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## Construct 2 learning media developments to improve understanding skills

To cite this article: Mujib *et al* 2021 *J. Phys.: Conf. Ser.* **1796** 012051

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## Construct 2 learning media developments to improve understanding skills

Mujib<sup>1</sup>, R Widyastuti<sup>1</sup>, Suherman<sup>1</sup>, Mardiyah<sup>1</sup>, T D Retnosari<sup>1</sup>, I Mudrikah<sup>1</sup>

<sup>1</sup>State Islamic University of Raden Intan Lampung, Indonesia

\*Corresponding author: rtridesi@gmail.com

**Abstract.** The objectives of this research were to find out how to develop, to know the feasibility, and to find out the teacher's and students' responses toward Construct 2 as the mathematics learning media on polyhedron material. The use of instructional media can make data presentation more attractive and reliable, facilitate data interpretation, summarize information, and increase students' understanding. This research employed the Research and Development method or R&D with ADDIE as the development model (Analysis, Design, Development, Implementation, and Evaluation). The data collection techniques employed were questionnaires and documentation. The questionnaires were distributed to four kinds of respondents, namely the media expert, the material expert, the student, and the teacher. The result of validation by media expert was in the high category. The results of the validation by the material expert and the media expert stated that the Construct 2 learning media was suitable to be used in teaching and learning activities for the seventh-grade students on polyhedron material. The application of Construct 2 was categorized as excellent based on the results of the small-group trial and large-group trial. Furthermore, the teacher's responses during the trials indicated that the Construct 2 learning media was categorized in the excellent category.

**Keywords:** Construct 2 ; Learning Media Development ; Improve Understanding Skills

### 1. Introduction

Education is vital for humans because, through education, humans can develop their potential [1]. Ability and potential are used as life provisions by individuals and society [2-4], so that they can face the changes due to the advancement of science and technology [5-9]. Advances in technology can change the way of thinking and conveying learning [10-12]. Technology and science are closely related to mathematics [13-15]. Mathematics is one of the sciences to improve the quality of education and the life of the nation [16]. Mathematics is a structured, organized, and tiered subject so that the learning materials are related to one another [17]. Students have differences in processing information [18], so that teachers must convey the learning material creatively. A creative delivery material requires technological learning media because it can contain images, sounds, and animation [19-23]. Based on the results of observations, the students were well-facilitated by their parents in the form of laptops, Android smartphones, and internet networks. However, these facilities were also not fully utilized. These limitations made the students experienced difficulty in understanding mathematics learning materials, both concepts and calculations [24-27].

Construct 2 learning media can be used without a special programming language and can contain

