The Innovation of Digital Flipped Book Attractive Module as Learning Media in Data Communication Subjects at Vocational High Schools

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Abstract. The existing learning resources that vocational high school students have used as references are still in the form of printed teaching materials, even though the covid-19 pandemic has changed the way students learn and teach to be all digital and online. This requires teachers to be creative in changing the packaging of teaching materials into an attractive digital form. The study aimed to develop an attractive e-book as a digital learning media with data communication content in theory and practice for vocational high schools. The method used in this research was the research and development (R&D) method using the ADDIE approach model stage. The product was trialed on 30 vocational students. The results revealed that the interactive flipbook was declared valid and practical. The effectiveness test with N-gain obtained a score of 0.8 with a high effectiveness category. The learning experience obtained by students has been quite able to instill a conceptual understanding of the subjects of data communication.

Keyword: Flipped Book, Learning Media, Attractive Module

1 Introduction

The rapid development of technology demands the need for an education system that is able to provide human resources (HR) that are able to compete globally [1][2]. The demands require national education policies need to be directed in order to be able to prepare human resources that can face future challenges effectively and efficiently from school age by utilizing technological advances, including advances in communication and information technology. The increase in the education sector means increasing human capacity to compete with developed countries[3].

Education is one form of realizing a dynamic and development-laden human culture so that the change and development of education are in line with the cultural change of life [4]. Changes in the improvement of education at all levels need to be done continuously. One of the changes made by the government in the field of education is to make improvements to the existing

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education curriculum. Learning that is innovative and creative in the classroom is expected to apply a learning model demanding students to think creatively-productively at every level of school [5][6].

Learning media has an essential role in transferring subject matter from teachers to students [7]. Nowadays, digital learning media as one of the digital learning media is proliferating and has managed to steal the attention of many parties' attention in education and industry [8]. Self-study is an individual's attitude derived from inside himself in growing awareness of the importance of learning. In self-study, a person has confidence that what is learned will benefit his life. Each learner's level of independence when receiving lessons is not the same, influenced by the characteristics of each learner. The characteristics of learners are divided into three, namely Cognitive Style, Learning Style, and Learning Motivation. These three characteristics of learners greatly determine the success of students in the learning process later [9].

Based on preliminary studies that have been conducted related to the development of learning materials in data communication subjects, it has been successfully developed print teaching materials of data communication modules [10]. The product was currently distributed in several schools and used as a supplementary in the learning process. Considering the conditions of nowadays learning process, which tend to be centered on students, and the utilization of digital media that connect learners with teachers remotely, the existing learning media was no longer relevant to the learning process. Students in the learning process were more interested in the presentation of material digitally [11].

Various digital media have been raised by adopting the source of learning teaching books that have been prepared before. In fact, the development of teaching materials with digital media has not been fully able to improve the quality of the learning process. Digital media developed so far did not have elements that can increase student learning motivation and have not increased students' independence in learning [12]. Presentation of material in a media was still monotonous and less exciting and interactive so that learning outcomes became less maximal. Moreover, digital learning media cannot optimally contribute to the learning process in today's digital age. The low contribution of digital media in today's digital era impacts the lack of maximum achievement of learners' learning achievements.

The gap between effort and reality was caused by learning media that have not matched the characteristics of student learning motivation. The use of digital media in learning that merely refers to the conformity of content with conventional subject matter might sometimes make students less competent to interpret the subject matter. Students' interpretations of the material differ, particularly those with low learning motivation. Motivation to learn is the overall driving force in students that gives rise to learning activities, which ensures the continuity of learning activities and provides direction to learning activities so that the desired goals of the learning subject can be achieved.

Many factors lead to low student motivation. In the learning process, an essential factor that influences low learning motivation is the presentation of less exciting material. Many learning media are still conventional and prioritize the presentation of complete material without regard to innovative elements, and the excitement of the learning media presented. This condition

becomes increasingly difficult by facing the current learning situation that relies heavily on presenting material with interactive online media without reducing the quantity of material presented in the learning process. Learning media as the cause of low student learning motivation directly impacts the quality of the information received by students in the classroom. Low student learning motivation leads to low learning outcomes in a learning process [13].

