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Designing and Testing Three-Dimensional Wall Magazine Based Chemistry Learning Media

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ABSTRACT. The obstacles experienced by students in the learning process constituted a backgroundof this research, and the obstacles were the limited learning media, the facilities and infrastructure in schools that were not optimal. This research aimed at knowing the validity and practicality levels of three-dimensional wall magazine-based chemistry learning media on Crude Oil lesson. It was Research and Development (R&D) with Borg and Gall model. This research was administered at State Islamic Senior High School 2 Kampar. The subjects of this research were the experts of three-dimensional wall magazine-based chemistry learning media design, the experts of learning material, and students at State Islamic Senior High School 2 Kampar. The object was threedimensional wall magazine-based chemistry learning media on Crude Oil lesson. The data were obtained directly form questionnaire. The instruments of collecting data werevalidity and practicality test questionnaires. The data obtained were analyzed by using qualitative and quantitative descriptive analysis techniques. Three-dimensional wall magazine-based chemistry learning media developed was tested valid with the percentage 98% (very valid), and it was tested practical with the percentage 100% (very practical). Based on these findings, it could be concluded that three-dimensional wall magazine-based chemistry learning media on Crude Oil lesson was valid and practical, so the limited test could be carried out.

Keywords: Three-Dimensional Wall Magazine Based Chemistry Learning Media, Crude Oil

INTRODUCTION

Educators must carry out relevant innovations based on students' needs, one of the innovations is using learning media(Sofiasyari, 2024). Learning media is also useful for conveying messages from the sender to the recipient of the message, thereby stimulating the thoughts, feelings, attention, interests and desires of students which results in the achievement of learning objectives effectively during the teaching and learning process(Akbar, 2021). The use of learning media in teaching and learning activities can increase students' interest and motivation to learn. Learning media helps improve understanding, present and facilitate interpretation of data, and condense information. Learning media is also able to increase the effectiveness and efficiency of learning to support the achievement of learning objectives(Gustianty, 2024).

There are many media that can be used to support the learning process, one of which is three-dimensional media, using three-dimensional wall media models. Three-dimensional wall art means a medium whose appearance can be observed from any viewing direction and has dimensions of length, width, and height or thickness, most of which are actual objects(Dewi, 2022). Through three-dimensional wall coverings, students can experience direct experiences that can be seen and touched(Sofiasyari, 2024).

By using a three-dimensional wall model, teachers should design designs. Design is a visual element that is developed under certain pretexts and processed according to needs (Nugroho, 2021). Design aims to design media development that produces a general description of the media (Qonita, 2022). Learning design is the process of determining what learning methods are best to implement, so that changes in students' knowledge and skills arise in the desired direction(Husnaeni,2024).

In this research, three-dimensional wall coverings are used in petroleum materials. Petroleum is a liquid mixture consisting of millions of chemical compounds, the most abundant of which are hydrocarbon compounds formed from the decomposition of fossil plants and animals (Pratama, 2019). Petroleum material is rote material and tells a lot of theory and is explained in the form of paragraphs in books, so alternatives are needed, one of which is three-dimensional media (Nurjanah, 2017).

METHOD

This research was carried out at MAN 2 KAMPAR. The population in this study were 2 chemistry teachers at MAN 2 KAMPAR and 104 class XI students at MAN 2 KAMPAR. The subjects in this research are learning media experts, while the objects in this research are chemistry learning media based on 3-dimensional wall paper.

This research uses the *Research and Development* type of research using the Borg & Gall model. This model has ten stages of *research and development*, namely *1) research and information collecting, 2) planning, 3) develop preliminary form of product, 4) preliminary field testing, 5) main product revision, 6) main field testing, 7) operational product revision, 8) operational field testing, 9) final product revision, 10) dissemination and implementation*(Waruwu, 2024). Research and Development is a process or steps to develop a new product or improve an existing product. Research and Development is a model that originates from the results of thinking, is still conceptual and its implementation is organized starting from planning, implementation, to evaluating the results(Ilmi,2022). However, this research is limited to stage 5, namely production revision based on initial field test results.

