p-ISSN: 2086-4280
e-ISSN: 2527-8827

Validity of Flip PDF Based E-Modules as Learning Media on Cube and Cuboid Materials

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Article received: 05-08-2024, revision: 23-09-2024, published: 30-10-2024

Abstrak

Penelitian ini bertujuan untuk mengetahui validitas e-modul Berbasis Flip PDF sebagai Media Pembelajaran Untuk Melatih Kemampuan Literasi Matematis Siswa Pada Materi Kubus dan Balok dilihat dari validitas sistem operasi, validitas isi, validitas bahasa dan desain. Penelitian ini menggunakan jenis penelitian Research and Development (R&D) yang mengacu pada model pengembangan Plomp yang terdiri atas 3 (tiga) tahapan, yaitu tahap preliminary research (fase investigasi awal), tahap prototyping phase (pembuatan dan pengembangan prototipe) dan tahap assesment phase (fase penilaian). Namun artikel ini hanya membahas sampai tahapan prototyping phase. Instrumen yang digunakan adalah lembar validasi, angket dan wawancara. Berdasarkan hasil validasi menunjukkan bahwa E-modul Interaktif yang dikembangkan memperoleh persentase rata-rata 87,5% untuk validitas sistem operasi termasuk kategori sangat valid, 80% untuk validitas isi termasuk kategori sangat valid, 90% untuk validitas bahasa termasuk kategori sangat valid dan 85,9 % untuk validitas desain termasuk kategori sangat valid untuk digunakan sebagai media pembelajaran untuk melatih kemampuan literasi matematis siswa.
Kata Kunci: E-Modul; Flip PDF; Kubus dan Balok; Literasi Matematis; Media Pembelajaran

Abstract

This research aims to determine the validity of the Flip PDF-based e-module as a learning medium for training students' mathematical literacy skills in cube and block material in terms of operating system validity, content validity, language validity and design. This research uses the Research and Development (R&D) type of research which refers to the Plomp development model which consists of 3 (three) stages, namely the preliminary research stage (initial investigation phase), the prototyping phase (prototype creation and development) and the assessment phase (assessment phase). However, this article only discusses the prototyping phase. The instruments used were validation sheets, questionnaires and interviews. Based on the validation results, it shows that the Interactive E-module developed obtained an average percentage of 87.5% for operating system validity including the very valid category, 80% for content validity including the very valid category, 90% for language validity including the very valid category and 85 .9% for design validity is in the very valid category for use as a learning medium to train students' mathematical literacy skills.
Keywords: E-Module; Flip PDF; Cube and Cuboid; Mathematical Literacy; Learning Media

I. INTRODUCTION

The development of technology has now reached the Industrial Revolution 4.0 and affects almost every aspect of human life, one of which is in the field of education. The concept of Industry 4.0 was first established in Germany compared to other countries. The European Union outlines the main characteristics of Industry 4.0, namely interoperability, virtualization, decentralization, real-time capabilities, service orientation and modularity (Tikhonova & Raitskaya, 2023). Simply put, the concept of Industry 4.0 is an integration of the cyber and physical world through the introduction of new technologies (Sony & Naik, 2020).

The rapid advancement of science and technology in the field of information communication and technology makes human life easier. The development of information communication and technology can be utilized to support and develop cognitive, affective, and social skills. Technology adds value to education and supports more effective pedagogy by providing knowledge and improving communication that supports learning (Asrial et al., 2019). Advances in science and technology have an impact on the world of education, one of which is to improve the quality of education so as to create quality humans (Nurvita et al., 2022).

Each period of industrial history required a corresponding form of education. The first three industrial revolutions respectively produced Education 1.0 (teacher-centered approach), Education 2.0 (peer assessment, high importance of teachers), and Education 3.0 (co-constructed, student-centered) (Miranda et al., 2021). Today, Education 4.0 is coming of age, with new educational technologies based on a series of tools in various environments. This is a response to all the requirements that the Industry 4.0 economy will impose on future workers (Tikhonova & Raitskaya, 2023).

The era of the industrial revolution 4.0 brings important changes in every aspect of human life, one of which is the education system in Indonesia. Education 4.0 is characterized by the use of digital technology in teaching and learning activities (Maulana et al., 2019; Warsito et al., 2023). Technology and information, especially in education, have changed the way humans learn to obtain and interpret information. With the introduction of technology as a tool in the learning process in the contemporary information technology era, education has undergone a significant revolution. Technology and information have an important role in creating creative and interesting innovations in learning activities, one of which is the creation of electronic learning or better known as electronic learning (E-Learning). E-learning is a teaching and learning process using electronic circuits to deliver learning content (Wan Jusoh & Jusoff, 2009; Widyatama & Pratama, 2022).

