

# Development of Electronic Publication Book (EPUB) Based on Science Multi Representation in Basic Concepts of Physics and Chemistry Courses

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## ABSTRACT

This research purposed to develop a multi representation science based electronic publication book (EPUB) for elementary school teacher education students in the basic concepts of physics and chemistry. The subjects in this research were first semester students for the 2021/2022 academic year in elementary school teacher education department. The development of this electronic publication book (EPUB) is carried out using the four D (4-D) model, namely define, design, develop and disseminate. At the define stage, which is to determine the learning achievements of the basic concepts of physics and chemistry, then at the design stage, namely to design an Electronic Publication Book (EPUB) with the help of media experts, after the design is complete. Data analysis techniques to be carried out are data validity analysis and practicality data analysis. Validation is carried out by media and material experts to determine the success of the media that has been designed. The results of research from the questionnaire were obtained based on the results of the validation of the feasibility of the content and the feasibility of the media, it was found that the virtual science laboratory based on the mobile application was said to be valid. Based on the results of the validation of the feasibility of the content is 80% and the feasibility of the media is 82%, it is found that the media is said to be valid with a validity level

**Keywords:** EPUB, Science, Chemistry courses.

## 1. INTRODUCTION

The spread of the Covid-19 virus, which was detected in 2019, It turns out that it still infects many people, especially in Indonesia. Through policy of the ministry of education and culture in early 2021, the learning system in the district/city is determined by the government and the service regional education. Increase in Covid-19 patients in some areas requires to continue to do face-to-face learning in the network. Referring to learning in 2020 related to online learning that raises many arguments, both positive and negative, regarding the lack of optimal implementation of learning. As stated by in research that the distance learning process that is currently being implemented cannot be called an ideal learning condition, but an emergency condition which must be implemented. There are still various obstacles so that all learning can be optimal. Innovation in learning is needed to support quality learning activities.

Sadikin (2020) mentions that learning that takes place through online media is only limited through images and videos presented via share screens to students, so it needs to be encouraged by the use of capable media multi-

represent the existing lecture material so that it can increase student activity in learning. In research Andromeda (2016), in some of its literature recommends use multiple representations to help students understand concepts and solve problems. Research in line with Waldrip (2006) defines multi-representation as activities to restate the same concept in various forms, which includes modes of descriptive representation (verbal, graphic, table), experimental, mathematical, figurative (pictorial, analogous, and metaphorical), kinesthetic, visual and/or operational-operational modes. More explained representation is something that represents, describes or symbolizes an object or process (Fatmaryanti & Sarwanto, 2015).

Metarepresentational means retranslating the same concept with the same format different forms, including verbal, pictorial, graphic and mathematical (Muzdalifah & Fakhruddin, 2015). Based on some of the statements above strengthen the importance of planting multi-representation to students in learning. Learning is an essential process in the world of education, in addition to online learning, which is less than optimal due to media limitations, based on data taken from the OECD in 2019

from the results of the Program For International Student Assessment (PISA), Indonesia occupies the country with the last order in the field of reading ability with an average of 371. The measured reading literacy skills include; indicator understand, use and reflect on and engage written texts to achieve goals and develop knowledge and potential by individuals. The results obtained show that reading literacy in Indonesia is very low. In line with reading literacy in his research Kholiq and Faridah (2019) stated that reading literacy on skills high-level thinking is included in the low category. Based on the data that obtained directly from educational institutions and increased resources Human resources have a very important responsibility to improve reading literacy.

Frank Hatt (1976) said that this reader, in existential reading situation, is a person who is literate, the statement confirms that Reading is a mirror that can give a picture against individuals. PIRLS (Progress in Reading Literacy Study) is a study international literature on reading literacy which aims to measure reading skills and reading comprehension that focuses on a) goals for reading, b) comprehension processes, and c) reading behavior and attitudes. The three indicators above are felt to be very necessary to be developed so that reading skills are increasing. Through increasing reading literacy and multi-representation, learning will be more optimal if it is supported by learning tools, one of which is through the use of digital books such as the electronic publication book (EPUB). The electronic publication book (EPUB) is an evolution of the printed book which commonly used in daily reading (Subiyantoro, 2014).

