

# DEVELOPING ELECTRICAL CIRCUITS FLIPBOOK USING FLIPBUILDER

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## Abstract

*The students learning outcome in electrical circuits topic are not satisfied. Then, researchers developed an interesting ebook using Flipbuilder that integrated with PhET Simulation software, called electric circuit flipbook. The objectives of this study are: (1) Describing the validity of flipbook based on three lecturers and three teachers; (2) Describing the practicality of flipbook from students respons questionnaire; and (3) Describing the effectiveness of the Electric Circuit Flipbook based on the improvement of student learning outcomes. The development of Electric Circuit Flipbook used ADDIE model. The instruments used are: material, media, and language validation sheet; questionnaire of student responses; and learning outcomes test. The results showed that: (1) The validity of the Electric Circuit Flipbook is very feasible; (2) The practicality of the flipbook is in very practical category; and (3) Flipbook effectiveness is in very effective category. Flipbook electrical circuits developed is eligible to use as a learning medium.*

**Keywords:** Electric Circuit Flipbook, ADDIE

## INTRODUCTION

There has been a lot of researches that solve the problem difficulty of learning about electrical circuit material. Fajar (2013: 24) uses an inquiry learning model, only effectively reducing misconceptions in circuit series electrical materials. Hidayatulloh's research (2015: 31) using a scientific approach can only reduce the mistakes of students' concepts with low to moderate criteria. Andriani, et al (2015: 369) using PhET simulations with student's worksheet shows improvement in concept understanding only in low to moderate category.

The results above are relevant to the conditions in the school that will be researched. The pre-research questionnaire given to 40 ninth grader Junior High School of Progresif Bumi Shalawat 2017/2018 academic year stated that 62.5% of students considered science to be an elusive subject, specifically, 80% of them declare that electrical circuit is the difficult material. The reasons are: (1) 37.5% memorizing; (2) 25% many concepts county; (3) 28.1% many elusive terms; and (4) 9.4% the concept is elusive. This is also in accordance with the results of teacher interviews that some students have difficulty in studying electrical circuit material, especially regarding the count.

Based on similar issues, research from Fajar (2013: 24), Hidayatulloh (2015: 31), Andriani, Indrawati, and Alex (2015: 369) suggest other methods to overcome concept errors in electrical circuit materials with interactive media that support learning.

These suggestions have been conducted such as Nurhayati and Mutmainnah (2014: 1) study which states that the students' learning outcomes are increasing with the teaching of demonstration method with PhET Simulation software. Student motivation is improved because the PhET Simulation software provides a virtual display of real electrical circuits. Ghofur research (2015: 179) about the development of 3-dimensional ebook known as flipbook get positive response from students and get mastery learning. Ease of learning and increased understanding of electrical circuit material require media that is able to support the message to be more easily accepted by students and techniques that are able to display the concept significantly according to the cognitive level of students. 100% of students previously described require a handbook to understand electrical circuit material independently and 100% of students agree if given a science ebook equipped with visual animation to assist in understanding the concept of electrical circuit material science. From the results of teacher interviews, students need an ebook that can explain the application of electrical circuit materials, electrical visualization in the circuit, and can make the abstract electrical circuit concept becomes real for students.



Figure 1. Flipbook cover.

The alternative media that can be used is Flipbook. Flipbook is electronic like ebook, but the flipbook can be opened in sheet by sheet. Ebook is very static in nature (can't be opened sheet by sheet), while the flipbook more dynamic and interesting, can be given images, animation, music, video and others. Hull & Chaparro (2006) stated that the students were satisfied with their experience viewing a document flipbook format and participants completed tasks quicker using the Flipbook format of the university course schedule when compared to a website format.



Figure 1. Interactive quizzes for material review

The developed flipbook is made with Flipbuilder software. There is a quiz related to the discussed material created with ISpring software, each question has different music. When students score above the standard of graduation in the quiz, they get the music "we are the champion" as feedback at the end of the quiz. There are interesting videos and pictures related to the material to be discussed, practical tutorial video using PhET simulation software.

