Development of E-Book Format EPUB on Dynamic Electrical Materials of X-Grade Vocational School

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Abstract. Based on the results of the research on product development carried out, as follows; This development has produced a learning media in the form of an e-book in EPUB format on Physics subjects in class X SMK / MAK. With this development model the media is very feasible and used in SMK level learning by going through several test stages on this development product. Based on the results of the material / content expert validation, the level of validity showed a final score of 82.44%. The evaluation of the Media Expert shows a percentage value of 89.60%, meaning that the product is declared fit for use. Based on data analysis from the results of the motivation questionnaire and the responses of class X students, it shows that the students' grades increased by 11.20% from the results before using the e-book and after using the e-book. For the results of the response questionnaire, it shows that the students are motivated and respond to the e-book well and it can be said that the e-book in the EPUB format can be used properly by students of SMK Bubutan Surabaya.

1. Introduction

The Advances and developments in technology today are so fast driving changes in the world of education, especially in learning resources and student learning media. Such a broad impact has given a new color or face to the world education system, known as e-learning, e-books, distance learning, online learning, web-based learning, computer-based learning, and virtual class rooms, where all of these terms refer to the same meaning, namely information technology-based education. This change does not mean replacing conventional learning sources but can support learning resources in the world of education. Lack of interest and motivation in student learning and lack of variety of learning methods Hidayatulloh, M., Wiryokusumo, I., & Walujo, D. A. (2019). Students prefer to learn physics by memorizing without understanding the concept of the material.

This innovation is needed so that the learning process becomes something interesting. In the process of delivering the learning process, a media that can facilitate the learning process is needed which can increase students' interest in learning. This innovation can be in the form of developing learning media that have not been used in learning activities, making the learning process monotonous and boring. Physics subject at high school education level is a material that explains various kinds of abstract concepts, one of which is electricity. When it comes to abstract material, verbal explanation is not enough. Sarikaya, et al. in Unal and Ozdemir (2015) say, "If these abstract events are taught with graphics, symbols, pictures or three dimensional models, students will have an opportunity to observe and review the case, which will turn into being concrete from being abstract". This sentence means

that if abstract events are taught with graphics, symbols, pictures or three-dimensional models, students will have the opportunity to observe and remember these events into something real. Media developments that should be done by educators need to be improved. The development of attractive and innovative educational media is urgently needed by today's teachers. The results of observations at SMK Bubutan Surabaya in class X majoring in TKJ, TPM, and TKR show that the lack of learning resources, the level of motivation of students in learning theory is still low and the use of media that has not been maximized in the learning process are some of the problems that teachers still have to overcome and students.

Based on this background, the formulation of the problem in the research to be carried out is as follows: Can Learning media e-book improve student learning? How do students respond to the e-book being developed? Research Objectives Based on the formulation of the problem, the purpose of this development research is to describe the effectiveness of learning media e-book on dynamic electricity material. Describe student responses to development e-book. This research is expected to provide the following various benefits. For schools, it can be used to support learning, especially for electricity in physics subjects. For students, that is, it can be used as a supplement to media and learning resources in the material. For teachers, it can be used as an alternative learning media and learning resources, especially on electricity

2. Research Method

The research type to be carried out is *Research and Development* using the ADDIE model. ADDIE is an acronym for the five phases of analysis, stage design, stage of development, the implementation phase and evaluation phase. The ADDIE model is used because it can be applied completely in this study without any components being removed and has a systematic description that looks more complete and systematic. Research will be conducted refers to multimedia models ADDIE development model, the analysis, design , development, implementation, evaluation which can be seen in the following figure:

Figure 1: ADDIE Scheme
Source: Branch, 2009

From the above scheme it can be seen that there are several stages in evaluating the ADDIE model. The target of the research to be carried out is the media *e-book* which will be used as a learning tool called "*E-books* on Dynamic Electrical Material.

The analytical method used in research at the validation stage is the analysis of the validity level of the media being developed. Analysis of the level of media validity was carried out through the analysis of the validation sheet of two expert lecturers.

Figure 2: Validation Calculation Formulas
Source: Branch, 2009

$$\text{Persentase } (\%) = \frac{SkorTotalKriteriaPengumpulanData}{SkorKriteria} x100\%$$

This describes the research process and data processing obtained in the development research *e-book* on EPUB format on dynamic electricity material at Vocational High School Bubutan Surabaya. The steps taken by researchers in conducting their research are in accordance with the selected development model, namely the ADDIE development model. The ADDIE development stage is the stage of analysis , the planning *(design)*, stage of development, the implementation phase and evaluation phase.

