Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

July 2022. Vol. 10, No. 3
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 712-718

Flipbook-Based Digital E-book Learning Media on Mechanical Wave Materials to Practice Critical Thinking Skills

Izmi Afifatul Azizah, *Imam Sucahyo
Physics Education Department, Faculty of Mathematics and Science Education, State University of Surabaya. Jl. Ketintang Gedung C3 lt., Surabaya, Indonesia. Postal code: 60231
*Corresponding Author e-mail: imamsucahyo@unesa.ac.id

Received: June 2022; Revised: July 2022; Published: July 2022

Abstract

The research aimed to know the validity, practicality, and effectiveness of e-book learning media on learning to train students' higher-order thinking skills. The research method used is the type of quantitative research. The research was carried out by giving a pretest, then being treated, and then a posttest. The subjects of this study were students of class XI Saince 2 Senior High School NU 1 Gresik. Data collection techniques using pretest-posttest and questionnaires. Data analysis used validity test, Cronbach alpha reliability test, and t-test. The results of the research that have been processed and analyzed can be concluded that the flipbook-based e-book learning media has an average validation value of 85.066%, categorized as very valid. Learning media has a practicality value of 85.067%, included in the very practical category. The questionnaire is classified as accurate because of the importance of rcount > rtable and is categorized as reliable because it has an alpha value of 0.869. Through the t-test, the significance value of 0.000 is less than 0.05, meaning there is a significant effect in giving treatment. Therefore, the research can be concluded that the flipbook-based digital e-book learning media obtains a valid category, is suitable for use, and trains students' critical thinking skills.

Keywords: learning media, e-book, flipbook, critical thinking skills

How to Cite: Azizah, I., & Sucahyo, I. (2022). Flipbook-Based Digital E-book Learning Media on Mechanical Wave Materials to Practice Critical Thinking Skills. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 10*(3), 712-718. doi:https://doi.org/10.33394/j-ps.v10i3.5474

https://doi.org/10.33394/j-ps.v10i3.5474

INTRODUCTION

The ability of human resources that needs to be improved is the ability to think critically or critically. This ability is essential and needs to be possessed by the workforce during the industrial revolution 4.0. Critical thinking is a person's cognitive competence to have a logical mindset, and a logical mindset plays a vital role in making clear decisions by analyzing information and assumptions to solve problems. Critical thinking skills are cognitive abilities that need to be trained in a learning activity and are included in higher-order thinking processes. The first three conditions for a person to have critical thinking skills are using cognitive abilities to observe a problem by paying attention to accurate information and evidence. Second, knowledge of how to ask and give logical reasons. Third, skills in implementing this method are a problem (Bhisma Murti, 2015).

Critical thinking ability includes understanding only problems, seeking and finding the correct method to solve problems, collecting accurate supporting information, making an assumption from the knowledge, and making a decision with confidence and accuracy. Other abilities covered by critical thinking are the ability to decipher data, process information, and assumptions, and understand and use straightforward, precise, effective, and specific language.

Science learning is a lesson that needs to train and develop higher-order thinking skills. The learning process is an effort carried out intending to maximize the potential possessed by

students into a competency. One way to train students' critical thinking skills is to involve learning media in the learning process. *Learning media* can be used to communicate subject matter that supports learning activities (Ambhara Sanuaka, 2017:10). The critical role of learning media in learning activities is to facilitate the message that the teacher or educator wants to convey to students. Various facilities can be used to support learning activities in the form of print or non-print media.

The development of science and technology makes it easier for teachers to develop learning media. The development of books that were initially widely printed have now been developed into non-printed books in the form of electronic books. E-books can be developed with various file formats and software. One of a wide variety of developing software, the Flip PDF Professional application can be an option. E-books are produced through Flip PDF Professional software, and each page can be flipped over like a printed book. The software can be used in making interactive e-books with three-dimensional designs.

