

DEVELOPMENT OF EDUCATIONAL GAME-BASED LEARNING MEDIA BY CONSTRUCT 2

Melati Khoirunnisya^{1*)}, Sari Herlina²⁾, Lilis Marina Angraini³⁾, Suripah⁴⁾
Mathematics Education Department, Universitas Islam Riau, Pekanbaru, Indonesia
^{1*)} melatikhairunnisya@student.uir.ac.id

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Abstract. This research aims to find out the results of validity and practicality of products resulting from the development of educational game-based learning media by construct 2. The learning media developed is an interactive learning medium so that it can increase the enthusiasm of learners in the learning process. This learning media can be used in the process of face-to-face learning and online learning during the Covid-19 pandemic. This research is development research that refers to the ADDIE model, which consists of 5 stages namely Analyze, Design, Develop, Implement, and Evaluate. The research instruments used are validation questionnaire sheets, teacher response questionnaires, and student response questionnaires. Data collection using the Likert scale. This research object is in the form of a learning medium with construct 2 on the material to build a flat side room of class VIII junior high school or equivalent. Media was tested to 25 grades VIII student at SMP Babussalam Pekanbaru. Validation data and practicality data obtained are analyzed by determining the average value of each. The average validation value obtained is 91.86% with a very valid category. The average teacher response questionnaire score is 100% with a very practical category and the average value of the student response questionnaire is 84.27% with a very practical category. Thus, it can be concluded that the educational game-based learning media by construct 2 tested its validity and practicality.

Keywords: *Development, Learning Media, Educational Games, Construct 2*

1. INTRODUCTION

The 4.0 industrial revolution began to enter the world and developed so rapidly that there was a major change to the human lifestyle. This revolution is characterized by the development of new technologies and approaches that will change human lifestyles and interactions.

At the end of 2019, the change due to the industrial revolution 4.0 is visible because of the Covid-19 virus pandemic (Coronavirus disease-2019), which is a virus that attacks the human respiratory system to cause death [8]. The virus is easily transmitted quickly around the world so governments in various countries impose social distancing and lockdown policies. All work is done from home online including teaching and learning activities in schools. In Indonesia, through Circular Letter Number 36962 /MPK. A/HK/2020 on Online Learning and Working from Home in the Context of Preventing and Spreading Corona Virus Disease (Covid-19) published by the Minister of Education and Culture of Indonesia, Nadiem Makarim, teaching and learning activities in schools are closed and diverted into online teaching and learning activities or known as online learning.

Online learning activities require teachers and students to be able to make the most of technology. Especially in mathematic subjects that desperately need media to change abstract things into more concrete. 3D-shapes materials are one part of the mathematics of geometry. Abstract geometric material makes it difficult for the student to learn and understand it. This is because the level of spatial abilities of a student is still low [9]. So, in studying this material needed learning media to help the student visualize geometric objects to be more concrete and students can more easily learn the material.

Construct 2 is software that can be used to create learning media. Construct 2 is a game-making software developed by Scirra. The games are based on HTML 5 which is devoted to 2D platforms. One of the advantages of this construct 2 software is that it does not use programming language so that anyone can use it.

On October 17, 2020, researchers interviewed with mathematics teacher of SMP Babussalam Pekanbaru. Based on the interview obtained information that during the learning process teachers have taken advantage of technological advances. The teacher explains the mathematics material with the help of Microsoft PowerPoint. However, there is less visible interaction of the student with the media used during learning activities. During online learning during the Covid-19 pandemic, teachers have made efforts to explain mathematics subject matter. The teacher provides a learning video downloaded from YouTube then discusses it with a student through the Zoom application. However, there is still less visible interaction of the student with the media used. The enthusiasm of learning students also decreased. So there needs to be the development of learning media that can attract the attention of students so that learning activities can be more interactive.

Based on the above exposure, researchers are interested in researching the development of mathematical learning media with the title "Development of Educational Game-Based Learning Media by Construct 2". The purpose of this study is to find out the results of validity and practicality of the development of educational game-based learning media by construct 2.