PhET simulation software can help the students to understand about material. PhET can be a good simulation to get maximum results in science learning and help students build a conceptual understanding of science. They present authentic scientific practices with appropriate animations that are useful in guiding students' thinking according to expert scientist's thinking. Student learns better when they build their own understanding of scientific ideas within the framework of their existing knowledge. They must be motivated to actively engage with the content and should be able to learn from that engagement. It can be fulfilled by interactive computer simulation. The students view simulations like as scientists view in their real research experiments (Wieman, Adams, & Perkins, 2008). Simulations in a PhET are interactive, students will feel like playing a game of science. In this simulation, PhET emphasizes the relationship between real-life phenomena and the underlying science. PhET is designed like a student to become an expert physicist (Perkins et al., 2008).



Figure 2. PhET simulation tutorial inside flipbook



Figure 3. Pop up video inside flipbook related of the topic

The ebook development research has got positive results in recent years. Research of Perdana (2013: 55) on Interactive Digital Book is feasible category from expert validity, student responses, teacher responses, and effectiveness. Nugraha's (2014: 1) research on bilingual interactive ebook media on heat material feasible in terms of material, presentation, language, illustration, and student responses. In addition, Istifarida, et al (2017: 143) about the ebook based problem-based learning GIS for the improvement of thinking skills are valid and feasible categories.

The errors of the students' concepts about electrical circuit material and ebook development research in the usual form or flipbook can be received well by experts and users both teachers and students. Therefore, a research aimed at developing a flipbook on electrical circuit material that is feasible in terms of the validity of expert and teacher judgment, practicality based on student responses, and effectiveness in terms of student learning outcomes.

## METHOD

Creating quality interactive media is an elaborate process that requires an appropriate methodology and expert team collaboration on material, design, and instructional aspects. It starts with the creation of sample chapters that serve as a blueprint for creating ebooks. The sample chapter specifies the digital design for each element in the book, including the page layout that describes how the ebook will perform. To create a sample chapter, the material expert's validator begins to draft the content. Next, Design experts decide what content of the ebook can be improved in appearance, what kind of interactivity to use, and create storyboards for each interactive element (Bartoszewicki, 2013).

One model of flipbook development that suitable the Bartoszewicki (2013) theory is ADDIE which stands for Analysis, Design, Development, Implementation and Evaluation (McGriff, 2000:1). This research develops Flipbook using Flipbuilder and ISpring software integrated with virtual practice using PhET simulation on electrical circuit material.

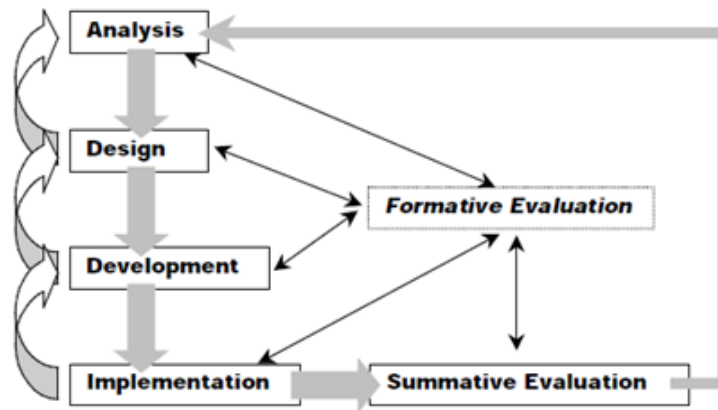


Figure 4 ADDIE Model

Source: McGriff, 2000:1

The developed flipbook is tested on the validator, ie three expert lecturers and three teachers to determine its validity. The average of validators' assessment results is determined by percentage and category according to Table 1.

Table 1. Flipbook validity categories

Percentage (%)	Category
0 – 20	Invalid
21 – 40	Validity is low
41 – 60	Medium
61 – 80	Valid
81 – 100	Very valid

(Source: Sugiyono, 2010)

The practicality of developed media was measured using a response questionnaire given to 40 students of ninth grade of Junior High School Bumi Shalawat Progresif 2017/2018 academic year. After learning using the developed Flipbook, they provide an assessment. The average of student response results is determined by percentage and category according to Table 2.

Table 2. Flipbook practicality category

Percentage (%)	Category
0 – 20	Not practical
21 – 40	Low practicality
41 – 60	Medium
61 – 80	Practical
81 – 100	Very Practical

(Source: Sugiyono, 2010)

Flipbook effectiveness was measured using a write test and analyzed using an N-gain test.

$$\langle g \rangle = \frac{(S_f - S_i)}{(S_{maksimal} - S_i)} \tag{1}$$

(Source: Hake, 1999)

The average of the N-gain test results is used to determine the flipbook effectiveness categories based on



pretest is done on 40 students of ninth grade of Junior High School Bumi Shalawat Progresif 2017/2018 academic year followed by a learning activity using Flipbook. Then, students work on postes and fill out a response questionnaire to assess the flipbook.