Research focuses on the use of mechanical wave materials. Thus, it is necessary to conduct a study that uses flipbook-based digital e-book learning media to train students' higher-order thinking skills in physics. Following the previous description, the researcher aims to conduct research that is to know the validity, practicality, and effectiveness of e-book learning media in learning to practice critical thinking skills.

METHOD

The method used by researchers in the research process is quantitative research. Research data was collected at SMA Nahdlatul Ulama 1 Gresik when the research was carried out during the even semester of the 2021/2022 academic year. The research subjects were students of class XI MIPA 2 using a one-group pretest-posttest research design. The one group pretest-posttest design formula is written as Table 1 below.

Table 1. Table of one group pretest-posttest design (Sugiyono, 2013)

Pretest	*Treatment*	*Posttest*
A_1	X	A'_1

The implementation of research using singular samples is carried out by giving a test to the sample before being given a treatment called a pretest (A1) to obtain data about students' critical thinking skills. After getting data on higher-order thinking skills, students are given treatment by giving a flipbook-based digital e-book (X). Next, a retest was conducted to estimate students' critical thinking skills (A'1). Through the post-test, experimental data will be obtained showing whether students' higher-order thinking skills have increased or not. Statistical analysis is a t-test or t-test to find out the comparison of results in (A1) with (A'1).

The process of processing and analyzing research data results through the validity test of learning media assessed by media experts, students' pretest-posttest results, questionnaires, and documentation of learning implementation. The results of the analysis of research data that have been collected are used to find the value of the learning media's validity, the media's feasibility, and the influence of students' learning media in practicing critical thinking skills.

The instrument for the feasibility of learning media is filled out by experts, namely two physics department lecturers, and a physics subject teacher. The evaluation criteria for the validation of flipbook-based e-book learning media can be seen in table 2 and table 3 for the criteria for media validity.

Table 2. Eligibility assessment as above

No	Score in percentage	Eligibility category
1	0% - 20%	Very unworthy
2	21% - 40%	Not feasible
3	41% - 60%	Quite feasible
4	61% - 80%	Feasible
5	81% - 100%	So feasible

Table 3. Validation assessment as above

No	Score in percentage	Eligibility category
1	0% - 20%	Invalid
2	21% - 40%	Not valid
3	41% - 60%	Quite valid
4	61% - 80%	Valid
5	81% - 100%	Very valid

Questionnaires that respondents have filled out require analysis in the form of validity tests and Cronbach alpha reliability tests to find a questionnaire's validity and reliability. The influence of flipbook-based digital e-book learning media was analyzed based on the results of the pretest and post-test, which were analyzed through a t-test with the help of IBM SPSS Statistics 25.

RESULTS AND DISCUSSION

The research carried out by students was pre-treatment with flipbook-based digital e-book learning media on mechanical wave material that researchers had previously developed. The research results that have been collected come from the pretest and posttest, media feasibility tests by experts, and filling out questionnaires. Calculating data through the validity and feasibility test of learning media by media experts is analyzed as follows, learning media uses five aspects as a benchmark for the validity and feasibility of learning media. These aspects are general appearance, software engineering, media visualization, material suitability, and presentation techniques. The results of the validation data are shown in Figure 1.

