on the aspects of content feasibility, presentation feasibility, language feasibility and graphic feasibility. The developed physics ebook can be used in the physics learning process.

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