Digital Learning Media Innovation and Learning Experience: Creating Interactive Flipbook for Vocational Student

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Abstract. Teachers' ability to think creatively and innovatively to improve their classrooms is essential in this digital age and in the face of the present pandemic. One of the ways is by transforming a printed textbook into an interactive and engaging e-book. Thus, this study aimed to develop an interactive flipbook for vocational school students and describe their learning experiences. ADDIE development model was applied through the testing phase of validity, practicality, and effectiveness to obtain a decent media to improve the understanding of student concepts. The Flipbook was trialed on 27 vocational students. The results revealed that the interactive Flipbook was declared valid and practical, where the effectiveness test with N-gain obtained a score of 0.495, belonging to a fairly effective category. The learning experience obtained by students has been quite able to instill a conceptual understanding of the subjects of data communication and computer networking.

Keywords: Digital Learning Media Innovation, Learning Experience, Interactive Flipbook.

1 Introduction

The Covid-19 pandemic has dramatically changed every human aspect, including education, through changes in the way of learning and teaching. Students must be familiar with distance learning through digital platforms due to social distance. Even though some schools have reopened, similar tendencies and challenges have continued for an indefinite period. Thus, the latest Education Technology trends are being revolutionized, focusing on connectivity, versatility, and student-centered learning.

In their role as change agents, teachers are also expected to be creative and innovative in their efforts to make adjustments in the school environment connected to learning. Teachers should immediately be repackaging content by integrating technology, making the learning process an exciting new experience *(attractive)* for students. According to current trends, the learning resources and media used in supporting the learning process need to be immediately transformed

into digital form. As stated by AECT, educators must transform traditional books into digital forms to make learning more effective.

The Association for Educational Communications and Technology (AECT) defines technology as facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources. The educators who utilize EdTech simplify this term as a concept of digitalizing traditional book teaching and learning. For them, the main difference lies in the way knowledge is delivered to make teaching more effective.

The current learning resources that vocational high school students have used as a reference are still in the form of traditional books, namely printed teaching materials. The disadvantage of this printed teaching material is the appearance that is less attractive. Students are less likely to carry it because they prefer something simple and easy to bring everywhere. Innovative teaching materials can be created by teachers by utilizing interesting information technology that can be carried and read anytime and anywhere. Moreover, nowadays, students get used to their gadgets such as smartphones. Teachers should utilize these opportunities to improve the quality of learning.

Preliminary studies and discussions with several students of teacher professional education in vocational high schools, specifically for computer and network engineering departments, found a need for innovation in creating digital-based teaching materials that students can access through their mobile devices. Materials generated must make use of software compatible with the Android operating system for students to have easy access to their educational materials. Researchers assumed that about 90% of students have Android-based gadgets.

The teaching book entitled "Data Communication and Computer Network and its Analogy in *Subak* Concept" has been widely used by vocational high students specifically for the TKJ department to learn the concept of computer networks. Referring to the current situation and the results of identification problems in the school, changing the textbook into a fun digital teaching resource will help students become more interested in adding knowledge about local wisdom in Subak, which has concepts that are similar to the science they are studying, namely Computer Network. Digital teaching materials offered were in the form of e-book Flip Book Makers, an electronic book application equipped with images, sound, and video. This feature was expected to increase students' learning motivation and make it easier to read it anywhere through their gadgets. The utilization of electronic-based teaching materials impacts increasing student participation in learning in the classroom [2][3]. The development of a computer networking e-book in the concept of *subak* as Interactive Digital Learning Media for Vocational High Schools was very feasible and urgent to be developed. This resulting product became an innovative work in terms of learning technology that can stimulate teachers to innovate in packaging teaching materials that will attract students.

Concerning Digital learning media based Flipbook, there have been many researchers who produced such interactive e-modules such as the utilization of Kvisoft Flipbook maker-based stoichiometric e-modules to observe the magnitude of improved understanding of student stoikiometryconcepts [4] and the development of Flipbook-assisted Web Learning that could improve logical thinking skills by using such products. Later, [6] has developed an interesting e-book using Flip builder integrated with PhET Simulation software. [7] developed interactive

teaching materials e-module chemistry based on Kvisoft-based chemistry magazine Flipbook Maker on thermochemistry for grade XI/MA high school students and the development of laboratory-based e-worksheets using Kvisoft Flipbook for science process skills by [8] and many more. Referring to the study results, most of the previous studies investigated flipbook-based development research in various fields and produced significant products that successfully improved learning outcomes and other bound variables such as critical thinking, logical thinking, and motivation of students. However, no one has described how the learning experience they gained after treatment using the Flipbook.