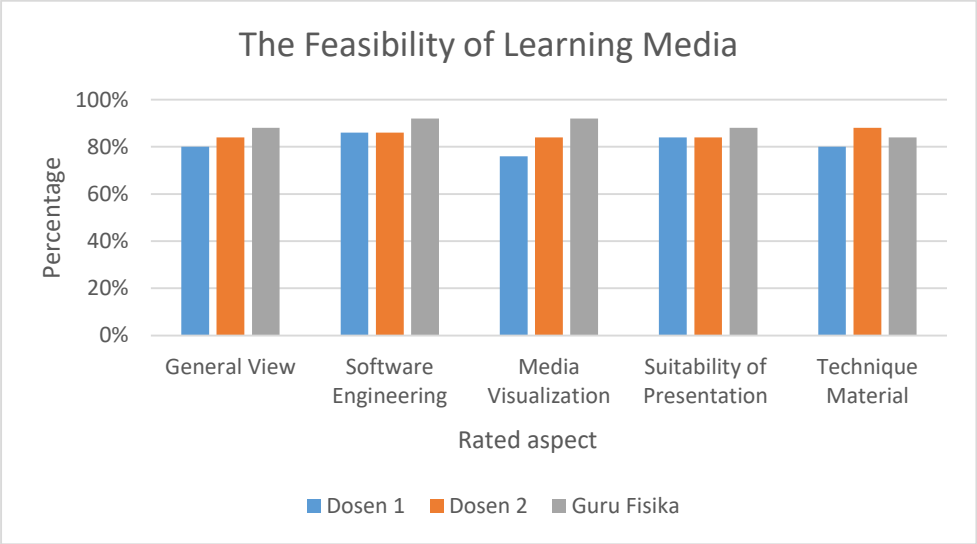

Figure 1. Diagram of the results of the feasibility of learning media

Figure 1 is the result of the feasibility test of flipbook-based digital e-book learning media from the three validators; based on the graph, the average feasibility assessment of lecturer 1 is 81.2%, lecturer two is 85.2%, and physics subject teacher is 88, 8%. The mean worth of media experts is 85.067% and is categorized as a very feasible learning media. So flipbook-based digital e-books are very suitable for use in the learning process, especially on mechanical wave material.

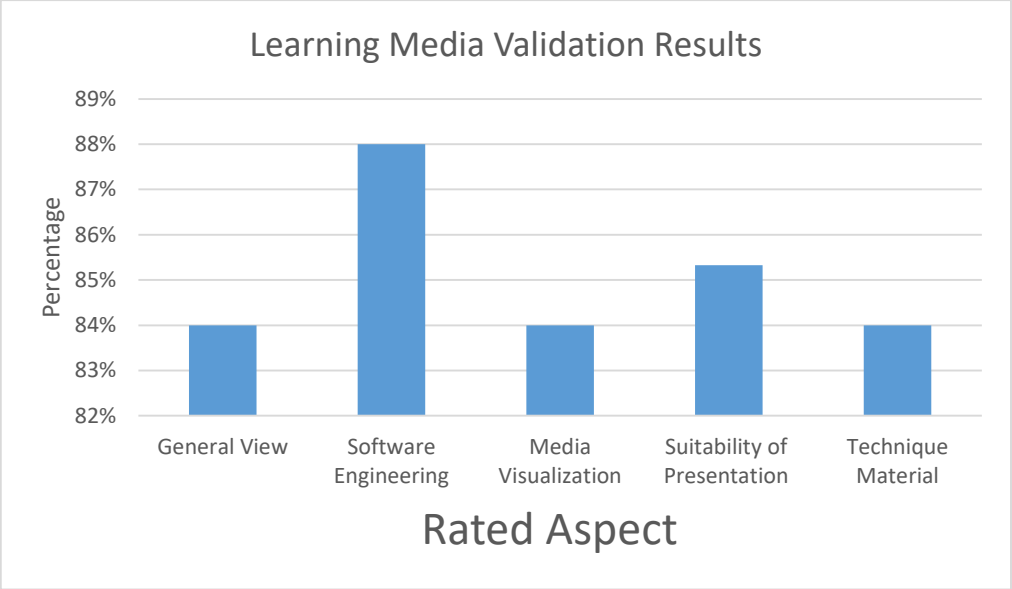

Figure 2. Diagram of the average results validate learning media

Figure 2 shows the average results of the validation tests that the three validators have assessed, and the assessment is based on seven aspects that are assessed and then averaged. The general display aspect has an average value of 84%, the software engineering aspect has an average value of 88%, the media visualization aspect is 84%, the material suitability aspect is 85.33%, and the material suitability aspect has an average value of 84%. Based on these seven aspects, a flipbook-based digital e-book on mechanical wave material is included in the excellent category. Suggestions given by the validator are that the e-book design is made more creative and innovative, and the appearance of the e-book is made more attractive by adding more pictures or videos that can stimulate students' higher-order thinking skills, presenting more varied practice questions based on digital literacy.