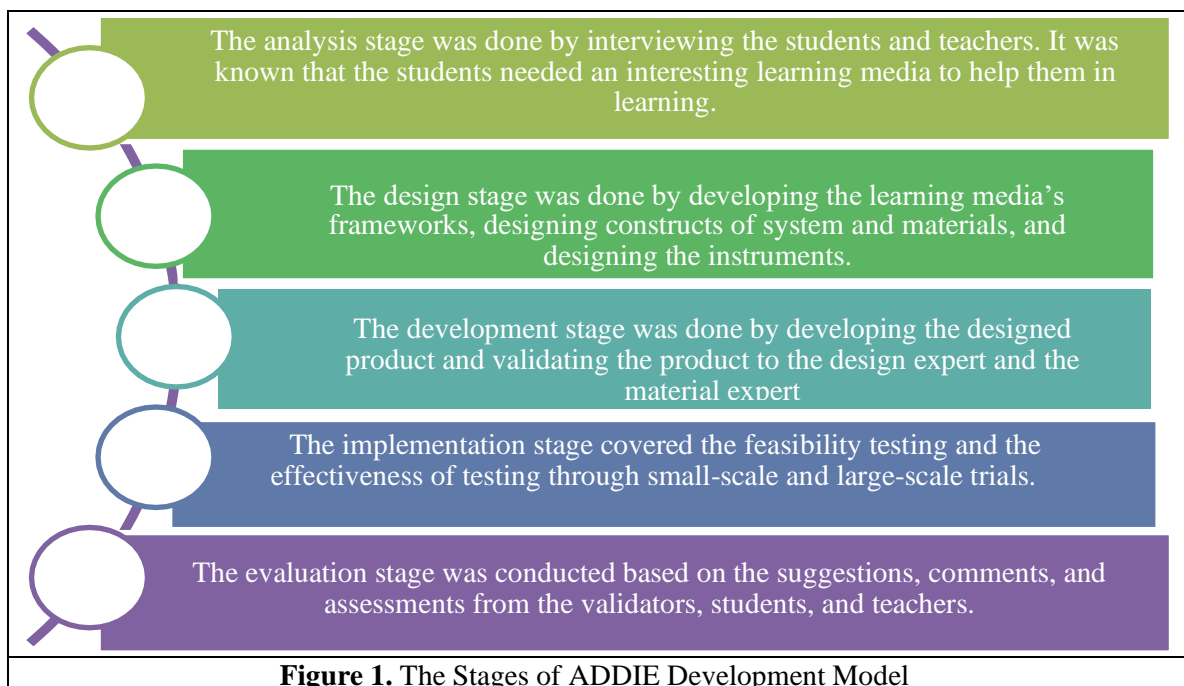


images, sounds, animations, videos, and other supporting components [28]. Computer-assisted learning media, such as Construct 2 learning media will further increase the interest and motivation of students to learn [29,30]. The use of instructional media is not only to increase the interest and motivation, but it can make the presentation of data more attractive and reliable, facilitate data interpretation, summarize the information, and improve students' understanding [31].

Similar types of research had been conducted previously; some of them are the research on the development of interactive learning media with Construct 2 software on trigonometric material through the ADDIE development model [32]. Research on the development of Construct 2 interactive learning media in electronics subject [33], interactive media development research based on Construct 2 in history subject [34], and research on the development of learning media based on Android using Construct 2 software for the polyhedron material through the ADDIE development model [35]. This research is not much different from previous studies, it even has similarities in terms of the software used. The software used was the Construct 2 software which was focused on the polyhedron learning material what distinguishes from previous research is android devices and materials for the instruments studied.

## 2. Research Method

The research method employed was the Research and Development method or R&D. This research aimed to develop a learning media using Construct 2 software on the polyhedron learning material for the seventh-grade students of MTs Negeri 2 Bandar Lampung. The development model employed was the ADDIE model which consisted of Analysis, Design, Development, Implementation, and Evaluation stages. The stages can be seen in figure 1.



The data collection techniques used in this study were questionnaires and documentation. There were four types of questionnaires in this research, namely the media expert validator questionnaire, the material expert validator questionnaire, the students' responses questionnaire, and the teacher's responses questionnaire. The questionnaires for the media expert and the material expert were used to test the feasibility of the learning media while the student and teacher's responses questionnaires were used to see the attractiveness of the learning media. The documentation in this research was in the form of pre-research questionnaire sheets, recordings of pre-research interviews, and mathematics learning

outcomes of the seventh-grade students of MTs Negeri 2 Bandar Lampung. The instruments used in this research were the preliminary study instruments, material expert validation instruments, media expert validation instruments, small-scale trial instruments, large-scale trial instruments, and product trial instruments for the teacher. This data obtained in this research consisted of two types of data, namely qualitative data and quantitative data. The quantitative data was processed by formulating numbers obtained from questionnaires and tests. The questionnaires in this research were the validation assessment questionnaire for the media and material experts, student response questionnaires, and teacher response questionnaires.

### 3. Results and Discussion

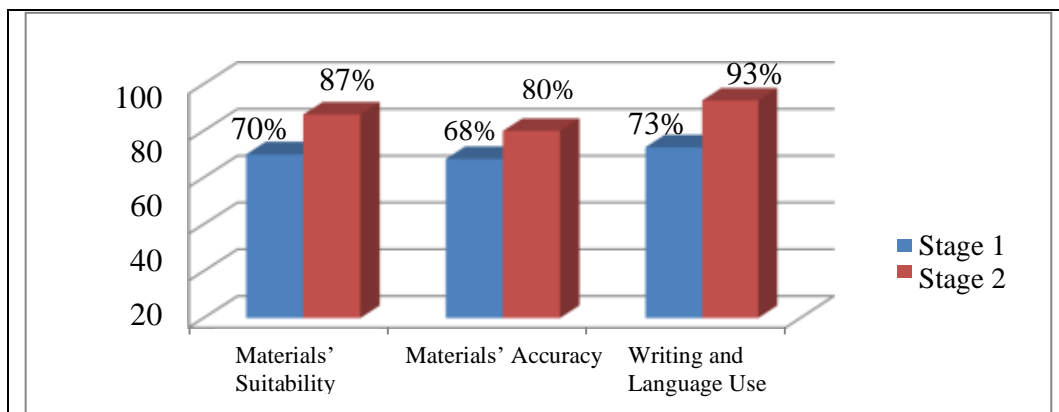
The research and development have been carried out by researchers to produce a learning media based on the application of the Construct 2 software. The developed learning media have been validated by material experts, media experts, education practitioners. It also has been tested on the seventh-grade students of MTs Negeri 2 Bandar Lampung which consisted of three classes with a total of 70 students. Based on expert validation and product testing, the developed learning media was declared feasible and interesting for the learning of polyhedron material.