Figure 3. Validity Criteria
Source: Riduwan in Farisa, 2015

Persentase (%)	Criteria
0 – 20	Very Less
21 – 40	Less
41 – 60	Enough
61 – 80	good/valid
81 – 100	Very good/very valid

Based on these criteria, the Learning media is said to be valid if all aspects in the questionnaire get a percentage of 61% with valid and very valid criteria. This analysis uses a questionnaire compiled based on the Guttman scale which is stated in the form of questions. The questionnaire is assessed using the criteria of a scale that can be seen on the scale if the answer is yes, it will get a value of 1, otherwise it will be 0.

2.1. Analysis Phase

2.1.1. Student Analysis

The research subjects in this research were X class X vocational high school students in Bubutan Surabaya, consisting of 21 students consisting of class X TPM, TKR, and TKJ. At this level students get basic physics material in two semesters. The students of SMK Bubutan are dominated by males and have characteristics that tend to be lazy to read books and like most students today who mostly hold smartphones for *browsing*, playing *games* or social media.

2.1.2. Analysis of Learning Objectives

At this stage of the analysis, an analysis of basic competencies and learning objectives used by the Vocational High School in Bubutan Surabaya was carried out. Basic competencies and objectives of learning physics in class X, namely regarding C1 and C2, namely in the realm of knowledge. This is in accordance with the *e-book* that will be applied to students. Because the *e-book* developed by researchers is not the main source of student learning but a

learning resource that supports students so that they are more interested in learning physics, especially in dynamic electricity.

2.1.3. Analysis of Teaching Materials or Concepts

In the analysis stage of the formation of the concept of the contents of this *e-book* , the researcher analyzed the material boundaries, which were limited to the concept of dynamic electricity. The material is limited to the concept of dynamic electricity because in the second semester there is dynamic electricity material. Electrical material is a complex material, especially for students. Mechanical engineering of electrical materials and electronic components is indispensable for basic theory before application in majors.

2.1.4. The Media Analysis

The learning media used in SMK Bubutan for physics material is powerpoint. Books are also the main learning resource for students of SMK Bubutan. The limitations and the lack of attractiveness of existing media and based on the character of students who are lazy to read books have made researchers develop *e-books* that students can take anywhere without having to carry physical books. So that at this stage the media to be developed is an *e-book* in EPUB format (*electronic publication*).

2.2. Planning Stage (Design)

This stage aims to design good instructional media and ensure the progress shown from the designs that have been made. The steps taken are as follows:

2.2.1. Problem Identification

This problem identification is done to prepare for possible obstacles or problems in the next stage. Some of the obstacles that may arise are:

a. Adjustment of work tools that will be used in media development.
b. The implementation of media creation starts from collecting work tools to making media.
c. Collection of library sources regarding dynamic electricity material that will be used as content in the *e-book.*

2.2.2. Work Tools

Development process *e-book* requires a supporting device in its manufacture. The tools needed for the development of an *e-book* with the EPUB format are:

a. Sigil Application Program as the main program in e-book creation.
b. Physics books and references related to dynamic electricity.
c. Images in either jpg or gif format to support multimedia in the content of the e-book.
d. Android / iOS smartphone to open e-books in the developed EPUB format. Android requires a third-party application called Lithium to run e-books. As for iOS, no additional application is needed because iOS already has iBooks which can be used to run e-books with this EPUB format.

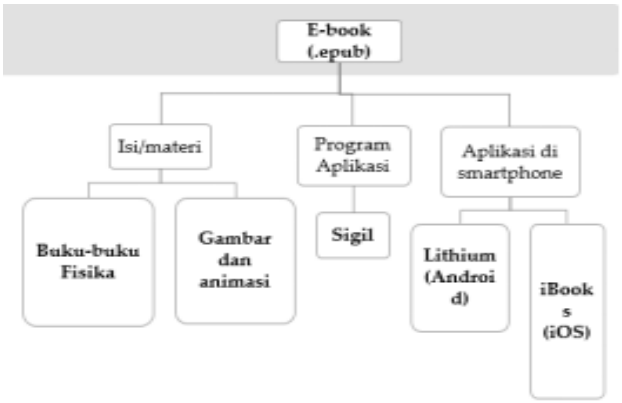


Figure 4: Chart of work tools
Source: Nailul (2021)

2.2.3. Development Stage (Development)

The development stage is the stage of making an *e-book* using work tools and library sources that have been prepared. The subject matter contained in the *e-book* includes the definition of dynamic electricity, quantities in dynamic electricity, electronic components, electrical circuits, laws in dynamic electricity, electrical energy and electric power. The following is a chart of the main material and sub-material in the *e-book.*