Table 4. Questionnaire Item Correlation

	r_{count}	r_{table}	Sig
A1	0.562	0.3673	0.002
A2	0.471	0.3673	0.013
A3	0.391	0.3673	0.044
A4	0.557	0.3673	0.003
B1	0.546	0.3673	0.003
B2	0.712	0.3673	0.000
B3	0.628	0.3673	0.000
B4	0.395	0.3673	0.041
C1	0.492	0.3673	0.009
C2	0.613	0.3673	0.001
C3	0.597	0.3673	0.001
C4	0.766	0.3673	0.000
D1	0.563	0.3673	0.002
D2	0.471	0.3673	0.013
D3	0.391	0.3673	0.044
D4	0.557	0.3673	0.003
E1	0.562	0.3673	0.002
E2	0.471	0.3673	0.013
E3	0.391	0.3673	0.044
E4	0.557	0.3673	0.003

Table 4 is the result of the Pearson product-moment validity test. Validity testing functions to see the validity of a question on the questionnaire used by researchers in estimating and obtaining research results. Questionnaire items were analyzed by comparing the value of rcount with rtable. In the research, there were 27 respondents in class XI SMA, so the value of N = 27. If you look at the r_{table} with a significance of 5%, you will get a value of 0.3673. Questionnaire items are included in the correct category when $r_{count} > r_{table}$, and questionnaire items are said to be invalid when $r_{count} < r_{table}$. All items in table 4 have r_{count} calculations greater than r_{table}, making the items in the questionnaire in the correct category.

The second way to determine the value of validity is through the value of significance. Based on table 4, it is known that the significance value for each questionnaire item has a value is < 0.05. The questionnaire item is valid when the significance value is < 0.05. When the significance value is > 0.05, it means that the item from the questionnaire is invalid. So that the questionnaire items have validity, by comparing the values of r_{table} and r_{count} and looking at the significance value, it can be concluded that the items in the research questionnaire are included in the correct category. Research has been done by (Iis & Totok et al. 2017) that instruments with rcount calculation results greater than rtable can be trusted when used for usage tests.

Table 5. Cronbach Alpha Reliability Test Results as above

Cronbach's Alpha	N of Items
0,869	20

Cronbach alpha reliability test aims to determine whether the research questionnaire has consistency when repeated measurements using the research. The questionnaire is reliable when testing Cronbach alpha > 0.6. Table 5 shows the calculation of the Cronbach alpha reliability test, and it is known that the alpha value of the questionnaire is 0.869, with the number of items in the questionnaire as much as 20 (N = 20). The research questionnaire with a total of 20 items has reliability due to the calculation of Cronbach alpha > 0.6 (0.869 > 0.6). Research that has been conducted by (Andreas et al, 2016) shows that each statement has a value greater than 0.60 and includes reliable.

Table 6. Pretest-Posttest Normality Test as above

	N	Mean	Minimum	Maximum	Test Statistic
Pretest	27	51,11	30	70	0,254
Posttest	27	78,89	70	100	0,27

The Kolmogorov-Smirnov one-sample normality test is a test that plays a role in checking whether the value of the distribution of research data is normal or not normally distributed. The data distribution value is normally distributed when the significance value is > 0.05. When the significance value is < 0.05, the data's distribution value is not normal. Figure 4 shows the results of normality testing on the pretest and posttest for class XI MIPA 2. According to the results, Table 6 shows the Kolmogorov-Smirnov normality value of 0.254 for the pretest and 0.274 for the posttest. The distribution of pretest data is normally distributed (0.254 > 0.05) and the distribution of posttest data is normally distributed (0.274 > 0.05). Figure 4 shows that the critical value of the Kolmogorov-Smirnov test is 0.254 for the pretest and 0.274 for the posttest. Compared with the table of critical scores for the Kolmogorov-Smirnov test = 0.02, with the number of respondents being 27 students (n = 27), it will get a value of 0.284. The critical value of the Kolmogorov-Smirnov test for pretest and posttest is > 0.284, so the data distribution is normal. It is also found in the research conducted by (Febby et al. 2021) that the pretest-posttest value data is typically distributed with the pretest-posttest significance value of the experimental and control classes having a value greater than 0.05.