2. RESEARCH METHOD

This research is a research and development (R&D) concerning the ADDIE model. The ADDIE model consists of five stages, namely Analyze, Design, Develop, Implement, and Evaluate. The ADDIE development model is a model that adapts well, is flexible, effective, and provides a common structured framework, as well as evaluation and revision at each stage. The object of research is the learning media by construct 2 on the 3D-shapes materials of grades VIII. The test subjects were 25 students of class VIII.4 SMP Babussalam Pekanbaru. The trial was conducted at the computer laboratory of SMP Babussalam Pekanbaru in the even semester of the 2020/2021 school year.

Instruments to measure media validity are validation sheet instruments filled by 3 validators, including media expert validator, material expert validator, and linguist expert validator. Validation sheets are filled using the Likert scale consisting of 4 answer options with categories of very good, good, bad, very bad. Then, the data obtained is analyzed by

determining the average value of the combined validator. The criteria for the validity of learning media can be seen in Table 1 [3].

Table 1. Validity Criteria

Validity Criteria	Level of Validity
76% - 100%	Very Valid
51% - 75%	Valid
26% - 50%	Invalid
0% - 25%	Very Invalid

Research instruments used to measure the practicality of learning media are a teacher and student response questionnaire sheets. The indicators of the teacher's response sheet are:

Table 2. Teacher Response Questionnaire Indicators

Indicators	Item Number
Ease of use of media	1,2,3,4
Time efficiency	5
Benefits of media	6,7,8,9
Ease of understanding the material	10
Attraction	11,12

Indicators of student response can be seen in the following table:

Table 3. Student Response Questionnaire Indicators

Indicators	Item Number
Presentation of material in the media makes it easier for the student to understand the material.	1
Presentation of material on the media attracts students to learn.	2
Interesting media display.	3
Images and animations on the media clarify the material presented.	4
Ease of navigation.	5
Ease of choosing a serving menu.	6
The language used is easy to understand.	7
The language used is communicative.	8
Learning activity increases.	9
Helps to increase the knowledge of the student.	10
Facilitate students in making conclusions.	11

The response questionnaire is filled using a Likert scale consisting of 4 answer options with categories of very agreed, agreed, disagreed, and very disagreed. The response

questionnaire is filled after using the media during the learning process. The practicality criteria of learning media can be seen in Table 4 [4].

Table 4. Practicality Criteria

Practicality Criteria	Level of Practicality
75,01% - 100%	Very Practical
50,01% - 75%	Practical
25,01% - 50%	Less Practical
00,00% - 25%	Unusable

3. FINDINGS AND DISCUSSION

A. FINDINGS

This research resulted in the development of interactive learning media based on educational games by constructing 2 on 3D-shape materials. The media can be run on computers /laptops operating Windows and can be used as self-learning. This media can also be used in online learning during Covid-19 and face-to-face learning. Educational game-based learning media by construct 2 was developed using the ADDIE development model.