This research did not only produce a product but also ensured that the product was suitable to be used in the learning process. The feasibility of the product was determined through the validation of material and media experts as well as of the teacher and the students. The learning media have been developed to be relevant to the basic competencies and indicators of the 2013 curriculum. The media development was carried out using the ADDIE development model which consisted of Analysis, Design, Development, Implementation, and Evaluation stages.

In the first stage, the researchers investigated the students' needs as a consideration in developing the product. The analysis stage was carried out by conducting interviews with the teacher and students. The results of the interviews showed that the students needed a learning media that can facilitate the mathematics learning process, especially on the polyhedron material. They needed a learning media that can contain supporting components, such as images and animation. Based on these needs, the researchers developed a learning media using Construct 2 software on the polyhedron material.

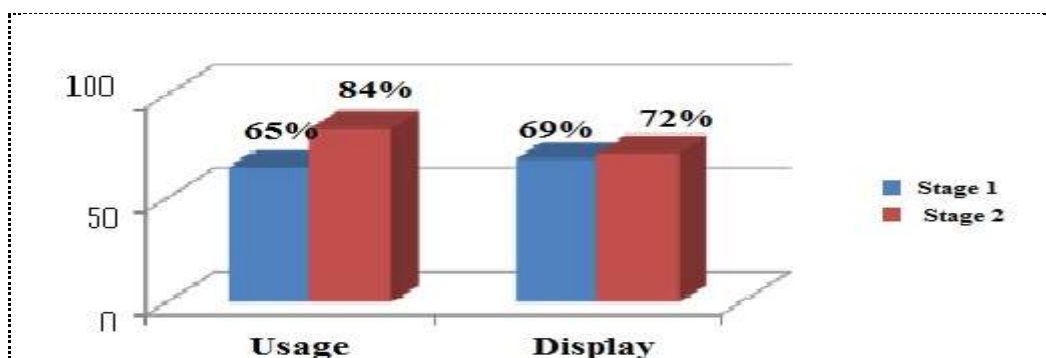
The second stage (Design) determined the product to be developed by designing the product. The design covered the media framework, the preparation of materials, and the selection of images and animations. The learning media framework consisted of materials, sample questions, tests, and the author's bio. The polyhedron materials consisted of cubes, blocks, pyramids, and prisms. The material was first prepared in the Microsoft Word based on the slide that would be displayed and then saved it in HTML format to be constructed in the Construct 2 software along with the predefined images and animations.

The next stage was the development stage. The developed products were validated by the media and material experts to find out their assessments, suggestions, and comments. The validation processes were carried out in two stages. The validation percentage experienced an improvement in the second stage of validation because the researchers improved the product based on the suggestions and comments from the validators. The following are the results of the validation by the material and media experts.



**Figure 2.** The Results of Material Experts Validation

In the second stage of validation, there were increases in the assessed aspects, namely a 7% increase in the suitability aspect of the material, a 12% increase in the accuracy of the material, and a 20% increase in the aspects of writing and language use. The average of the increase in the second stage of validation was 17%. Based on the validation by the material experts, the developed learning media was suitable to be used, because the validity and reliability test is feasible.



**Figure 3.** The Results of Material Media Experts Validation

There were increases in the second stage of media experts validation, namely a 19% increase in the usage aspect and a 3% increase in the display aspect. The average percentage of the increase was 11%. Based on the results of the media experts' validation, the developed learning media was declared fit for use, because the validity and reliability test is feasible.

The validated learning media was tested at the Implementation stage. The implementation stage consisted of small-scale, large-scale, and teacher trials. Trials by students and teachers were carried out to determine the responses and attractiveness of the developed learning media. The small-scale trial was carried out to 20 respondents of the seventh-grade students of MTs Negeri 2 Bandar Lampung. The small-scale trial obtained a response of 87% in the excellent category. Furthermore, the large-scale trial was carried out to 50 respondents of the seventh-grade students of MTs N 2 Bandar Lampung. The large-scale trial obtained a response of 84% in the excellent category. The next was the trial for the teacher which was carried out to 2 mathematics teachers at MTs N 2 Bandar Lampung. The teacher trial obtained a response of 91% in the excellent category because of the results of the research.

The last stage of the research and development was Evaluation. This stage was carried out at each stage of the research and development. The evaluation carried out in the Analysis stage related to the learning outcome of the students. The evaluation at the Design stage related to the design of the learning media which was adjusted to the level of students' interests. The evaluation at the Development stage was carried out based on assessments, suggestions, and comments of the material experts and media

experts. The evaluation at the implementation stage was carried out based on the assessments, suggestions, and comments of the students and teachers. The results obtained stated that developed learning media was feasible and interesting to use. The product of Mahsunah and Waryanto's research was in the high category with a score of 4.08 from media experts, 26 from the material experts, and 30 from the mathematics teachers with a maximum score of 35 .