According to Sullivan (2011) to determine the validity of a learning medium, first, do a literature search for a standardized validation instrument. Next, use expert judgment to assess media based on standard instruments. Therefore, the flipbook validation instrument uses: Instrumen Penilaian Buku Teks Pelajaran Kurikulum 2013 IPA Sekolah Menengah Pertama/ Madrasah: Buku Siswa, BNSP (2014). Validator consists of three professors who are experts in the material, media, and language of science books and three science teachers. Tables 4, 5, and 6 show flipbook validation results based on material, media, and language.

Table 4. The result of flipbook material validation

<b>Indicator</b>	<b>Average</b>	<b>Category</b>
<b>Dimension of spiritual attitude (KI 1)</b>	82%	Very feasible
<b>Dimensions of Social Attitude (KI 2)</b>	94%	Very feasible
<b>Knowledge Dimension (KI 3) Scope of Material</b>	90%	Very feasible
<b>Dimension of Knowledge (KI 3) Material Accuracy</b>	91%	Very feasible
<b>Knowledge Dimension (KI 3) Updates and contextual</b>	90%	Very feasible
<b>Skill Dimension (KI 4)</b>	94%	Very feasible
<b>Average</b>	<b>90%</b>	<b>Very feasible</b>

Table 5 The results of flipbook media validation

<b>Indicator</b>	<b>Average</b>	<b>Category</b>
<b>Presentation techniques</b>	90%	Very feasible
<b>Supporting material presentation</b>	87%	Very feasible
<b>Learning Presentation</b>	89%	Very feasible
<b>Average</b>	<b>88%</b>	<b>Very feasible</b>

Table 6 The results of flipbook language validation

<b>Indicator</b>	<b>Average</b>	<b>Category</b>
<b>In accordance with the development of learners</b>	82%	Very feasible
<b>Communicative</b>	94%	Very feasible
<b>Dialogic and interactive</b>	90%	Very feasible
<b>Coherence and the demands of the thought line</b>	90%	Very feasible
<b>Conformity with Indonesian rules</b>	92%	Very feasible
<b>Use of terms and symbols</b>	92%	Very feasible
<b>Average</b>	<b>90%</b>	<b>Very feasible</b>

The average of flipbook validation results based on material, media, and language is shown in Figure 7.

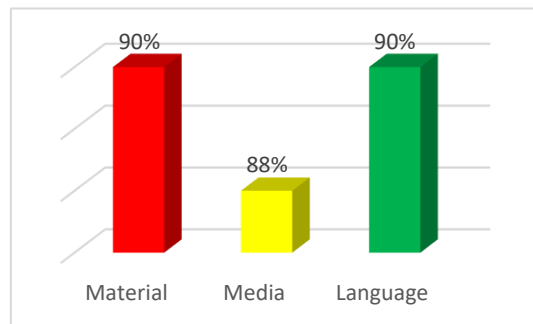


Figure 6. Graph of validation results of each flipbook eligibility criteria

The results of validation by three expert lecturers and three science teachers got an average score of 89% with very feasible category. The developed flipbook has been in accordance with BNSP rules (2014) and is ready to be used for students in Indonesia in science learning on electrical circuit materials

Table 7. Reliability of validation sheet items

Cronbach's Alpha	N of Items
0.983	49

(Taken from SPSS 17)

The reliability value of the question items of 0.983 is greater than Cronbach's Alpha minimum value of 0.6. This means that the items on the validation sheet are reliable or can be trusted as a data collection tool in the research.

The practicality of the flipbook was obtained from a questionnaire of student responses. According to Nieveen (Hobri, 2010) aspects of practicality based on field applications of student responses. The practical aspects of flipbooks are measured based on the clarity aspects of the format, material, media, and language.