Based on the above problems, it is necessary to have visually appealing digital media that is visually appealing and engaging in its presentation to increase students' learning motivation to understand concepts that require rigor and imagination. It is expected that students' learning motivation would grow due to digital learning media that is visually appealing and interactive. Students can comprehend and receive the learning materials, which improves students' learning comprehension. In addition, students can comprehend the lesson independently by exploring the material at home, according to the characteristics of each individual.

2 Literature review

2.1 Digital learning media

The development of information and communication technology has shifted into the digital age. Information and publications that were previously only documented and disseminated through printed sheets of paper are now starting to be documented and disseminated through electronic media as an alternative substitute. In education, technology and information in learning are known as e-learning. E-learning is a term that refers to learning that takes place through the use of electronic devices. The e-module is a digital or electronic presentation of learning materials that introduces content in a more fascinating and interactive way than traditional print or video formats. [14].

An e-module displays information or manuscripts in an electronically recorded book format using a hard disk, floppy disk, CD, or flash disk. E-modules can be opened and read using a computer or electronic book reader (e-book viewer or e-book reader). Digital learning media is a teaching material arranged systematically, and interestingly that includes the content of the material, methods, and evaluations. It can be used independently to achieve the expected competencies in electronic media.

2.2 Data communication print module in theory and practice

The data communication print teaching module in theory and practice has been developed by researchers in the study of innovative learning media development in 2018. This printed teaching module has been distributed in several vocational high schools in the Buleleng district, while some were distributed outside the Buleleng district area. This print teaching module was the primary reference teaching material in some vocational high schools. It was also used as supplementary media in other schools during the learning process. When it is adjusted to the current learning context, the presentation of the material is no longer relevant in improving the quality of learning optimally. The shift in the learning process leads to digital learning, making print teaching modules increasingly abandoned and students prefer to learn with digital media, although the content presented is not much different. Printed textbooks are packaged in an engaging digital form to be more helpful. The application that is a trend today is Flip Book

Makers, an electronic book application equipped with images, sounds, and videos. Even researchers add Augmented Reality to the e-book, making it more attractive.

2.3 Flip book maker

Flipbook maker is software that can open every page into a book. Flipbook maker software can create and convert pdf files, images/photos into a book or physical album. The final result can be stored in .swf,.exe, or .html format. By using flipbook maker software, students will be more interested in learning because it contains a more attractive display and improves students' learning achievements [15].

Flip Book Maker is software that can change the appearance of PDF files to be more attractive like a book. Ncesoft Flip Book Maker can also make PDF files such as a magazine, Digital Magazine, Flipbook, Company Catalog, Digital Catalog, etc. The benefit of Flip Book Maker in the learning process is that it can motivate students in learning because it looks interesting and dynamic. The advantage of this application is (1) able to give a flip effect, namely opening or flipping sheet after page of the book, so that it is like reading a real book; (2) the creation of electronic books with this application is very easy; (3) the resulting e-book is not only a book, but can be equipped with images, sounds, and videos; (4) the products can be published in the form of SWF or Flash, HTML to be published through the website.

3 Methodology

3.1 Research design

The present study was in the research and development (R & R&D) method adapted from the ADDIE development model. The ADDIE model is a development model popularized by Reiser and Molenda that consists of analysis, design, development, implementation, evaluation. The ADDIE model focuses on iteration and reflection, so continuous improvements can be made that focus on feedback.

3.2 Participation

The formative evaluation section conducted *expert appraisal* through one-to-one expert judgment by two experts related to the justification of conformity (validity) of content implemented in the flipbook. Furthermore, two design and media experts were also required to justify the application's accuracy and functionality and test the effectiveness and success of the research. A response test was conducted on 30 students to respond to their learning experiences during the treatment.

3.3 Data collection

The data obtained were grouped according to the nature into two parts, namely qualitative and quantitative data analysis. Data classified in qualitative data was in the form of inputs, comments, and written suggestions either from expert judgment or validators involved, while for qualitative data quantified were obtained from student responses related to the practicality of the response questionnaire using Linkert scale and effectiveness through N-gain score.

3.4 Data analysis

The collected data were descriptively analyzed. The data analysis from the expert test results was based on Table 1. The conversion guidelines were used.