The learning experience becomes something important to recognize because of the paradigm shift in learning from face-to-face to online learning, thus students' learning patterns become more personal that is self-regulated. The learning experience can be a reference for teachers in improving the quality of the learning process. Online and distance learning is a new experience for vocational students who get used to doing practice in face-to-face learning. Due to the professional flexibility, teacher creativity is indispensable in developing a digital media innovation that can facilitate students in exploring the content they want to learn (choose-Your-Own-Adventure). There may be various pedagogical practices in it during online learning. Therefore, this study examined how technology, in this case, is the development of computer network content with flipbook technology with pedagogy, affected the learning experience of vocational students during Covid-19. It was expected to identify the technology-mediated and effective pedagogical practices from the students' perspectives.

2 Material and method

This research applied the research and development (R&D) method using the ADDIE approach model stage [9]. Based on the previous research and the results of the need analysis in preliminary research, the following stages were carried out, (i) analyzing existing content, which is still abstract in the congregation into images, simulations, or video shoots, (ii) creating a simulation design or video scribe or augmented reality that will enrich the content, (iii) developing the design results, (iv) implementing the design into an exciting flip bookmaker, and (v) evaluating the implementation results through formative evaluation with one to one expert test, one to one leaner, small group, and field trial to test the practicality and effectiveness of the product and the criteria of research success.

2.1 Participation

Expert appraisal through one-to-one expert judgment by two experts related to the justification of conformity (validity) of content implemented in the Flipbook was conducted in the formative evaluation section. Furthermore, two design and media experts were also required to justify the accuracy and functionality of the application and also test the effectiveness and success of the research. Lastly, a response test was conducted on 27 students to get student satisfaction and what learning experience they have gained during the treatment/trial.

2.2 Data Collection

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

2.3 Data Analysis

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

Table 1. Conversion guidelines.

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

As for effectiveness was done through a normalized gain test (N-Gain) to find out the improvement of students' cognitive learning outcomes after being treated. This score was taken from the pre-test and post-test scores obtained by students. Normalized gain or N-Gain is a comparison of the actual gain score with the maximum gain score [10][11][12]. 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. 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.

3 Result and discussion

The research began by conducting preliminary studies through discussions and interviews with several vocational school teachers as the participants during the Teacher Professional Education activities. They conveyed that the students prefer simple teaching materials more, accessible anywhere, which students currently have their gadgets as the result of the Covid-19 pandemic. To reassure the interview results related to the students' needs in the pandemic situation, the researchers also conducted observations and dissemination of questionnaires involving 30 vocational students while doing work practices in the laboratory in shifts. The results showed that 90.23% of students want alternative learning content that is interesting and easy to understand. At the same time, 89.50% of students were used to using gadgets as a learning resource both at school and at home. This finding was under the trend in the 21st century, which is a digital era that demands students to utilize technology as a source of information and learning resources [13]. Following up on the results of interviews, observations, and questionnaires, the researchers provided a solution by making changes related to printed textbooks that have been owned before by repackaging them into digital eBooks that are easily

accessible to students and interesting to learn. This repackage utilized a flipbook maker application that is being contested and has become the current trend. This app makes it easy for students to learn because it is rich in dynamic images through changing the abstract to a concrete concept, and can be given in the form of simulations, video scribes, etc. to motivate students in exploring their knowledge [14][15][4][16][8].

The development process was begun by analyzing the abstract content in computer network teaching modules that could be described. The selection was worth simulating because of the complexity of the computer network content described in the teaching module. The design stage was done to produce prototype media and assessment instruments from the analysis. The prototype media was following the syllabus in vocational high schools as a pilot project of this research. The result of the development process is shown in **Figure 1** below.