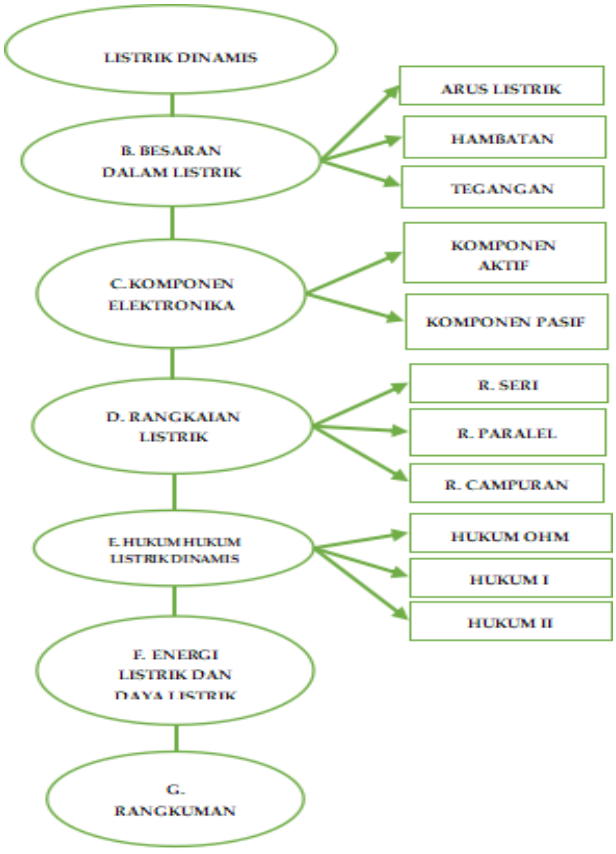


Figure 5: Chart of e-book materials
Source: Fauzi (2021)

At this stage, expert validation is also carried out to determine the feasibility of the *e-book.* The *e-book* validation consists of content / material validation and media and design expert validation. The following is a list of names of validators *e-book*:

a. Material validation / content conducted by Lydia Rohmawati, M. Si. He is an expert in the field of Physics who is a lecturer in Physics at the State University of Surabaya.
b. The second validation of the material / content was carried out by Azharul Auliyaur Rohman, M.Pd. He is a Physics teacher at MA Pasuruan.
c. Media validation and design by Dr. Noer Fatirul, M.Pd. He is a lecturer at the PGRI Adi Buana University Surabaya.

2.2.4. Implementation Phase (Implementation)

At this stage, prior to the application of *e-book* given a learning motivation questionnaire*(pre-test)*to determine the level of students' learning motivation. It aims to obtain the percentage of student motivation before treatment. After the *e-book* was developed and validated by experts, *e-books* are applied in learning to be tested. The implementation process was carried out on the students of SMK Bubutan Surabaya class X totaling 21 students. The application process is carried out during the Physics subject. Then carried out the application of the *e-book* by transferring the *e-book* to each student. The size of this e-book is less than 15 megabytes which is around 14.4 megabytes. *This e-book* tends to be light considering there are animations in it.

At the beginning of the application, students were given an explanation regarding the use of this *e-book* . Students who use Android smartphones Android are required to download the Lithium application on the *Play* Store because with this application the *e-book in* the EPUB format developed can run optimally. Students who use Apple smartphones don't need to download the application because they are already using the available iBooks. After that, enter the stage of providing dynamic electric material and carry out a question and answer process for things you want to know more deeply so that things you don't know are related to the material.

After the implementation was carried out, a learning motivation questionnaire (*post test*) was given to students again to determine the level of student motivation after being given learning using this e-book .

In addition to the learning motivation questionnaire, students were also given a student response questionnaire to the e-book with this developed e-pub format. Student response questionnaires are used to determine student interest in this *e-book* . In addition to the student questionnaire, an assessment questionnaire was also given to a colleague, namely Riche. He is a fellow physics teacher at SMK Bubutan Surabaya. The results of response questionnaires and peer assessments can be used as suggestions for future improvements *e-book* .

2.2.5. The evaluation stage (Evaluation)

The last stage in ADDIE is the evaluation stage. At this stage, a student response questionnaire was given to the students of SMK Bubutan Surabaya to the *e-book* that was developed. In addition to student responses, a peer assessment was carried out, namely Ms. Riche. This assessment data

3. Results and Analysis

3.1. Results of Material / Content Validation

Material and content validation was carried out by Lydia Rohmawati, M.Si and Azharul Auliyaur Rohman, M.Pd.