Based on Preliminary study in odd semester learning for the 2020/2021 academic year obtained data in the form of direct observation and interviews with several students who stated that during the lecture process there were no books used as a guide for students in learning, one of the factors that perceived by students is that in the absence of references, students are difficult to understand the material to be studied. Previously according to students that teaching materials are always available, but due to online learning, Printed books that are usually used are now unable to reach students located in different cities and counties. So that students stated that they really needed learning resources such as digital books to support lectures and increase knowledge related to the material lectures. This is in line with Mentari's research (2018) which states that the development of e-book learning media based on the results of research is able to measure students' creative thinking skills.

Based on the literacy presented in the background, the researcher carries out the development of a series of follow-up studies of previous entitled "Mobile Based Virtual Science Laboratory Development Application to Improve Students' Critical Thinking Skills PGSD". The result of previous research is a virtual laboratory that was created using Macromedia Flash. Virtual laboratory presented through practicum in the network is felt to be

less than optimal if not integrated with the use of teaching materials that support development network-based learning. Therefore, it is very necessary to do a follow-up study to develop the learning process through development of electronic publication book (EPUB).

## 2. METHOD

This study aims to develop an Electronic Publication Book (EPUB) based on Science Multi Representation for PGSD students. This research lasted for 4 months starting May-August in the PGSD FIP study program, Medan State University. This research begins with research preparation, research proposal and design, research implementation, data processing, research results discussion and reporting. This type of research uses 4D models (four-D models). According to Trianto (2014) the development of the four-D model consists of 4 main stages, namely: 1) define, 2) design, 3) develop, and 4) desiminate.

The procedure for developing an Electronic Publication Book (EPUB), this study limited only to the development stage based on Science Multi Representatiton for PGSD students is as follows 1) defining stage, this stage aims to determine learning outcomes for the basic concepts of Physics and Chemistry. The definition stage consists of initial analysis is to analyze learning achievement in accordance with learning programs, student analysis is to determine the characteristics of students, task analysis is to find out the tasks that must be done from learning the basic concepts of Physics and Chemistry, and concept analysis is carried out to determine the material that must be mastered by students, namely the basic concepts of Physics and Chemistry. b) design phase, this stage aims to design an Electronic Publication Book (EPUB) based on Science Multi Representatiton for PGSD students. The design phase consists of formulating the instrument, namely the Electronic Publication Book (EPUB) based on Science Multi Representatiton, choosing a media concept is by formulating a prototype Electronic Publication Book (EPUB) based on Science Multi Representatiton for PGSD students, the initial plan is to prepare the initial draft of the Electronic Publication Book (EPUB) based on Science Multi Representatiton for PGSD students, development stage, this stage aims to produce an Electronic Publication Book (EPUB) based on Science Multi Representatiton. The development stage consists of product validation carried out by 2 media experts, revision 1 is to improve the results of the validation carried out by media experts. The results of the validation improvement are draft 2, product trial from validation results, and final revision based on trial results.

## 3. RESULT AND DISCUSSION

The procedure for developing a based Electronic Publication Book (EPUB) Science Multi Representatiton to PGSD students are as follows: 1) Defining Stage, this

stage aims to determine learning achievement of the basic concepts of Physics and Chemistry. Stage the definition consists of: Initial analysis is to analyze learning outcomes according to with RPS. Based on the analysis of the learning outcomes of these courses, prepare a semester lesson plan for the basic concepts of physics and chemistry. 2) Student analysis is to determine the characteristics of students, Furthermore, to analyze the needs of students in learning the basic concepts of physics and chemistry are done, the distribution of the questionnaire by using the google form with the number of respondents were 42 students who were given randomly to PGSD students obtained the results of student responses to each question item availability of teaching materials in the basic concepts of physics and chemical. From these questions, as many as 16 respondents with a percentage of 38% answered that there were teaching materials that given by the lecturer. This means that teaching materials are still low given by lecturers to students so as to encourage lecturers to try to compile a teaching material that can basic concepts of physics and chemistry are used, and the use of teaching materials in the basic concepts of physics and mathematics courses chemistry can improve abilities and skills students in overcoming the problems experienced in daily life, as many as 12 respondents with a percentage of 28% answered that their use of teaching materials use can improve abilities and skills. Results this still shows the low quality of the teaching materials provided arranged, if we will see in teaching materials in the basic concepts of physics and chemistry are easy for use by students, as many as 16 respondents with a percentage of 38% answered that the teaching materials given very easy to use, and the next about the teaching materials that are arranged are not in accordance with the achievements learning expected by students, as much as 8 respondents with a percentage of 19% answered teaching materials not in accordance with the expected achievement in accordance with Semester implementation plan distributed to students, if through teaching materials prepared by lecturers, students have interest in lectures on basic concepts of physics and chemistry, as many as 12 respondents with a percentage of 28% answered that the use of teaching materials makes students interested, and teaching materials used in learning, it is difficult to accessed by students, as many as 16 respondents with a percentage of 38% answered that teaching materials were easy to access by students student, next about teaching materials in learning the basic concepts of physics and chemistry has benefits for students, as many as 42 respondents with a percentage of 100% answered with teaching material scan be useful for students, and the application of teaching materials in learning makes it easier students in obtaining information related to lectures basic concepts of physics and chemistry, as many as 42 respondents with a percentage of 100% answered with teaching materials can make it easier for students to obtain information related to lecture material.