(a)
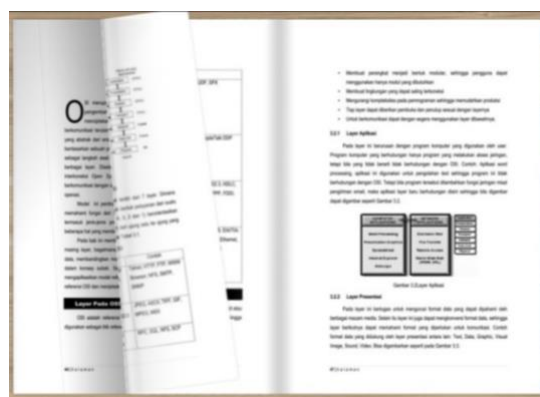
(b)
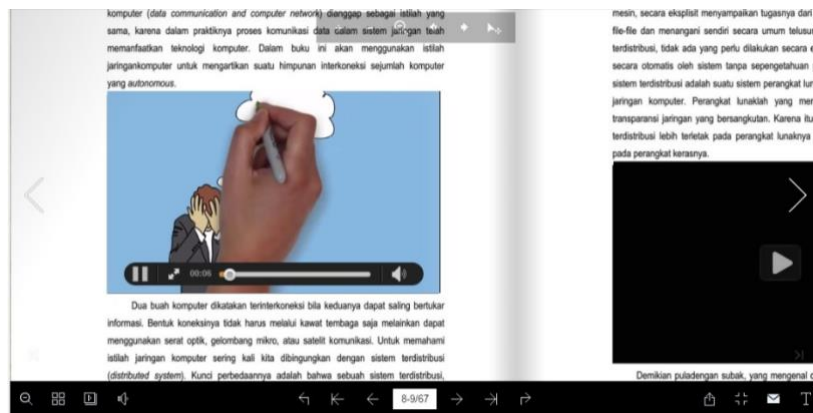
(c)

Fig. 1. The result of the development process.

For the design of the assessment instrument, a validation form related to expert judgment both for the content validator, media/design validator, and student/teacher response questionnaire relevant to the research were being reviewed. The development and implementation stage was done to realize the design that has been produced into the flipbook maker using the flip builder application. In the evaluation section, a test related to the validity of content, design, and media was conducted by experts as well as the disseminated questionnaires related to student satisfaction and learning experience that they experienced safe field trial.

Validation was required to test the feasibility of the product used in the learning process based on the substance aspect of the content according to the syllabus in use. The design/media related to the suitability of learning content with display (visual communication) and software utilization was under the standards of the Ministry of Education. The expert test of content and design and media obtained an average result of 92.08%, belonging to the Valid criteria that can be seen in **Table 2**.

Table 2. Validity test results.

No.	Assessment aspects	Score in percentage by the validator
1	Substance of content	90.23%
2	Learning design	88.20%
3	Display (visual communication)	89.88%
4	Software utilization	100 %
5	Percentage of average score	92,08%
6	Criteria for the validity of the whole aspect	Valid

The validation criteria in **Table 2** show that the resulting product has met all aspects referred to the standard of KEMENDIKBUD. The Flipbook passed the practicality and effectiveness test, with 67 % of students stating that it was practical and 23 % stating that it was very practical because the content became easy to understand. However, 10% stated that it was less practical as in **Figure 1**. The ability of the students' device to load video access in the Flipbook caused the Flipbook to run slowly, making it less practical.
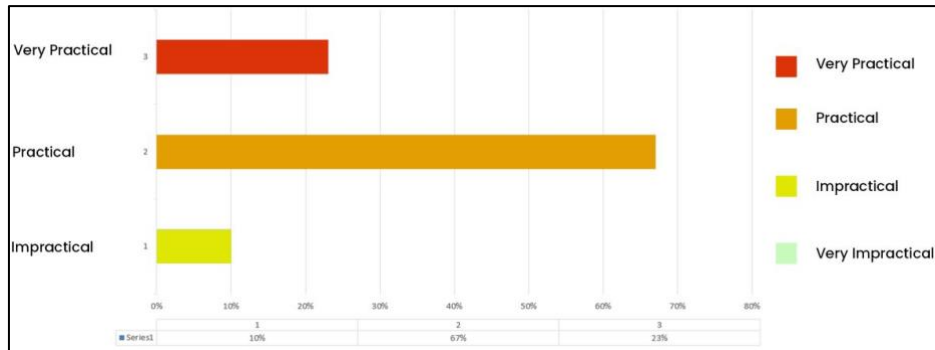
Fig. 2. Practicality test results.