Table 1. Conversion Guidelines of Validity and Practicality test.

Interval	Validity Criteria	Practicality Criteria
75,00 – 100,0	Valid	Practical
50,00 – 74,99	Quite Valid	Quite Practical
25,00 – 49,99	Less Valid	Less Practical
00,00 – 24,99	Invalid	Impractical

A normalized gain test (N-Gain) was conducted to determine the improvement of students' cognitive learning outcomes after being treated. The result was taken from comparing students' pre-test and post-test scores. N-Gain test compares the actual gain score with the maximum gain score. The actual gain score is the gain score obtained by the student, while the maximum gain score is the highest possible gain score for the student. The data from students' cognitive learning outcomes were collected and analyzed based on the following criteria in Table 2 below.

Table 2. Conversion Guidelines of N-Gain test.

Interval	Effectiveness Criteria
$[g] \geq 0,7$	High effectiveness
$0,3 \leq [g] < 0,7$	Medium effectiveness
$[g] < 0,3$	Low effectiveness

To ensure that the flipbook was effectively used and able to improve the understanding of student concepts, the average post-test results compared to the minimum completion criteria in the class were used as a pilot project.

4 Result and discussion

This research was conducted based on the ADDIE research design. The study results are presented following the stages in the ADDIE research design.

4.1 Analyze stage

The result of the analysis stage showed that the learners feel bored during learning because the learning content used by educators was less interesting, in the form of printed books, which resulted in learners not understanding the learning material. Learners expected the learning content provided by educators to be packaged attractively so that students are more interested in learning. Based on the discussions with the teachers, the subjects of material that need to be developed into attractive learning content were softswitch server material, softswitch server configuration, and VoIP network.

4.2 Design stage

The result of the design stage was mapping learning materials and designing a Learning Implementation Plan tailored to the learning stages contained in the problem-based learning model to be packaged into attractive learning content. As for the other results of the design stage, namely, designing an attractive learning content interface design is a general picture of the attractive learning content developed. Attractive learning content consists of text, images, learning videos, quizzes, and evaluations, packaged in a flip book maker.

4.3 Development stage

At the development stage, the translation of the interface design was made into the physical form of attractive learning content, adapted to the Learning Implementation Plan. The translation of the interface design at the design stage was made using Professional Flipped Book 3D software. The developed interactive learning content contains images, learning videos, quizzes, and evaluations. Product development results with Flipped Book 3D Professional are shown in **Figures 1**, **Figure 2**, and **Figure 3**.

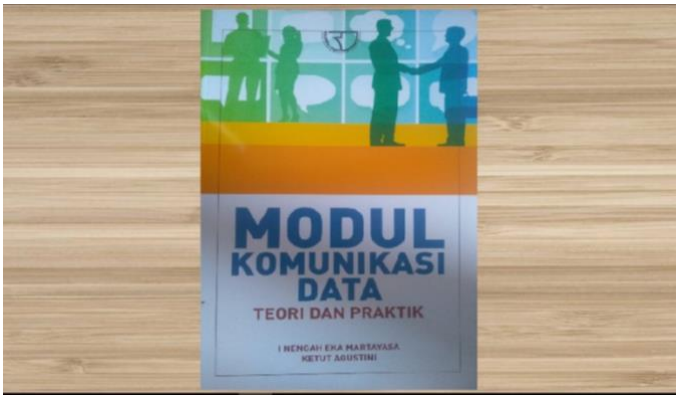

Fig. 1. Cover book on flipped book maker software.

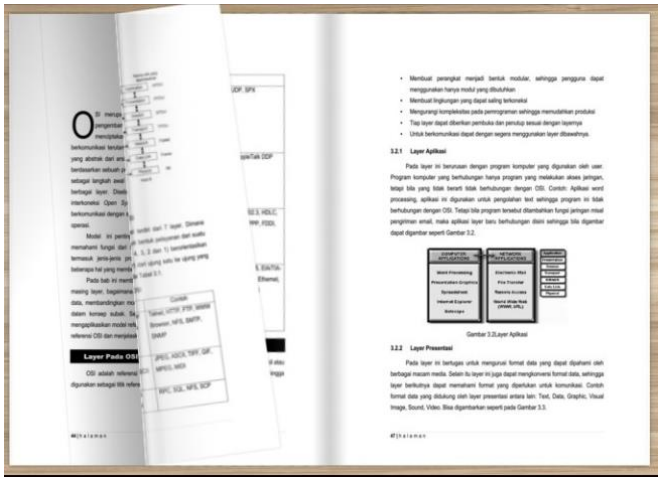

Fig. 2. Attractive book content on flipped book maker software.