Table 7. t-test on The Results of Pretest-Posttest as above

	N	Correlation	Significance	Significance (2-tailed)
Pretest & Posttest	27	0,636	0,000	0,000

Paired samples t-test is one of the tests used to compare the difference between two means derived from two paired samples and has the condition that the data are typically distributed. The null hypothesis (Ho) in this study is that there is no effect of giving treatment on students' critical thinking skills, and the analysis hypothesis (Ha) in this study is that giving treatment affects students' critical thinking skills. If the significance value (2-tailed) has a value of < 0.05, it indicates that there is a significant effect on the difference in the treatment given, or the hypothesis (Ha) is accepted. If the significance value (2-tailed) has a value > 0.05, it indicates that the difference in the treatment given has no significant effect or (Ha) is rejected. Table 7 is the result of the pretest and posttest t-test data for students of class XI MIPA 2. Table 7 produces a correlation value of 0.636 while the significance value (2-tailed) is 0.000. Because the significance value (2-tailed) is in the interval 0.000 < 0.05, the conclusion is that the analysis hypothesis (Ha) is accepted, which means that the difference in the treatment given has a significant effect. Based on other research conducted by (Ramadani et al., 2021) shows that there is an increase in students' critical thinking skills through the treatment given. This is evidenced by the significance value (2-tailed) < 0.05.

CONCLUSION

Based on the processing and analysis of the research results, the research concludes that the flipbook-based digital e-book learning media has an average validation value of 85.066%, which is categorized as very valid. Learning media has a feasibility value of 85.067%, included in the very feasible category. The questionnaire is categorized as valid because of the value of $r_{count} > r_{table}$. The calculation of rcount on the questionnaire item is worth more than 0.3673 and is categorized as reliable because it has an alpha value of 0.869 (0.869 > 0.6). Through the t-test, the significance value of 0.000 < 0.05 (0.000 < 0.05), meaning that there is a significant effect in giving treatment. Therefore, the research can be concluded that the flipbook-based digital e-book learning media obtains a valid category, is suitable for use, and trains students' critical thinking skills.

RECOMMENDATION

Suggestions that are considered for further development are developing learning media by paying attention to the appearance and design of better and more attractive media, complementing the media with various images and videos.

ACKNOWLEDGMENT

Completing the articles I have made, some people want to cooperate, provide support, and share knowledge with me. Therefore I would like to express my deepest gratitude to Drs. Imam Sucahyo. M.Si. as a mentor who constantly guides and provides education to me, my family who has prayed for and supported me, my friends who helped and shared their knowledge for me, and the Prisma Mataram journal research institute. Hopefully, the article that I have completed can be helpful.

REFERENCES

Aviyanti S. D., Widiaty I. (2021*). Identifying Effective E-books For Effective Digital Learning*. Bandung, Indonesia: Indonesia University of Education.

Dewi Lutfiana, Susilawati, Kurniawan Wawan. (2020). Pengaruh Media Lectora Inspire Terhadap Kemampuan Berpikir Kritis Siswa Pada Materi Difraksi dan Interferensi Gelombang Mekanik Kelas XI SMA. *Jurnal Luminous: Riset Ilmiah Pendidikan Fisika*, 1(1), 20-26.

Ernawati Lis dan Sukardiyono Totok. (2017). Uji Kelayakan Media Pembelajaran Interaktif Pada Mata Pelajaran Administrasi Server. *Elinvo (Electronics, Informatics, and Vocational Education)* 2(2), 204-210.

