The analysis of depth high school physics material in terms of standards for the development of earthquake theme physics e-books

D P Perwita and A Fauzi*
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Padang 25131, Indonesia

*ahmadfauzi@fmipa.unp.ac.id

Abstract. The aim of this study was to determine the current level of depth of the material compared to standard books, if the physics material was superficial, it will be added with standard material. So, before developing an earthquake-themed physics e-book, it was necessary to conduct a depth analysis of high school physics material in terms of standard material. The population of this study was a high school physics book and a physics standard book, with a sample of two high school physics material books class X semester 1 based on the 2013 curriculum and two physics standard books. This study was descriptive qualitative in nature, using a sheet instrument of physics material depth analysis in terms of standard material. The data collection techniques were used documentation and content analysis. Based on the analysis, it was found that the physics material for class X semester 1 was still in the deep enough category. This was evidenced from the results of the depth analysis of physics material in terms of standard material that basic competence (BC) 3.1, 3.2, 3.3, 3.4, 3.5 and 3.6 with the percentage of depth respectively 20%, 87%, 47%, 60%, 60% , and 53%. Therefore, shallowness in physics material will be complemented by standard material, thereby improving the quality and having a high level of depth in the high school physics e-book in the development of earthquake physics e-book. So, the next study to be carried out is to develop an earthquake-themed high school physics e-book.

1. Introduction
The National Education System as stated in Law Number 20 of 2003 has the function of developing capabilities and shaping the character and dignity of the nation's civilization in the context of educating the nation's life. The intelligence and progress of a nation is largely determined by the quality of human resources. The role of education is very important to create an intelligent, peaceful, open and democratic society. Therefore, education renewal must always be carried out to improve the quality of education of a nation. To improve the quality of education based on curriculum implementation. If the quality of the curriculum is good, the quality of education is also good. The curriculum as a guide for the implementation of education requires a means of textbooks.
Based on the Regulation of the Minister of National Education No. 2 of 2008 in article 4 paragraph (1): "Textbooks at the primary and secondary education levels are assessed for their feasibility first by the National Education Standards Agency (BSNP) and have the proper content, language, presentation and graphics that have been determined by Government Regulation No. 19/2005 and Ministerial Regulation No. 22 and 23 of 2006. The standard of eligibility of textbook content according to BSNP can be seen from the completeness of the material, the breadth of the material, and the depth of the material contained in the book [in 1]. Textbooks should be able to help understand the main scientific concepts easily. The main scientific concepts should be presented in depth in the textbook, but the presentation should not lead to misunderstanding. The ability to find and understand relevant learning resources is very important in their learning and life process [2]. Students' abilities can be developed by using various learning resources in the learning process [3].

The physics standard book is the main handbook for higher education academics in the world who concentrate knowledge in the field of science and engineering which contains standard materials that have good quality depth and breadth of physics material. In standard books, the material and examples are easy to understand because they use simple language. The standard book presents concepts that often occur misconceptions, accommodating (Science, Technology, Engineering, and Mathematic (STEM) in learning and structurally accommodate practicality in presenting the meaningfulness of a physics concept. These elements become important in order to develop student competence in physics. The STEM concept will make the discussion meaningful. How physics is not only related to material formulas, but how the discussion is carried out in an integrated manner with technology and science. Students get a strong understanding of the concepts of physics, so that they can apply their conceptual understanding to solve quantitative problems smoothly. In Indonesia there have been many standard books in Indonesian translation versions. Examples of basic physics standard books are books by Giancolli, Tipler, Halliday and Resnick, Serway Vuille.

Physics book is a handbook for teachers and students in secondary schools. In physics textbooks, there are several core competencies that must be achieved. Core competencies (KI) are the level of ability to achieve the competency standards of graduates that a student must have at each grade level, Core competencies are designed in four interrelated groups, namely with regard to religious attitudes (core competency 1), social attitudes (core competency 2), knowledge (core competency 3), and application of knowledge (core competency 4). The four groups become a reference for basic competencies and must be developed in an integrative learning event. While basic competence (BC) is the ability and minimum learning material that students must achieve for a subject in each educational unit which refers to the core competencies [4].

The materials in the textbook at each level of education have similarities and differences. For example, high school physics books and standard books have similarities about the material being discussed. This of course will be found in almost every textbook because the curriculum in Indonesia is spiral in which each level of education will be given the same material but different portions. However, the difference lies in the depth of the material discussed in the textbook and the most important thing is the involvement of many people with various experts in the preparation of the textbook. This difference of course will provide a different set of knowledge for teachers and students who use these textbooks and of course will affect the quality of learning.