E-learning has many benefits that can be applied in the learning process such as making it easier for students to use

p-ISSN: 2086-4280
e-ISSN: 2527-8827

teaching materials anywhere and anytime. The existence of e-learning or digital learning causes students to be more comfortable and enthusiastic in learning because of the attractive material display (Nugroho et al, 2023).

Modules are a medium in obtaining material effectively because students can learn according to their abilities and speed (Inanna et al., 2021). One of the media that is suitable for use when implementing distance learning is the e-module, which is a module with a physical form that is different from the printed module, the printed module component is processed in such a way that it transforms into an electronic form. The use of e-modules makes students interested in the learning process, because it can be accessed anytime and conditions anywhere supported by adequate tools, and does not make it difficult for students (Inanna et al., 2021). In addition, teachers are also easy to carry out learning activities even though they are in different places with students (Fourlilla & Fauzi, 2019). Therefore, e-modules are used as a means of learning which includes material, methods, and evaluations that are practically designed so as to attract student interest in learning.

There are many software that can be used to create this e-module. Some of them are Professional 3D page flip, kvisoft flipbook maker, professional pdf flip and others. Among the three software, flip pdf professional has an advantage in the ease of processing and operation of the final product produced. The flip pdf professional application can be run on computers and smartphones. Flip pdf professional is a software that can turn PDF files into digital books like books when flipped. In flip pdf, a professional can also add various learning media in the form of images, audio, video, animation, quizzes, buttons, interesting and interactive (Soekarman, 2022). Based on some research results, it is stated that the use of flip pdf-based e-modules is easy to use by students and interesting. As said by Komikesari (2020) said that students can use e-modules independently. The same thing was stated by Rama, et al (2020) that the development of this android-based learning module was able to attract students' attention and make students understand the material.

Therefore, based on some of the research results above, this research will develop a learning media in the form of e-modules based on flip pdf in learning mathematics. One of the materials in mathematics that still does not provide satisfactory results in problem solving skills is about flat-sided space, especially in the submaterial of cubes and blocks (Nasution et al., 2023). In line with the results of previous research, based on preliminary analysis, it was found that teachers have difficulty in visualizing cubes and blocks when embedding concepts. So it takes a learning media that is easy to make and operate by students and is able to visualize cubes and blocks very well and clearly. In order to facilitate the teacher in the learning process and make students interested in learning.

The same thing is expressed by students, that they find it difficult to visually imagine the concepts of cubes and cuboids that are taught. Teaching materials used by teachers in the form of modules or props have not been able to fully make

students understand the concepts taught. Students need a medium that is dynamic, interesting and of course interactive. From the conclusion of the preliminary analysis, an e- module based on flip pdf was made as a learning media on cube and beam material. The purpose of this study was to determine the feasibility of flip pdf based E-modules as learning media on cube and cuboids material in terms of learning media lecturers, teachers and students.

II. METHOD

This research is a development research. The model used is the Plomp model where this model consists of three stages of model development, namely the preliminary research phase, the prototype design phase, and the assessment phase. This research is limited to the prototype design phase of the feasibility of E-modules based on flip pdf as learning media on cube and cuboids material in terms of learning media lecturers, teachers and students.

This research produced an interactive e-module as a learning media to train students' mathematical literacy skills on cube and block materials. The interactive e-module that has been developed is then validated by one learning media lecturer (expert review), one teacher (user) and tested on a small group of six grade VIII junior high school students. This is in line with what Plomp & Nieveen (2007) said that media validity is seen from content validity and construct validity.

The instruments used are validation sheets for expert validation, in this case a learning media lecturer and validation sheets to users (in this case a math teacher), questionnaires for students and interviews. The results of the data obtained in the form of percentages then with a quantitative descriptive method analyzed by comparing the scores of data results from all validators with the criteria score. The validation assessment uses Likert scale calculations as in Table 1:

Table 1.
Likert Scale for Validation Sheet

Value Scale	Description
1	Invalid
2	Less Valid
3	Valid Enough
4	Valid
5	Very Valid

(Riduwan, 2015)

The value obtained is then converted into percent by using the following formula:

$$P(\%) = \frac{\Sigma\ Skor\ Hasil\ Pengumpulan\ Data}{Skor\ Kriterium} \times 100\%$$

The data obtained is in the form of percentages, which are used to determine the suitability of the media being developed, then the data is interpreted on a percent scale as in Table 2:

Table 2.
Likert scale percentage validation sheet

Skala Penilaian	Keterangan
0-20	Invalid
21-40	Less Valid
41-60	Valid Enough
61-80	Valid
81-100	Very Valid

(Riduwan, 2015)

The media being developed is said to be valid if the validator's assessment meets the percentage result of ≥61%.