Table 1: Table Assessment of Content/ Material Experts 1 and 2
Source: Author's Document

Aspek yang dinilai	Kriteria Penilaian Deskripsi	Validasi 1 Skor	Validasi 2 Skor
Kesesuaian materi dengan kebutuhan	Kelengkapan materi	4	4
	Keluasan materi	4	4
Kesesuaian media dengan media pembelajaran	Kesesuaian *e-book* dengan tujuan pembelajaran	5	4
	Kemudahan pemahaman materi oleh siswa dengan menggunakan *e-book.*	4	5
	Kesusuaian materi bahan ajar yang disajikan dengan tingkat kebutuhan siswa.	4	4
	Keakuratan konsep dan definisi	4	5
	Keakuratan contoh	3	5
	Keakuratan gambar	4	5
Kebermaknaan materi	Keterkaitan materi	4	4
	Kemenarikan materi	5	4
	Mendorong untuk mencari informasi lebih lanjut	2	3
	Konsistensi sistematika sajian dalam kegiatan belajar	4	4
	Keruntutan penyajian	5	4
	Contoh cerita dalam kehidupan sehari-hari	5	3
	Pemberian kegiatan siswa untuk menguasai konsep	4	4
	Kelayakan kegiatan siswa pada setiap materi	4	4
	Kesesuaian kegiatan siswa dengan tujuan pembelajaran	4	5
	Keterlibatan siswa	3	4
Lugas	Ketepatan struktur kalimat	5	5
	Kefektifan kalimat	4	5
Komunikatif dan interaktif	Ketepatan pengguanaan Bahasa	5	5
	Kemampuan memotivasi pesan atau informasi	4	5
	Kemampuan mendorong berpikir kritis	4	4
Kesesuaian dengan tingkat perkembangan siswa	Kesesuaian perkembangan intelektual siswa	4	5
	Kesesuaian dengan tingkat perkembangan emosional siswa	4	4
Total		**101**	**108**

3.2. Results of Media Validation and Design Media

Validation and design were carried out by Dr. Noer Fatirul, M.Pd. The comments and suggestions given by the validator to the *e-book* being developed are summarized in the following table.

Table 2: Table of Comments and Suggestions
Source: Author's Document

Expert Content/Content	Expert Media and Design
Development of the e-book is expected to drive students to find literature / information and the relevant sources and are expected to further involve the active participation of students in learning (more attractive) so that students are motivated to learn	Strive form of letters vary in order to create Students' reading interest

Table 3: Questionnaire Results Response
Source: Author's Document

Aspects assessed	Percentage
Are the images and animations in this e-book interesting?	95.24%
Can you operate this e-book easily?	90.48%
Is the language used in the e-book easy to understand?	95.24%
Are the terms contained in the e-book easy to understand?	80.95%
Can the contents of the e-book motivate you in learning?	85.71%
Can this e-book help you be active in participating in teaching and learning activities?	85.71%
Was this e-book interesting or fun?	80.95%
Do you find it easier to understand material about electricity after learning to use this e-book ?	71.43%
Is there a description or writing of the e-book that is difficult to understand?	38.10%
Do the illustrations in the e-book match the material presented?	95.24%
Average Percentage	86.77%

Aspects 1 and 2 are criteria for clarity of format *e-book*, aspects 3 and 4 are linguistic criteria, aspects 5, 6, 7 and 8 are presentation criteria, while aspects 9 and 10 are illustration criteria. In question 9, the negative question is whether or not there is difficulty understanding the writing or description of the *e-book.* This will be discussed in more detail, namely in the discussion section. In addition to student responses, a peer assessment was carried out, namely Ms. Riche. This assessment data has been processed and the percentage is calculated so that the results can be seen.

3.3. The Material Expert Analysis

Feasibility of *e-book* EPUB format was obtained from the results of validation conducted by material / content experts as well as design and media experts. The scores are analyzed using the following formula.

$$P = \frac{\Sigma Skor\ pengumpuan\ data}{\Sigma Skor\ maksimal\ tiap\ aspek} x100\%$$

Source: Riduwan (2015)

E-*book is* said to be feasible if it meets the criteria percentage of 61% - 80% and very feasible if it meets the percentage criteria of 81% - 100%. The validation results of the two validators are presented in the following table.