Education 4.0 takes advantage of technological advances that have developed, so one of the right problem solutions is to use electronic-based teaching materials. E-books can be used by students as a source of independent study at home. E-books are presented in an electronic format that is able to display interactive simulations by combining animation, text, video, images, audio, and navigation that make students more interactive so that learning can take place more fun and attract students' attention. The advantages of e-books include: small physical size, easy to carry, not rotten, easy to process, easy to distribute, and supports reforestation, thereby reducing paper waste and reducing tree cutting [5]. To make physics e-books more effective and efficient, e-books can be designed by integrating earthquake disasters.
An earthquake is a great shock caused by disturbances in the earth's crust that spread to the earth's surface [6]. Earthquakes are caused by collisions between the earth's plates, active faults of volcanic activity or rock debris [7]. Earthquake is a natural event whose time and place of occurrence cannot be predicted [8]. So that a school institution is needed which is an educational forum to reduce the consequences of an earthquake.

Based on interviews with several teachers, the material contained in high school physics textbooks was in accordance with the objectives of the curriculum. Then obtained information that there are some information, concepts or similarities that are lacking or not in the textbook so that teachers look for information in other sources such as the internet and pocket books. This is a problem in the teaching and learning process. Although textbooks are an achievement of teachers who are believed to be qualified in their fields, it does not rule out the possibility of containing, a little or a lot, things that do not meet standards.

Based on previous study, analyzing the suitability of physics material with earthquake material, the results of his study revealed that physics material for class X semester 1 with earthquake material is suitable for integration with vector material, straight motion and parabolic motion [9]. Then another study which title is ”content analysis of high school physics textbook class X straight motion material”. In this research, it analyzes the suitability of the material only in straight motion material which is viewed from the completeness, breadth and depth of the material [10]. However, previous studies have not analyzed the depth of physics material in terms of standard material. From previous study, this needs to be developed by analyzing the depth of physics material in terms of standard material.

One of the important criteria for textbooks is the feasibility of the content which can be judged from the depth of the material. This study analyzes the depth of the material based on factual knowledge, conceptual and procedural knowledge from physics material and standard material. Factual knowledge is knowledge about separate elements and has its own characteristics pieces of information. Conceptual knowledge includes knowledge of categories, classifications, and the relationship between two or more categories or classifications. Procedural knowledge is knowledge about how to do something [11].

This study is an important part of the development of high school physics e-book, this is to determine the level of depth of high school physics material now in terms of standard material. After obtaining the results of the depth of physics material with standard material, if the physics material is superficial or lacks it will be equipped with standard material, thus improving the quality and having a high level of depth in the SMA physics e-book. This is what makes the research objectives. Taking into account the above background encourages researchers to conduct a depth analysis of physics material in terms of standard material for the development of earthquake-themed high school physics e-book.

2. Research Method
This type of this study is descriptive qualitative. Descriptive method is a method used in data collection on a scientific background and is used by researchers to describe an event that occurred [12]. The data obtained are qualitative data. The results of the analysis obtained are expressed in percentage terms and then interpreted in the form of scientific narrative.

The population of this study is in the form of high school physics books and physics standard books. The technique used in sampling using the Sampling Porpositive technique, with samples of two high school physics books class X semester 1 and two standard physics books. The selection of high school physics books selected is based on the use of superior schools and less superior schools in the city of Padang. Two books on high school physics material based on the 2013 curriculum published by the Ministry of Education and Culture in the 2016 revised edition and a triad publication. Then for two standard material books, the book Physics Principles With Application Edition 6 by Douglas C Giancolli [13] is coded Book A and the book Fundamental Of Physics Edition 9 Volume by Halliday, Resnick and Jearl Walker [14] is coded Book B. Material per Basic Competencies (BC) in high school
physics books with standard material book A and book B are grouped in Table 1. The basic competencies used in this study are based on the 2013 curriculum class X semester 1 as many as 6 basic competencies (BC).

**Tabel 1.** Classification of material per Basic Competencies (BC) in high school physics books with standard material book A and book B

| Basic Competencies 3.1 | Book A | Book B |
|------------------------|--------|--------|
| The Scope of Physics, Scientific Methods And Work Safety | Chapter 1 (1-3) Introduction, Measurement, Estimating | Chapter 1 Measurement |
| Basic Competencies 3.2 | Chapter 1 (4-8) Introduction, Measurement, Estimating | |
| Vectors | Chapter 3 (1-4) Kinematics in Two Dimensions: Vectors | Chapter 3 Vectors |
| Basic Competencies 3.4 | Chapter 2 Describing Motion: Kinematics In One Dimension Straight Line | Chapter 2 Motion Along A Line |
| Parabolic Motion | Chapter 3 (5-7) Kinematics in Two Dimensions: Vectors And Three Dimensions | Chapter 4 (5-6) Motion In Two Dimensions |
| Basic Competencies 3.5 | Chapter 5 (1-5) Circular Motion; Gravitation | Chapter 4 (7-9) Motion In Two Dimensions |
| Circular Motion | | |

In this study, researchers did not have to go to the field because all research materials could be presented or collected at the researcher's place. So that study has time flexibility in the process. Research is only concerned with documented data that is explicitly recorded by the human senses. Such data tend not to change and are immune to the intervention of researchers. Analytical study is less costly with easier data sources to obtain.