III. RESULT AND DISCUSSION

The prototype design phase is the design and development stage of e-module

p-ISSN: 2086-4280
e-ISSN: 2527-8827

media. At this stage, an e-module has been designed which is adapted to the needs analysis carried out by previous researchers, such as a concise e-module, with learning videos and dynamic.

The e-module that is designed is also in accordance with the elements of the module, containing a learning activity section in the form of a description of the learning content, summary and test. However, the difference with modules in general is the introduction or apperception and complete material can be seen in the learning videos in this e-module. Apart from that, interactive here is the use of Geogebra software to show how a mesh of cubes and blocks can form a cube or block. The images presented are dynamic and interactive so students can carry out experiments independently.

Making e-modules begins with arranging material according to learning outcomes using power point. Initial creation can also be done using Microsoft Word, however, to make it easier to create and layout and design, PowerPoint is used. After that, it is converted into PDF format and then edited using Corporate PDF.

n making this e-module, several learning videos were adapted from YouTube. Apart from that, we also use the Geogebra application to make the cube nets look dynamic so that students can move the cube nets independently.

The description of the e-module prototype created is as follows. The following is a view of the front cover of the flip pdf based e-module.

Figure 1. E-Module Cover Display

Then the creation of the e-module continued according to the story board that had been designed, such as adding learning videos and demonstrations using Geogebra. The following is an illustration of the e-module part of learning activities II regarding cube nets.

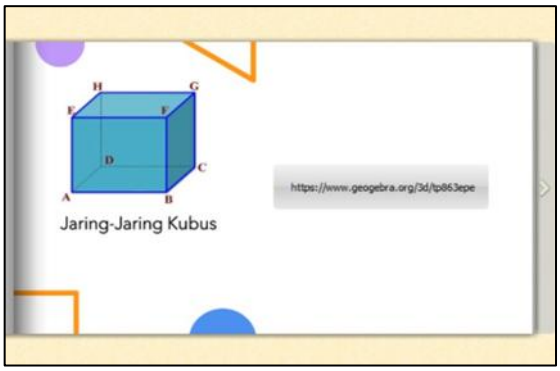

Figure 2. Learning Activity II Display

In Figure 2 you can see a link listed at the beginning of the e-module in learning activity II. When the student clicks on this link, it will immediately connect to the Geogebra application. The following will show the intended geogebra display.

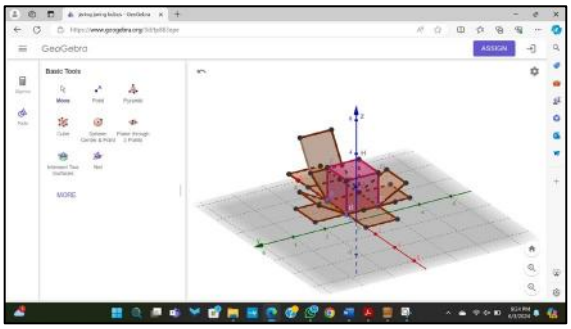

Figure 3. Geogebra view to open and close the cube nets

Next, the learning video display can be seen as follows.

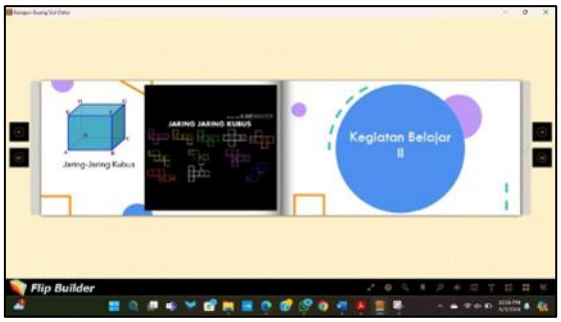

Figure 4. Learning Video Display

This e-module is also equipped with learning activities in the form of practice questions to train students' mathematical literacy skills. Examples of practice questions can be seen as follows.

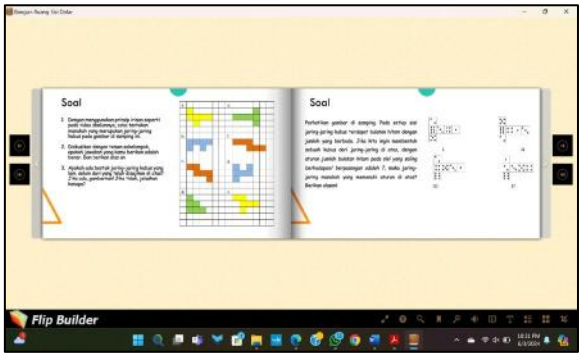

Figure 5. Display of Sample Exercise Questions

Next is the assessment from experts. This assessment from experts or validity aims to determine the quality of a learning media. The assessment was carried out by one mathematics learning media lecturer and one mathematics subject teacher. The aspects assessed by the validator are operating system validity, content validity, language validity and graphic design validity. Assessment is carried out using a Likert scale of one to five for each statement.