1. Analyze

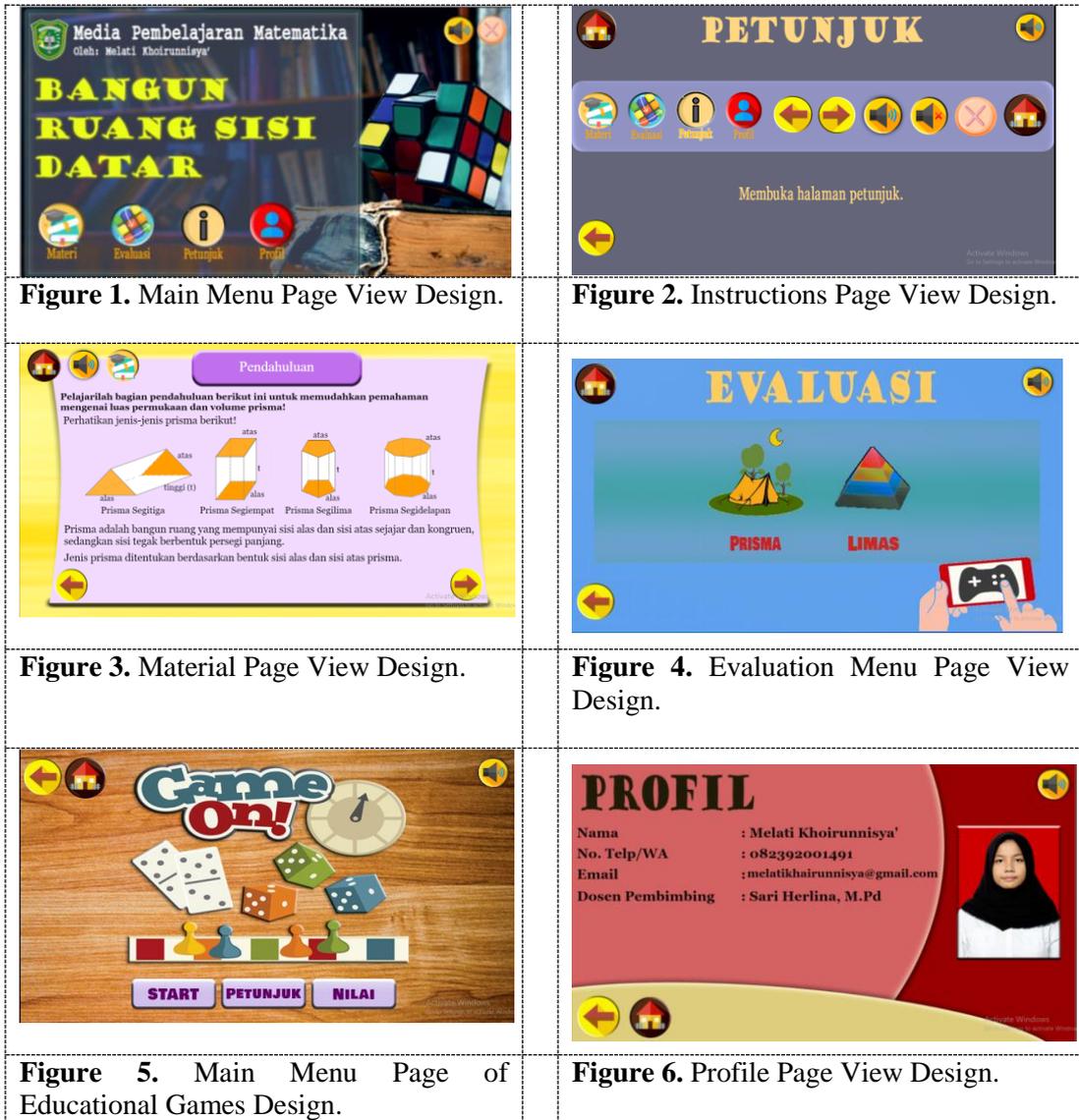
In the early stages, an analysis of the needs of teachers and learners is carried out. Data were obtained from the results of interviews with the mathematics teacher of SMP Babussalam Pekanbaru about mathematics subject matter, learning media used, and characteristics of the student during the learning process. Based on the analysis of the material obtained the result is that the 3D-shape material is material that is abstract and difficult for a student to understand so that the media is needed to make the material more concrete. In media analysis obtained the results that during the learning process needed media that can increase the motivation and enthusiasm of students during the learning process to create interactive learning activities.

2. Design

At the design stage, the design of learning media and research instruments is carried out. The instruments made are validation sheets and response questionnaires of teachers and students. Before designing the learning media first, the preparation of the material to be presented. The material is arranged in 4 meetings consisting of the surface area as well as the volume of prisms and limas.

After compiling the material, then create a main menu page view design. This page contains the main menus presented in the learning media, namely material menus, evaluation instructions, evaluation, and researcher profiles. Next is the design of the instructions page that contains instructions on how to use navigation buttons contained in the learning media. The third design is the design of material menu pages that include prism and limas. Each material consists of three parts: the introduction, the surface area formula, and the volume formula. The fourth design is the design of the evaluation page to conduct an independent learning evaluation. Evaluation is presented based on

educational games that use an unlock-level system. If students have not been able to open the next level, then they need to repeat the learning. The last design created is the design of the researcher's profile page that contains personal data and photos of the researcher.