Gaol Marta Lumban, Serevina Vina, Supriyati Yeti. (2019). *Media Pembelajaran Ebook Berbasis 3D PageFlip pada Materi Suhu dan Kalor dengan Model Pembelajaran Discovery Learning* (pp 319-324). Jakarta, Indonesia: Physics and Physics education Department, State University of Jakarta.

Gunawan, Andreas Aldo. (2016). Pengaruh Kompensasi dan Disiplin Kerja Terhadap Kinerja Karyawan pada PT Gesit Nusa Tangguh. *Jurnal Ilmiah Manajemen Bisnis* 16 (1), 1-11.

Hidayatullah Zul, Makhrus Muh., Gunada I Wayan. (2018). Analisis Tingkat Kemampuan Berpikir Kritis Gelombang Mekanik Melalui Pembelajaran dengan Pendekatan Konflik Kognitif. *Jurnal FKIP Universitas Mataram*, 4(2), 151-157.

Jennah Rodhatul. (2009). *Media Pembelajaran*, Antasari Press.

Mawarni Sella, Muhtadi Ali. (2017). Pengembangan Digital Book Interaktif Mata Kuliah Pengembangan Multimedia Pembelajaran Interaktif untuk Mahasiswa Teknologi Pendidikan. *Jurnal Inovasi Teknologi Pendidikan*,4(1), 84-96.

Murti Bhisma. (2015). Berpikir Kritis. Fakultas Kedokteran. Universitas Sebelas Maret. http://fk.uns.ac.id/static/file/criticalthinking.pdf

Priyadi Rian, Mustajab Amin, Tatsar M. Zaky, Kusairi Sentot. (2018). Analisis Kemampuan Berpikir Kritis Siswa SMA Kelas X MIPA dalam Pembelajaran Fisika. *Jurnal Pendidikan Fisika Tadulako Online (JPFT)*, 6(1), 53-55.

Putri, Febby Ayuni Esya, Syaiful, Siburian Jodion. (2021). Kemampuan Berpikir Kritis Siswa pada Pembelajaran *Online Inquiry* dan *Problem Based Learning* (PBL). *Edumatica:* Jurnal Pendidikan Matematika 11(1), 84-91.

Raihan Siti, Haryono, Ahmadi Farid. (2018). Development of Scientific Learning E-Book Using 3D Pageflip Professional Program. Innovative Journal of Curriculum and Educational Technology, 7(1), 7-14.

Ramadhanti Arviana, Agustina, R. (2021). Analisis Keterampilan Berpikir Kritis Peserta Didik Melalui Model Inkuiri Terbimbing Pada Materi Laju Reaksi.. Jurnal Kependidikan Undikma 7(2), 385-394.

Sanuaka I W. A. Ambhara, Ariawan K. Udy, Sutaya I Wayan. (2017). Pengembangan Media Pembelajaran Electronic Book (E-BOOK) Interaktif Multimedia dalam Mata Pelajaran Teknik Animasi 3D dan Teknik Animasi 2D di Jurusan Multimedia SMK Negeri 3 Singaraja. Jurnal Pendidikan Teknik Elektro Undiksha, 6(1), 9-20.

Setiawan, Dewa G. E., Mahmud Surti A. (2020). Penerapan Alat Peraga Terhadap Hasil Belajar Siswa Pada Materi Gelombang Mekanik. Jurnal Pendidikan Fisika Tadulako Online JPFT, 8(2), 49-51.

Sugiyono. (2013). Metode Penelitian Kuantitatif Kualitatif dan R&D. Bandung: Penebit Alfabta

Zahirah Dhea Lulu, Ismayu Eryeni, Yunara Nur Laili. Retrieved February 10, 2022, from researchgate website: https://www.researchgate.net/publication/326625009_Desain_Modul_Interaktif_dengan_Menggunakan_3D_PageFlip_Professional_Pada_Materi_Fisika_Gelombang_Mekanik