Based on the results of the distribution of the questionnaire stated that the use of teaching materials really needs to be used in learning on the eyes basic concepts of chemistry and physics. Task analysis is to find out the tasks that must be done from learning the basic concepts of Physics and Chemistry. Based on semester lecture plans that have been designed, then analyzed tasks that will be presented to achieve the desired competence expected by students from lectures on basic concepts of physics and chemical, concept analysis is carried out to find out the material that must be used mastered by students, namely the basic concepts of Physics and Chemistry., design Phase, this stage aims to design Electronic Publication Book (EPUB) based on Science Multi Representation on PGSD students. The design phase consists of formulating instruments to be used in Electronic Publication Book (EPUB) based on Science Multi Representation. The application used in making e-books is flipbook and choosing a media concept is to formulate a prototype Electronic Publication Book (EPUB) based on Science Multirepresentation to PGSD students. Media design in the application can look like the image below. Planning early is compiling the initial draft of Electronic Publication Book (EPUB) based on science multi representation to student PGSD. The results of the design at this stage obtained a draft book on basic concepts of physics and chemistry.

Development stage, this stage aims to produce an Electronic Publication Book (EPUB) based on Science Multi Representation. The development stage consists of product validation carried out by material experts before further when the product is designed it will be validated by media experts.

The suitability of the material with learning outcomes (material load), the development of the material in the product is adjusted to the needs of students in accordance with the learning outcomes were based on the results of the analysis, the material used in the learning product is appropriately applied. The material contained in the product is presented accurately so that it is easily understood by students and the use of the product is in accordance with the selection of material, the material presented in the product is in accordance with the demands and developments of the current curriculum, which is based on TPACK, and the products presented in the practicum encourage students' curiosity.

The systematics of media presentation belongs to the good category where there are clear guidelines on the use of media in the application, the product is made to support the presentation in practical learning so that it is easier for students to carry out the instructions to be carried out, the presentation of material available in the media makes it easier for students to understand learning that can be accessed or downloaded directly by students in the application, products are arranged systematically and regularly so as to facilitate student understanding of the learning being studied, the media layout display can

be said to be good and attractive for students. The display on the application adds to the attractiveness of students to do practicum. Based on the results of the validation of

the feasibility of the content is 80% and the feasibility of the media is 82%, it is found that the media is said to be valid with a validity level.