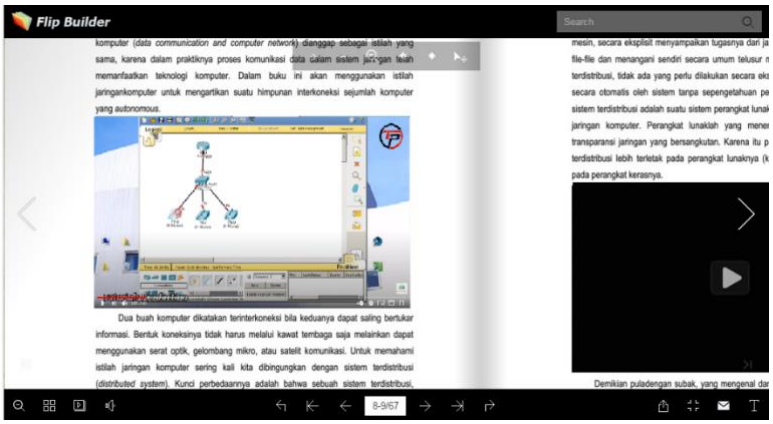

Fig. 3. Playing video on attractive flipped book.

According to the current syllabus, validation was required to test the feasibility of the product used in the learning process based on the substance aspect of the content. At the same time, the design/media was related to the suitability of learning content with display (visual communication). Summary of expert test results of content and design and media obtained an average result of 90.08%, belongs to Valid criteria, as seen in Table 3 below.

Table 3. Validity test results.

No.	Assessment aspects	Score in percentage by the validator (%)
1	Substance of content	93.14
2	Learning design	87.23

3	Display(visual communication)	90.86
4	Software utilization	94,32
Percentage of average score		**94,32**
Criteria for the validity of the whole aspect		**Valid**

Results from the practicality and effectiveness test flipbook completed by 30 students who participated in the study revealed that 56% felt that it was practical. 29% stated quite practical because the content was easy to understand, but 15% stated less practical, as in **Figure 4** below.

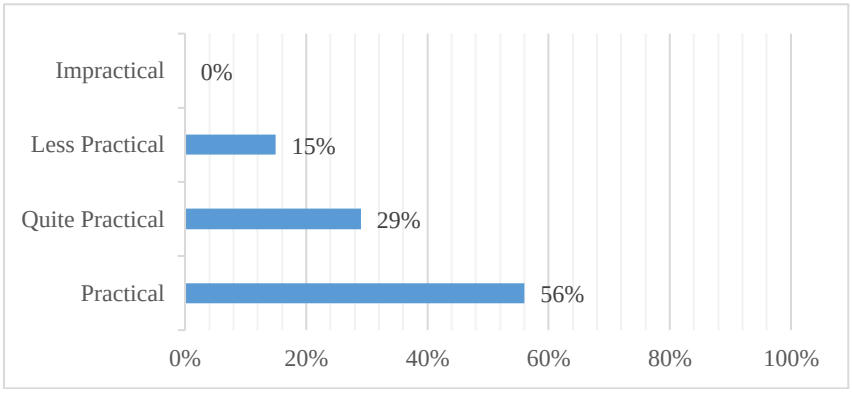

Fig. 4. Practicality test results.

Students' devices may have varying capabilities, making it less practical to use them because the video access featured in the flipbook loads slowly.

4.4 Implementation stage

Product testing was developed for prospective users at the implementation stage, namely teachers and learners. The evaluation was done by conducting a product effectiveness test by providing pre-test and post-test to learners to find out the improvement of learners' learning outcomes in flat wake material after using attractive learning content. The pre-test and post-test questions consisted of the same 20 questions on each test. The pre-test and post-test values are presented in Table 4 below.

Table 4. Data of pre-test and post-test.