This is in line with research that has been conducted by previous researchers, including research by Mahsunah and Waryanto on the development of learning media using the Construct 2 Software [33]. This research was in the high category with a score of 4.08 from media experts, 3.96 from the material experts, and 4.04 from the mathematics teachers with a maximum score of 5.00. This study also received positive responses from students with a percentage of 79.23%. Mahsunah and Waryanto's research did not test the same effectiveness as this research because the focus of the materials was different; Mahsunah and Waryanto's research was focused on trigonometric materials while this research was focused on polyhedron materials.

Another research was conducted by Putriani on the development of learning media using Construct 2 software [34]. Based on the assessment by media experts and material experts, her product obtained a score of 3.89 in the high category, and based on the assessment of the mathematics teacher, her product obtained a score of 4.8 in the excellent category. The students' responses scored 4.14 in the high category. This research did not investigate the same effectiveness as Putriani's research because her research was carried out at SMP N 2 Madiun while this research was carried out at MTs Negeri 2 Bandar Lampung. in addition, it also researches historical learning and has not researched mathematical understanding Based on the previously conducted research, it is known that the development of learning media using the Construct 2 software on various materials and subjects produces feasible and attractive learning media to be used in the learning process. The followings are the sample displays of the developed learning media.



**Figure 4.** Main Menu

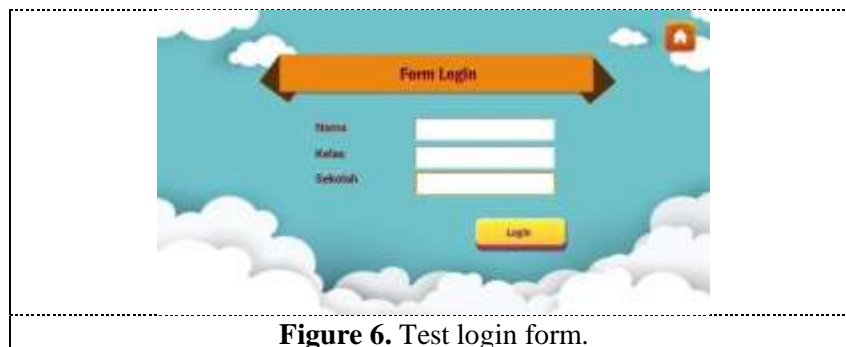


**Figure 5.** Pyramid Animation

Figure 2 shows the main menu of the developed learning media which consists of three parts, namely the opening, content, and closing parts. The opening part of the learning media is the instructions for using the media. The contents of the learning media consist of the material menu, tests, and developers' bio. The closing part contains discussions of questions.

Figure 3 shows the animated display of a combination of two shapes, namely a pyramid and a cube. The content section of the learning media is the main menu which consists of the material menu for building cubes, building blocks, building pyramids, and building prisms. In each material, animations are provided to make it easier for students to understand the material. The animations provide animations of vertices and animations of a combination of two polyhedrons. The animation of vertices serves to make it easier to explain the formula for the surface area of a shape. The animation of the combination of two polyhedrons serves to make it easier to explain the volume formula for the shape.





**Figure 6.** Test login form.

The test page is a part of the content of the learning media which consists of 15 questions. The test menu begins with a login form that contains the name, class, and school of the student. The login form on the test menu is used to simplify the scoring. When the test has been completed, it will automatically display the results of the scores according to the students' answers, complete with the identity of the students.

#### 4. Conclusions and Suggestions

Based on the research and development, it can be concluded that the results of the material expert validation obtained an average value of 87% (excellent category). The results of the media expert validation obtained an average value of 81% (excellent category). The results of the validation of the material experts and media experts indicated that the learning media is suitable to be used in teaching and learning activities for the seventh-grade students on polyhedron materials. The small-scale trial obtained an average value of 87% (excellent category). The large-scale trial obtained an average value of 84% (excellent category). The trial done by the teachers obtained an average value of 91% (excellent category). The results of the trials indicated that the developed learning media was very attractive for teaching and learning activities on the polyhedron materials for the seventh-grade students.

There are suggestions that the researchers can provide related to research and development. The developed learning media can be used to improve the quality of schools in utilizing technological advances and can be used as one of the mathematics teaching media on polyhedron materials for seventh-grade students. Then, it is hoped that other learning media can be developed based on the needs of the students. Also, this research is expected to be used as a reference for further research.

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