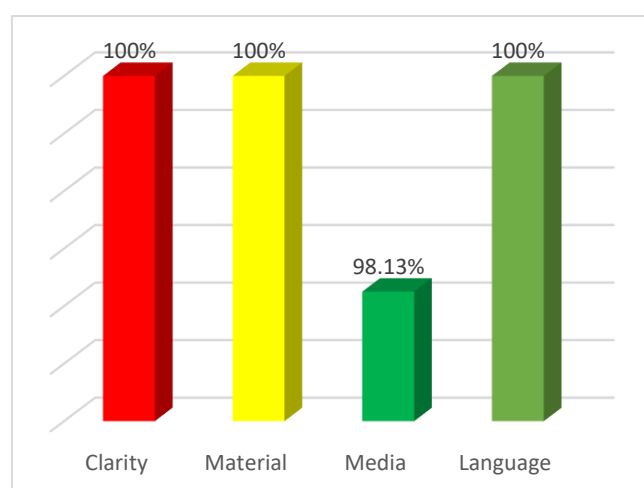


Figure 7. Graph of student response results

Based on Figure 8, the clarity of formats, materials, media, and language of the flipbook is categorized as very practical, with an average score of 99.53%. Based on the questionnaire question, the value of 99.53% means that the flipbook is interesting, easy to use, the language is easy to understand, motivates students



to learn, makes it easy to understand the electrical circuit material, and the flipbook illustration in accordance with the material. This is in accordance with the opinion of Karsenti (2014) that a good ebook is interactive, enjoyment, has a favorite multimedia content as well as adaptive for students.

According to Hobri (2010), the effectiveness of the media (including flipbook) is measured by improving student learning outcomes. The pretest and posttest mean values are shown in Table 8.

Table 8 Result of test

Pretest average	Posttest average	N-gain	Category
32,5	81,25	0,72	Very effective

With N-gain value of 0.72, the electric circuit flipbook proved to be very effective. In accordance with the opinion of Alós and Lago (2012: 1) the integration of textbooks with appropriate learning methods get higher quality in the learning process and learning outcomes. According to Dale (in Summers & Davis, 2015: 3) learning techniques with student actions result in up to 90% retention. People get the best learning outcomes as they use sensory-based learning styles. Good sensory channels are done through the interaction of students with learning resources, the more opportunities, the more learning from the learning activities. The content of the book should provide students with independent learning opportunities, providing plenty of time for student activities, so that students automatically learn. Flipbook electrical circuits are equipped with virtual labs, video phenomena, as well as concrete explanations, so retention can be maximized because the design of learning activities actually builds more real-life experiences for students.

Student responses in very practical categories and highly effective category of N-gain indicate that the flipbook succeeds in assisting teachers in improving students' motivation to discover the concept of a subject matter independently. This is in accordance with the characteristics of the ebook proposed Wijayanti (2015), through a good ebook, teachers can better position themselves as a facilitator to create self-reliance in learning to find their own concepts for students. Content in the ebook helps students to visualize abstract material especially in science learning.

Based on the validation, practicality and effectiveness aspects, the ADDIE development model has succeeded in making the learning media feasible and in line with its theory because ADDIE instructional design aims to create media with more student-centered learning objectives, organized based on an in-depth analysis of student needs (McGriff, 2000:1) and ADDIE is an effective design, with approaches that help lesson designers, media developers and teachers to create efficient and effective teaching designs by applying the ADDIE model process to every learning media product (Aldoobie, 2015).

Nguyen (2015:76) mentions there are four characteristics of the ebook. First, the ebook is a software product book, so it has a structure like a regular book, has a page and users can access the page on the ebook is randomly like a regular book page.

First, the ebook is a software product book, so it has a structure like a regular book, has a page and users can access the page on the ebook is randomly like a regular book page. Second, the ebook is a book software product that works online or offline. Second, the ebook is a book software product that works online or offline. Thirdly, the ebook is always equipped with ebook readers that can be accessed by a computer or

tablet device. Fourth, the ebook has the ability to integrate advanced and modern forms of technology as the best information transmission medium. The Ebook allows users to insert images, animations, videos, and more with the goal of helping to further understand the lessons in depth. Flipbook developed according to the characteristics of the ebook described by Nguyen (2015). Flipbook structures developed such as reversible books, able to work online or offline, are available in various formats such as fla (flash), exe (application) or in other extensions. Flipbook can be read through compatible smartphones, tablets or compatible devices. The ability to transfer flipbook messages has been proven in its validity, effectiveness and practicality.

## CONCLUSION

Based on successful ADDIE stages, it can be concluded that the Flipbook electrical circuit is eligible. It is based on 88% validity score with very feasible category, practical score measured based on student response 99,53% with very practical category, and effectiveness score of flipbook was 0,72 with very effective category.

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