A. Validity of the Operating System

The validity of the operating system aims to determine the ease of use of the e-module. Starting from downloading to accessing the available features. The operating system validity results were obtained.

Table 3.
Likert scale percentage validation sheet

Validator	Percentage	Description
Lecturer	85	Very Valid
Teacher	90	Very Valid

Based on Table 3, it can be concluded that for the operating system aspect, very valid results were obtained from both validators. This means that there is ease in using the e-module.

B. Content Validity

Content validity aims to determine the relevance of learning media to learning material (Zahwa et al., 2021). In this case, content validity is carried out to determine the clarity and suitability of the material in the e-module with the learning substance and learning objectives. The results of content validity can be seen in Table 4.

Table 4.
Content Validity

Validator	Indicator	Percentage	Description
Lecturer	1	80	Valid
	2	80	Valid
Teacher	1	80	Valid
	2	80	Valid

Based on Table 4, it can be concluded from the two content aspect indicators that the material presented in the e-module is clear and in accordance with the learning substance and learning objectives. Apart from that, this E- module also contains videos and supporting images that can support students' understanding of the material (Kamila et al., 2018). So this is also

p-ISSN: 2086-4280
e-ISSN: 2527-8827

one of the factors for this aspect to be valid.

C. Language Validity

Language validity aims to find out whether the language used in the e-module is appropriate and standard according to good and correct Indonesian language rules. The following is a recap of the data from language validation results.

Table 5.
Language Validity

Validator	Percentage	Description
Lecturer	87	Very Valid
Teacher	93	Very Valid

Communicative language is a way of using language in accordance with the communication functions of language so that it is easy for readers to understand (Yastini et al., 2018). Therefore, in this e-module the language used is adjusted to the correct spelling of the language as per the rules of the Indonesian language. This aims to make the material presented in this e-module easy to understand and interpret. Based on table 5, the language aspect of the e-module uses standard and appropriate Indonesian, this is reflected in the percentage obtained which is very valid.

D. Validity of Graphic Design

Graphic design validity aims to find out how the design was created, whether the selection of letters, layers, objects and layout is appropriate or not. Letters (fonts) have characteristic functions and meanings so that appropriate use is important so that the meaning can be conveyed and minimizes misunderstandings (Syahrul, 2019). The combination of colors and background used is designed to be comfortable and easy to read to produce an attractive appearance that can influence students' interest in reading (Mumpuni, 2019). The following are the validation results for the graphic design aspect.

Table 6.
Validity of graphic design

Validator	Indicator	Percentage	Description
Lecturer	1	92	Very Valid
	2	87	Very Valid
	3	80	Valid
	4	80	Valid
Teacher	1	84	Valid
	2	87	Very Valid
	3	90	Very Valid
	4	87	Very Valid

Based on Table 6, it can be concluded that the e-module graphic design is as it should be.

Then this e-module was tested on a small group of students to find out how readable and practical this e-module was for users, in this case students. Of the 6 students, there are two students with high ability, two students with medium ability and two students with low ability. From the questionnaire that was distributed after students saw the e-module that had been given, the following results were obtained.

Table 7.
Student Practicality Questionnaire

Aspect	Percentage	Description
Material	80	Valid
Design	79	Valid
Presentation	80	Valid

From the results of the practicality questionnaire analysis obtained, it can be concluded that according to students the e-module developed is valid. This means that the e-module developed can be accepted and responded well by students so it can be said to be suitable for use.

Based on the results of interviews with students, it was said that they were interested in the many features in this e-module, and the presentation using short sentences made students feel they could understand more quickly. They can get a complete explanation through the learning videos in the e-module. Apart from that, they can see and practice directly in making cube and block frames. It is new for students to be able to move cube and block nets using geogebra which is connected directly to the e-module page created. So that students feel interested and happy when practicing moving the nets.

The results of teacher interviews stated that overall the designed e-module was suitable for use. There are several suggestions given by the teacher, namely to add direct practice such as cube nets and blocks to each sub-material studied so that learning is more meaningful and students can be more interested in learning.

IV. Conclusion

Based on the analysis and discussion, it can be concluded that the Flip PDF-based e-module developed in this study is suitable for use as an instructional medium to enhance students' mathematical literacy in the topic of cubes and rectangular prisms. Therefore, it is recommended to proceed to the assessment phase to evaluate the effectiveness of this media in actual learning settings. Furthermore, similar development can be extended to other solid geometry topics, such as pyramids and prisms.

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