Table 4: Expert Validation Results Material / Learning Content

Aspects assessed	Results (Validator 1)	Results (Validator 2)	Category
Suitability of material with student needs	80.0%	80.0%	Good
Conformity with learning media	80.0%	93.3%	Good / Very Good
Material significance	78.0%	78.0%	Good
Straightforward	90.0%	100.0%	Very Good
Communicative and interactive	86.7%	93.3%	Very Good
Conformity with student development levels	80.0%	90.0%	Good / Very Good
Percentage of Content Assessment / Material	82.44%	89.11%	Very Good

3.4. Expert Analysis Design and Media

Table 5: Design and Media Expert Analysis

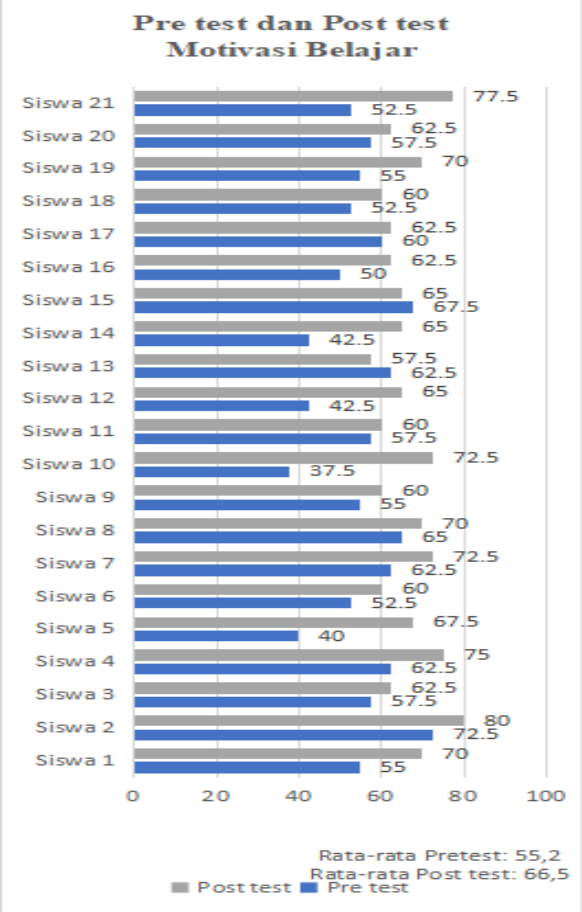
Aspects assessed	Results	Category
Book size	90.00%	Very good
Book cover design (cover)	90.91%	Very Good
Design of book content	87.78%	Very Good
Percentage of Design and Media	**Assessment 89.56%**	**Very Good**

Based on the graphs. If described, the results of the *pre-test* and *post-test* learning motivation show that there is a very clear difference between before and after using the media *e-book.* The percentage of learning motivation scores before using the *e-book* was 55.2 based on Arikunto (2010), which was included in the medium category. After implementing the *e-book* , the percentage score of learning motivation was 66.5 which was included in the high category. The increase in learning motivation on average is an increase of 11.3.

This shows an increase in the percentage of student learning motivation scores after the implementation of the e-book. There was an increase in one category level, namely from the medium to high category. This increase also shows that the e-book developed is effective in increasing student motivation.

The 13th student and the 15th student experienced a decrease in learning motivation, namely from 62.5 to 57.5 and 67.5 to 65. However, according to Arikunto (2010), this decline was still in the same category, namely in the moderate category. So that in this case there is no increase in the motivation of the two students could be due to an intrinsic factor in them.

Figure 6: Results of Pretest and Post-test
Source: Results of Data Processing



3.5. Student Questionnaire Analysis of SMK Bubutan Surabaya and Peer Assessment

The results of student responses to the *e-book* that the author developed obtained an average percentage of 86.77%. This shows that e-books have a positive response. However, there is an aspect that gets a percentage of 38.10%, namely the question "Is there a description or illustration of an image or writing an e-book that is difficult to understand?". This shows that there are still some students who still have difficulty understanding the descriptions and illustrations in the e-book. One of the reasons for the difficulty of understanding this description or picture is because students get some new material obtained about electricity that had never previously existed in the junior high school level. One of them is the material regarding active components and passive components in electronics so that there are terms that are still unfamiliar to class X students.

The peer assessment of the e-book developed by the author obtained a percentage score of 88%. According to Riduwan (2015) it is in the very good or very feasible category. It can be concluded that this e-book received a positive response from the physics teacher of SMK Bubutan Surabaya. B

Based on the results of the research that has been done, it can be seen this e-book had good response from students and peer.

4. Conclusion

It can be concluded that 1) This development product, e-pub based e-book, is very feasible and can be used as learning media or one of learning source in vocational high school. 2) Based on data analysis from the results of the motivation questionnaire, it shows that the students' grades increased by 11.20% from the results before using the e-book and after using the e-book. For the results of the response questionnaire, it shows that the students are motivated and respond to the e-book well and it can be said that the e-book in the EPUB format can be used properly by students of SMK Bubutan Surabaya. For further research, it might be useful and more attractive if given the detail images or added more media in this e-pub based e-book.

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