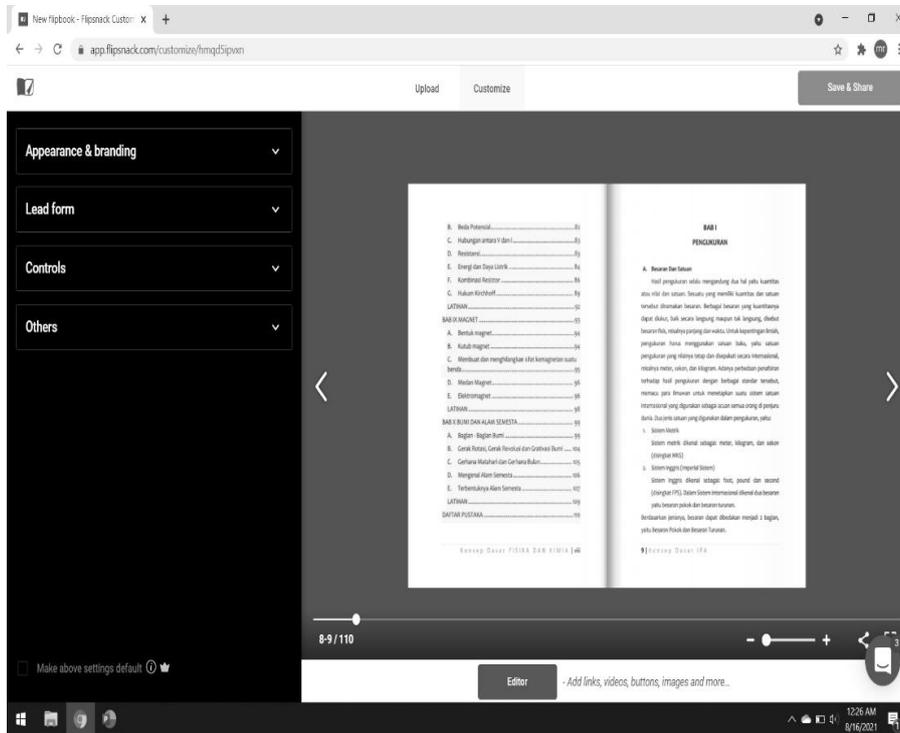


Figure 1. EPUB Design

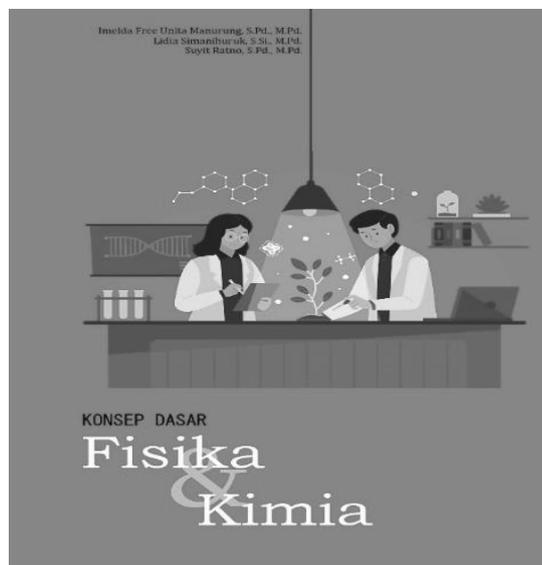


Figure 2. Book Design

**Table 1.** Expert Validation Results of Content Eligibility

Assessment criteria	Number	Max Total Score	Score Achieved	Classification
Material Load	1,2,3	15	10	Worthy
Material accuracy	4,5,6,	15	10	Worthy
Material update	7,8	10	10	Worthy
Encourage Curiosity	9,10	10	10	Worthy
Total number		50	40	40/50 = 80%

**Table 2.** Expert Validation Results of Media

Assessment criteria	Number	Max Total Score	Score Achieved	Classification
Material Load	1,2	10	8	Worthy
Material Presentation	3,4	10	8	Worthy
Language	5,6	10	8	Worthy
Coherence	7,8	10	8	Worthy
Layout	9,10	10	9	Worthy
Total number		50	41	41/50 = 82%

#### 4. CONCLUSION

Based on the results that have been presented, it can be concluded that at the definition stage and development stage, the data obtained from the questionnaire stated that the EPUB product is very important to be implemented. The results of research from the questionnaire were obtained based on the results of the validation of the feasibility of the content and the feasibility of the media, it was found that the virtual science laboratory based on the mobile application was said to be valid. Based on the results of the validation of the feasibility of the content is 80% and the feasibility of the media is 82%, it is found that the media is said to be valid with a validity level.

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#### REFERENCES

- [1] Arda A and Saehana 2015 *Pengembangan media pembelajaran interaktif berbasis komputer untuk siswa SMP Kelas VIII* (Mitra Sains) pp 69–77
- [2] Azhar A 2007 *Media pembelajaran* (Jakarta: PT Raja Grafindo Persada) pp 15–85
- [3] Basar A 2021 *Problematika Pembelajaran Jarak Jauh Pada Masa Pandemi Covid-19* (Edunesia: Jurnal Ilmiah Pendidikan) pp 208–218.
- [4] Isroqmi A 2015 *Pemilihan Software Aplikasi*

*Untuk Pembuatan Media Pembelajaran Interaktif*  
(Jurnal Dosen Universitas PGRI Palembang)

- [5] Sadikin A and Hamidah A 2020 *Pembelajaran Daring Di Tengah Wabah Covid-19* (Biodik) pp 214–224
- [6] Suryani A and Rusmin A R 2014 *Pengembangan Multimedia Pembelajaran Berbasis Komputer Model Permainan Pada Mata Pelajaran Ekonomi Di SMA Muhammadiyah 1 Palembang* (Jurnal PROFIT Kajian Pendidikan Ekonomi Dan Ilmu Ekonomi) pp 1–13