No	Respondents	Pre-test	Post-test
1	Respondent 1	25	85
2	Respondent 2	50	95
3	Respondent 3	45	80
4	Respondent 4	65	90
5	Respondent 5	65	95
6	Respondent 6	20	85
7	Respondent 7	80	100

No	Respondents	Pre-test	Post-test
8	Respondent 8	40	80
9	Respondent 9	85	95
10	Respondent 10	60	85
11	Respondent 11	65	95
12	Respondent 12	80	100
13	Respondent 13	45	85
14	Respondent 14	85	100
15	Respondent 15	65	80
16	Respondent 16	90	100
17	Respondent 17	15	90
18	Respondent 18	60	95
19	Respondent 19	70	90
20	Respondent 20	60	95
21	Respondent 21	35	85
22	Respondent 22	30	90
23	Respondent 23	55	90
24	Respondent 24	45	90
25	Respondent 25	30	85
26	Respondent 26	55	100
27	Respondent 27	55	95
28	Respondent 28	50	90
29	Respondent 29	55	100
30	Respondent 30	45	85
	Average	54	91
	Max Score	100	
	N-Gain	0.8	
	Criteria	High effectiveness	

The process of calculating the value of N-Gain from the table above is as follows:

$$\text{N-Gain} = \frac{\text{Post-test} - \text{Pretest}}{\text{Max Score} - \text{Pretest}} \quad (1)$$

$$\text{N-Gain} = \frac{91 - 54}{100 - 54}$$

$$\text{N-Gain} = \frac{37}{46}$$

$$\text{N-Gain} = 0{,}8$$

It was revealed that there was a 37 point rise in the average post-test value compared to the pre-test value based on the average pre-test and post-test values. The findings obtained from the N-Gain attractive learning content calculation were 0.8 in accordance with the effectiveness requirements. The results of calculations that have been obtained were then categorized in effectiveness criteria. After converting the table, the results obtained showed that attractive learning content belongs to "Highly Effective."

4.5 Evaluation stage

The last stage in the ADDIE model was the evaluation stage, aiming to find out the shortcomings of interactive learning content so that improvements need to be made so that the products developed can be applied. This stage improved or eliminated the shortcomings previously contained in interactive learning content. Evaluation at each stage was also carried out based on assessment indicators used as the minimum standard.

4.6 Discussion

In the development stage, product development translated the design interface into a physical form of interactive learning content adapted to the design of the problem-based learning model and learning implementation plan design. Translation of interface designs that have been made at the planning level was made using 3D Professional Flippage. Attractive learning content developed using 3D Flippage Professional software contained images, learning videos, quizzes, and evaluations. Interactive and varied learning content facilitated learners' interaction with learning media during distance learning [16].

The improvement in the moderate category certainly has a reason that each student has a different learning style. There are two categories related to how learners learn. How learners can absorb information easily (modalities) and how students manage and process such information (brain dominance). Therefore, the learning style combined the two categories, namely how students absorb, organize, and process information [9]. The results of the previous research stated that some characteristics affecting students' success in learning are motivation, knowledge skills, and learning style. Thus, the developed flipbook was quite adaptive according to the characteristics of the student. Based on student characteristics, most vocational students need mentoring to learn using interactive flipbooks so that the role of teachers as facilitators is indispensable [17].

The results of this development research showed that the use of interactive flipbooks was quite capable of making students able to explain the concept of the material and exemplify implementation in the field. However, some content needed to be mentored by the teachers. It means that learning to use the flipbook as a learning medium has a fairly good influence on students' understanding of the material presented. Thus, it indirectly affected the increase in critical thinking of students. This was also supported by research that stated that the development of learning media enables students to be faster at capturing information presented in visual, animated, and graphics-based learning content than textual forms.

Attractive learning content belongs to the effective category because interactive learning content can make it easier for learners to learn independently. In interactive learning content, there are already stages of problem-based learning model, so learners can easily understand the material because of discussions between learners.

5 Conclusion

Attractive e-book as digital learning media with data communication content in theory and practice for vocational high schools has been successfully developed using the ADDIE development model approach. This media can be declared valid, practical, and highly effective

for learning in vocational high schools. The learning experience obtained by students instilled the concept of understanding the concept of data communication and computer networking.

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