On the effectiveness test, it was obtained that the average pre-test was 52.50 and the posttest average was 76.019. After being calculated using the formula N-gain, it was obtained N gain 0.495 which belongs to the moderate category (quite effective). But the improvement of learning outcomes was still in the moderate category, so it needed to be strengthened by the criteria of success.

Table 3. Summary of effectiveness test results.

	Average	Standard deviation	Standard error average
Pre-test	52.500	12.3452	2.3758
Post-test	76.019	13.1423	2.5292
N-gain score	0.495		

Table 3 shows that the average pre-test score was 52.5 and the student's post-test score was76.019 (on a scale of 100). Based on PAP, the post-test scores qualified "Good" and was above the KKM score of data communication subjects and computer networks of 75. Looking at the average or mean of Post-test which is greater than the average value or mean pre-test, it can be said that the interactive flipbooks could successfully improve the understanding of student concepts in data communication subjects and computer networks. Referring to the qualification criteria of student learning outcomes based on PAP, the success of interactive Flipbook met the qualifications of at least 80% of students who followed the learning could achieve the benchmark value of success indicators of achievement of basic competencies set. The percentage rate of student field trials was 85.83% with a post-test score of 76.019 (on a scale of 100). The value obtained slightly exceeded the minimum criteria of success. Therefore, the interactive Flipbook was stated to be quite successful in improving the understanding of the concept of student computer networks. Furthermore, additional in-depth research and analysis are required to determine why certain achievements have fallen short of desirable levels or have only reached the moderate category.

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", namely, how learners can absorb information easily (modalities) and how students manage and process such information (brain dominance). Therefore, the learning style is a combination of the two categories, namely how students absorb, organize, and process information. Based on the research that has been conducted, some characteristics that affect the success of students in

learning were motivation, knowledge skills, and learning style so that the developed Flipbook was quite adaptive. Based on the student's characteristics, most vocational students need mentoring to learn using interactive flipbooks, thus the roles of teachers as facilitators are indispensable. This is in line with the scaffolding theory put forward by Vygotsky who argued that students would be able to reach the maximum area if they helped adequately. If the student learns without assistance, he or she will remain in the actual area without being able to develop to a higher level of potential development. In learning, scaffolding can be said to be a bridge used to connect what students already know with something new or that students will master. The main thing in the application of scaffolding lies in the guidance of teachers. Teacher guidance is given gradually after students are given problems so that their actual abilities reach potential abilities. The help can be a hint, encouragement, warning, outlining the problem into troubleshooting steps, or giving an example [17][18][19].

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 exemplified implementation in the field, but some content needed to get mentoring from teachers. This means that 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 is also supported by research [11], which stated that learning media development made students faster at capturing information presented in visual, animated, and graphics-based learning content than textual forms.

The learning experiences that students have after using interactive flipbooks could not be separated from Dale's experience cone which creates a concrete-abstract network starting from students who participated in real experiences, students as observers of real events, students who were presented by the media, and finally students as observers of events represented by symbols. These concrete abstract traces were displayed in the form of a cone of the experiment. Edgar Dale's Cone of Experience is a detailed elaboration of Bruner's three levels of experience. One's learning outcomes are obtained from direct experience (concrete), the reality in one's living environment rather than through artificial objects, to verbal symbols (abstract). The higher the top of the cone, the more abstract the message delivery medium is. Dale's depiction in the cone is a level of learning experience arranged sequentially based on the level of concreteness and abstraction of the experience and during the reception of teaching content or messages. The level of message abstraction will be higher when the message is poured into symbols such as charts, graphs, or words. If the message is contained in such symbols, the senses involved in interpreting it are increasingly limited [20][21]. Based on the cone of experience, an interactive flipbook includes images, visual symbols, and sentences that clarify the content of the material. Students also gained direct experience by observing, using, and operating the teaching materials, so that the concept of understanding was embedded in the material concepts of data communication and computer networks.

4 Conclusion

Interactive Flipbook as a Digital Innovation learning media has been successfully developed using the ADDIE development model approach. This media could be declared valid, practical, and effectively implemented into vocational high schools learning. The learning experience

obtained by the students has been able to instill the concept of understanding the concept of data communication and computer networking.

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