The procedure in this study is divided into three stages, namely the stages of preparation, implementation and completion. Some of the procedures that must be carried out at the preparation stage are preparing the research design, determining the book to be used, preparing the research instrument, performing the validity of the instrument, assessing the validity of the instrument, then analyzing the results of the instrument validity test and improving the instrument. At the implementation stage the researcher collected data as needed, namely analyzing the depth of the physics material in terms of standard material. Whereas at the completion stage, namely processing data from study results, drawing conclusions from the research conducted and reporting the results of the research.

The instrument used in this study is a sheet of depth analysis of physics material in terms of standard material in 3 aspects of knowledge (factual, conceptual and procedural). The analysis sheet is in the form of a table, with a scale score of 1,2,3,4 and 5. The highest score for each indicator is 5 and the lowest score for each indicator is 1. The instrument analysis sheet is first validated by 3 validators to assess the validity level of the instrument using the instrument validity sheet. The results of the validation of the research instrument in depth of physics material in terms of standard material for the development of earthquake-themed high school physics e-book met the valid criteria.

The data collection technique used in this study is to study documentation techniques and to analyze the data with content analysis techniques. Content analysis technique (content analysis) is to analyze the content of the data written. The data in this study were processed by means of descriptive statistical analysis techniques with the calculation of percent (%) used to determine the depth category per Basic Competencies (BC) using the five-scale standard reference assessment (PAP) conversion guidelines calculated using the following equation:
Value = \frac{\text{actual score}}{\text{SMI}} \times 100\%

(1)

Information: the actual score represents the score obtained in the study, SMI ideal maximum score symbol

The data from the calculation of the depth of physics material in terms of standard material for each Basic Competencies can be categorized as in Table 2.

| Achievement Level (%) | Category          |
|-----------------------|-------------------|
| 81-100                | Very deep         |
| 61-80                 | Deep              |
| 41-60                 | Deep enough       |
| 21-40                 | Not deep enough   |
| 0-20                  | Not deep          |

3. Result and Discussion

In-depth analysis of physics material in terms of standardized material is an important part of the development of earthquake-themed high school physics e-book. This aims to determine the current level of depth of high school physics material in terms of standard material. After obtaining the results of the depth of physics material with standard material, if the physics material is superficial or lacks it will be equipped with standard material, thus improving the quality and having a high level of depth in the high school physics e-book in the development of earthquake physics e-book. This study analyzes the depth of the material based on factual, conceptual and procedural knowledge from physics material and standard material.

The data generated in this study is a percentage of the depth of physics material in terms of standard material. Data in the form of numbers will be processed into descriptive data. The descriptive data is in the form of a depth analysis of physics material in terms of standard material. Data from the depth analysis of physics material in terms of standard material on the aspects of factual, conceptual, and procedural knowledge of class X semester 1 can be seen in Figure 1.

![Figure 1 Depth analysis of physics material in terms of standard material](image)

Based on Figure 1 shows that the lowest aspect of factual knowledge is in Basic Competencies 3.1 and Basic Competencies 3.3 because there is no standard material in each of the basic competencies (BC), and the highest is in Basic Competencies 3.2, there are 4 standard materials in physics material Basic Competencies 3.2. Then in the aspect of conceptual knowledge, the lowest is in Basic Competencies 3.1 because there is no standard material in Basic Competencies 3.1 physics material,
and the highest is in Basic Competencies 3.2 and Basic Competencies 3.4, there are 4 standard materials that exist in each of the two basic competencies (BC). Furthermore, the analysis on the aspect of procedural knowledge is lowest in Basic Competencies 3.1, Basic Competencies 3.4 and Basic Competencies 3.6, this is because there is no standard material in physics material, while the highest score is Basic Competencies 3.2, namely measurement material, meaning that there are 2 standard materials in the measurement material.