3. Development

Materials from the design stage are used as a basis in creating learning media using *construct 2* in the development stage. At this stage, data analysis is also carried out from the validation of learning media. Validation sheet instruments are used to obtain data from the validation of developed learning media. Validation sheets consist of three aspects, namely aspects of the media display, material aspects, and language aspects. Validation results by three Validators can be seen in Table 5.

Table 5. Learning Media Validation Results

Media	Assessment (%)	Average (%)	Validity Criteria
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	V ₁	V ₂	V ₃		
1st Meetings	85,23	93,18	98,86	92,42	Very Valid
2sd Meetings	85,23	90,91	98,86	91,67	Very Valid
3rd Meetings	85,23	89,77	98,86	91,29	Very Valid
4th Meetings	85,23	92,05	98,86	92,05	Very Valid
Combined Average				91,86	Very Valid

Based on Table 5 it is known that the average value of learning media validation results is 91.86% with "very valid" criteria. Although the learning media is very valid, the validator also provides some useful suggestions for perfecting the learning media.

4. Implementation

Valid learning media then can be tested in the learning process. The trial was conducted on the student of class VIII.4 even the semester of the 2020/2021 school year at the computer laboratory of SMP Babussalam Pekanbaru. Media tests were conducted during 4 meetings. After the trial ended, the response questionnaire sheet was given to teachers and students to obtain data on the practicality of the learning media developed. Furthermore, the practicality data is analyzed to find out the practical level of educational game-based learning media by construct 2. The results of the assessment of the response of teachers and students are contained in Table 6 below:

Table 6. Learning Media Practicality Result

Respondents	Average(%)	Practicality Criteria
Teachers	100	Very Practical
Student	84,27	Very Practical

Based on Table 6 it is known that the average value of the teacher response questionnaire is 100% with the criteria "very practical" and the student response questionnaire 84.27% with the criteria "very practical". Students feel that the language used in this learning media is quite difficult to understand.

5. Evaluate

In this study, the evaluation is only done until the formative evaluation. Evaluation is carried out by revising the learning media based on the suggestions given by validators. Revisions to the media display aspect lie in the layout section between text and images in the problem example and color composition section. In addition, some navigation buttons also need to be fixed because they do not work properly. The validator also suggests adding learning motivation sentences from Muslim mathematicians so that students are more enthusiastic about learning. The display of the motivational sentence can be seen in the following image.



Figure 7. Learning Motivational Sentence Design

Validator juga memberikan saran pada aspek materi, yaitu agar menuliskan satuan panjang pada penyelesaian contoh soal agar dapat diketahui datangnya satuan luas pada kesimpulan jawaban. Beberapa pemilihan gambar juga direvisi karena belum sesuai dengan konsep bangun ruang sisi datar.

B. DISCUSSION

Based on the results of research it is known that the development of educational game-based learning media with construct 2 was developed with the ADDIE development model. This model consists of 5 stages, namely Analyze, Design, Development, Implementation, and Evaluate. The resulting product is educational game-based learning media by construct 2 on the 3D-shapes material.

In the analysis stage, material analysis and media analysis are based on interview results. The result of this analysis is that teachers and students need interactive learning media and can increase the enthusiasm of students in the learning process on 3D-shapes material. After getting the results of the analysis, then at the design stage, the result is used to design learning media. Before making a media design researchers arrange the learning material to be presented. Following the opinion [2], the material is prepared concerning Core Competencies (KI), Basic Competencies (KD), Competency Achievement Indicators (IPK), and Learning Objectives. So that the learning media made is not only limited to "aids". This is in line with opinion[5] because media can be effectively utilized to improve the quality of learning if structured based on learning objectives.

After the media design is made, the next stage is development. At this stage, the media is made using construct 2 concerning the design of the media. Then, the finished media is validated by three experts, namely media experts, material experts, and linguists experts. The validation result obtained is 91.86% with the category "very valid". During the validation process, the validator provides suggestions. This is following the use of validation according to [6] so that the suggestions serve as a basis for revising small errors found in the learning media so that the media is tested for validity.

Learning media that are declared valid can be used in the learning process. At the implementation stage, this media is used during the learning process in 4 meetings. Implementation was carried out at SMP Babussalam Pekanbaru in class VIII.4 semester even the 2020/2021 school year. The response questionnaire instrument is given to students and teachers at the fourth meeting after learning is completed. The results of the practicality analysis obtained from the teacher's response questionnaire are to get an average score of 100% with the category "very practical", and the response questionnaire

of learners obtained an average of 84.27% with the category "very practical". The evaluation stage is carried out by revising the learning media based on the suggestions given by the validator. Revision of learning media consists of aspects of media display and material aspects, while in the language aspect there is no revision.

Based on research that has been carried out, this educational game-based learning media can increase the enthusiasm and learning spirit of the student. The use of unlock-level systems in learning media makes students enthusiastic and fosters their ambition to solve the training problems given. In addition, during the learning process student not only interact with the media but also interact with friends to get better learning outcomes.

4. CONCLUSION

Based on the results and discussion of research obtained that the average value of validation results of educational game-based learning media with construct 2 is 91.86% with "very valid" criteria. The average value of the assessment of practicality results based on the teacher's response questionnaire is 100% with the criteria "very practical" and based on the student response questionnaire obtained a score of 84.27% with the criteria "very practical". Thus, it can be concluded that the products of educational game-based learning media development by construct 2 are tested for validity and practicality.

REFERENCES

- [1] Angko, N., & Mustaji. (2013). Pengembangan Bahan Ajar dengan Model ADDIE untuk Mata Pelajaran Matematika Kelas 5 SDS Mawar Sharon Surabaya. *Jurnal Kwangsan*, 1(1), 1–15.
<https://doi.org/10.31800/jtp.kw.v1n1>
- [2] Herlina, S., Zetriuslita, Istikomah, E., Yolanda, F., Rezeki, S., Amelia, S., & Widiati, I. (2021). Pelatihan Desain LKPD dalam Pembelajaran Matematika Terintegrasi Karakter Positif Bagi Guru-guru Sekolah Menengah/Madrasah di Pekanbaru. *Community Education Engagement Journal*, 2(2), 27–34.
<http://journal.uir.ac.id/index.php/ecej>
- [3] Hidayati, N., & Susanti. (2013). Analisis Penggunaan Media Pembelajaran Pada Mata Pelajaran Ekonomi Materi Akuntansi Kelas XI IPS di SMA Negeri 1 Sidoarjo. *Jurnal Pendidikan Akuntansi (JPAK)*, 1(3), 1–18.
<https://virtual-class.unesa.ac.id/index.php/jpak/article/viewFile/3683/6262>
- [4] Kumalasan, M. P. (2018). Kepraktisan Penggunaan Multimedia Interaktif pada Pembelajaran Tematik Kelas IV SD. *Jurnal Bidang Pendidikan Dasar (JBPD)*, 2(1), 1–11.

<https://doi.org/10.21067/jbpd.v2i1A.2345>

- [5] Miftah, M. (2013). Fungsi, dan Peran Media Pembelajaran Sebagai Upaya Peningkatan Kemampuan Belajar Siswa. *Jurnal Kwangsan*, 1(2), 95–105.
<https://doi.org/10.31800/jtp.kw.v1n2.p95--105>
- [6] Rahayu, Setyawan, A. A., & Wahyuni, P. (2019). Pengembangan Perangkat Pembelajaran Matematika dengan Pendekatan Matematika Realistik Berbasis Kuliner Melayu Riau di Sekolah Dasar. *Aksiomatik*, 7(3), 18–24.
<https://journal.uir.ac.id/index.php/AKS/article/view/2659>
- [7] Ridoi, M. (2018). *Cara Mudah Membuat Game Edukasi dengan Construct 2: Tutorial*. Maskha.
- [8] Supriatna, E. (2020). Wabah Corona Virus Disease Covid 19 dalam Pandangan Islam. *SALAM: Jurnal Sosial Dan Budaya Syar-I*, 7(6), 555–564.
<https://doi.org/10.15408/sjsbs.v7i6.15247>
- [9] Wahyuni, A., Effendi, L. A., Angraini, L. M., & Andrian, D. (2020). Developing Instrument to Increase Students' Geometry Ability Based on Van Hiele Level Integrated with Riau Malay Culture. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 24(2), 208–217.
<https://doi.org/10.21831/pep.v24i2.33811>