The percentage of depth results in physics material in terms of standard material for each BC (basic competence) is shown in Table 3.

| Basic Competencies | Depth | Category     |
|--------------------|-------|--------------|
| 3.1                | 20%   | Not deep     |
| 3.2                | 87%   | Very deep    |
| 3.3                | 47%   | Deep enough  |
| 3.4                | 60%   | Deep enough  |
| 3.5                | 60%   | Deep enough  |
| 3.6                | 53%   | Not deep enough |

Based on the data from Table 3, it can be seen that there are 6 basic competencies that are measured for the depth level of physics material in terms of standard material in class X semester 1. Basic Competencies 3.2 with a depth percentage of 87%, then for the category that is quite deep in Basic Competencies 3.3, Basic Competencies 3.4, Basic Competencies 3.5, then for the category that is less deep in Basic Competencies 3.6, and the category is not in or there are no aspects of factual, conceptual, and procedural knowledge of standard material found in Basic Competencies 3.1. The results of the analysis data show that the depth of physics material in the aspects of factual knowledge, concepts and procedures in each Basic Competencies and the percentage of physics material depth is quite deep.

Based on the results of the analysis carried out, it was found that in Basic Competencies 3.1, the scope of physics, scientific methods and work safety did not have factual, conceptual and procedural knowledge of the standard material that existed in Basic Competencies 3.1 material. The standard material books (Book A and Book B) do not present material on the scope of physics, scientific methods and occupational safety, it's just that the material is explained a little in the opening sentence in some basic competencies (BC).
The results of the depth analysis of physics material in terms of standard material show that the percentage is categorized as deep enough. But there are still some aspects of factual, conceptual and procedural knowledge in standard material that are not contained in physics material. Several possible reasons why this happened. Physics standard books involve world academic experts in the field of science and education, who have good quality depth of physics material. These results indicate that there is still room to improve the depth quality of high school physics books. The solution to this problem is that in physics material there is a material superficiality or a lack of material, it will be equipped with standard material in book A and book B, so that it improves quality and has a high level of depth in high school physics e-books. The results of the analysis of this study can consider that the high school physics book prior to the development of the earthquake high school physics e-book must ensure that the SMA physics book has a high level of depth. Therefore, this preliminary study is the basis for the author to develop an earthquake high school physics e-book.

4. Conclusions
Based on the preliminary analysis conducted, it was found that the physics material for class X semester 1 was categorized as deep enough. This is evidenced from the results of the depth analysis of physics material in terms of standard material that Basic Competencies 3.1, Basic Competencies 3.2, Basic Competencies 3.3, Basic Competencies 3.4, Basic Competencies 3.5 and Basic Competencies 3.6 with the percentage of depths respectively 20%, 87%, 47%, 60%, 60 %, and 53%. Therefore, the shallowness of the material on physics material will be complemented by standard material, thus improving the quality and having a high level of depth in the high school physics e-book in the development of earthquake physics e-book. So, the next research to be carried out is to develop an earthquake-themed high school physics e-book.

References
[1] Hidayat F, Sinaga P & Hernani H 2017 Int. Journal of Science and Applied Science: Conference Series, 1 (1) pp 1-10 https://doi.org/10.20961/ijsascs.v1i1.5100
[2] Asrizal A, Amran A, Ananda A & Festiyed F 2018 IOP Conference Series: Materials Science and Engineering https://doi.org/10.1088/1757-899X/335/1/012067
[3] Asrizal, Desnita & Darvina Y 2020 IOP Conf. Series: Journal of Physics: Conf. Series https://doi.org/10.1088/1742-6596/1481/1/012123
[4] Permendikbud No. 24 tahun 2016 tentang Kompetensi Inti dan Kompetensi Dasar Pelajaran Pada Kurikulum 2013
[5] Ruddenmayanti 2019 Prosiding Seminar Nasional Pendidikan Program Pascasarjana PGRI Palembang
[6] Mustafa B 2010 Jurnal Ilmu Fisika | Universitas Andalas, 2 1 44–50
[7] Irwansyah E, et all 2011 Jurnal Informatika, 11 1 49-54
[8] Fauzi, A 2014 Fisika Bencana Alam (Padang: Universitas Negeri Padang Press)
[9] Sesma N & Fauzi A 2020 Pillar of Physics Education, 13 1 81–88
[10] Hadi M Solihin 2015 Analisis Konten Buku teks Pelajaran Fisika SMA kelas X Materi Pokok Gerak lurus
[11] Anderson W Lorin & Krathwohl D R 2010 Kerangka Landasan untuk Pembelajaran Pengajaran dan Asesmen Revisi Taksonomi Bloom (Yogyakarta: Pustaka Belajar)
[12] Sugiyono 2008 Metodologi Penelitian Kuantitatif, Kualitatif, dan R & D (Bandung: Afabeta)
[13] Giancoli D C 2005 Physics: Principles With Application Sixth Edition (London: Prentice Hall Internasional, Inc)
[14] Halliday Resnick & Walker J 2011 Fundamental Physics 9th Edition (United States of Amerika: John Wiley & Sons, Inc)
[15] Riduwan 2010 Belajar Mudah Penelitian untuk Guru Karyawan dan Penulis (Bandung: Afabeta)