The data collection technique used in this research is through questionnaire interviews and documentation. Researchers conducted interviews with class XI MAN 2 KAMPAR study teachers to determine the problems, obstacles and difficulties experienced by the school. . Documentation in this research was carried out to investigate or analyze written objects such as books, magazines, regulations, meeting minutes, diaries, activity reports and so on. There are four types of questionnaires used, namely validity test questionnaires by learning material experts, validity test questionnaires by learning media experts, practicality test questionnaires by teachers, and student response questionnaires. The assessment of this instrument is prepared using a rating scale calculation scale.

Table 1. Validation Questionnaire Scale by Media Design Experts

Instrument Item Answers	Skor
Very good	5
Good	4
Pretty good	3
Not good	2
Not good	1

Rating scale is raw data obtained in the form of numbers, then interpreted in a qualitative sense (Alawiyah, 2021). Rating scales measure a person's appearance or behavior of others through statements at a continuous point or meaningful category of value. In this research, each of the criteria above is connected to questions related to the media created.

The data analysis technique used is qualitative descriptive analysis and quantitative descriptive analysis which describes the results of validity tests and practical analysis tests. Qualitative descriptive analysis techniques are used to improve students' worksheets that integrate Islam into the chemical element material that has been designed. Quantitative descriptive analysis techniques are used to describe the characteristics of the data for each validity variable to make it easier to understand the data for the subsequent analysis process.

RESULT AND DISCUSSION

The results of this research are chemistry learning media based on three-dimensional wall paper on petroleum materials. This product was designed by researchers so that it can be an alternative teaching material that can help teachers in the learning process and as a learning resource for students. This three-dimensional wall-based chemistry learning media based on petroleum material was developed using a development procedure according to *Borg and Gall* which was simplified according to research needs into five stages. Data on the results of each stage carried out are as follows.

1. Information gathering stage

This data collection stage was carried out in two ways, namely field study and literature study. The results obtained from the analysis of this field study through an interview process with chemistry subject teachers stated that the obstacles experienced by students in the learning process were limited learning media, apart from that the facilities and infrastructure at school were also not optimal. This can be seen from the enthusiasm of students during the learning process. Therefore, interesting learning media is needed so that students are more interested in the learning process. One of the innovations is to use three-dimensional wall media on petroleum materials. The results obtained from the field study analysis were by collecting information from journals and books related to the design and testing of three-dimensional wall-mounted chemistry learning media on petroleum materials.

2. Planning Stage

At this planning stage there are several things that must be done, namely adjusting the core and basic competencies as well as the syllabus based on the 2013 curriculum, designing initial media designs and compiling research instruments.

In this research, three-dimensional wall-mounted learning media was developed only at KD 3.2. The sub-topics taken include: formation process and techniques for separating petroleum fractions and their uses.

The next stage is designing the initial design, at this stage the design is made in the form of a prototype and storyboard containing the content that will be included in the learning media.

Table 2. Prototype Description

No	appearance	information
1	three-dimensional wall coverings	The overall three-dimensional appearance of the wall magazine
2	information	The information contains an explanation of the operation of three-dimensional wall coverings
3	basic competencies	Basic competencies contain basic competencies and learning indicators
4	material	The material contains a discussion of petroleum material
5	miniature	The miniature contains the processing process and petroleum fractions.
6	profile	The profile contains the creator's identity such as name, ID, study program and faculty

Prototype is a term that is often used in various fields, including product design, software development, and others. A *prototype* can be interpreted as an example or initial model created to test a concept that has been introduced. The main purpose of a *prototype* is to understand whether

the concept can be implemented and is as expected, as well as to detect errors before the final product is developed (Aprilia, 2024).

3. Initial product development stage

At this stage, a storyboard in the form of a three-dimensional wall-mounted magazine on petroleum material was developed with the following stages: a) the three-dimensional wall-mounted section, namely the part that contains the overall appearance of the three-dimensional wall-mounted magazine, b) the information section, namely the section that contains the explanation and operation of the three-dimensional magazine, c) basic competency section, namely the section containing basic competencies and learning indicators, d) material section, namely the section containing discussions of petroleum material, e) miniature section, namely the section containing processing processes and petroleum fractions, f) profile section, namely the section containing manufacturer's identity such as name, ID, product and faculty.

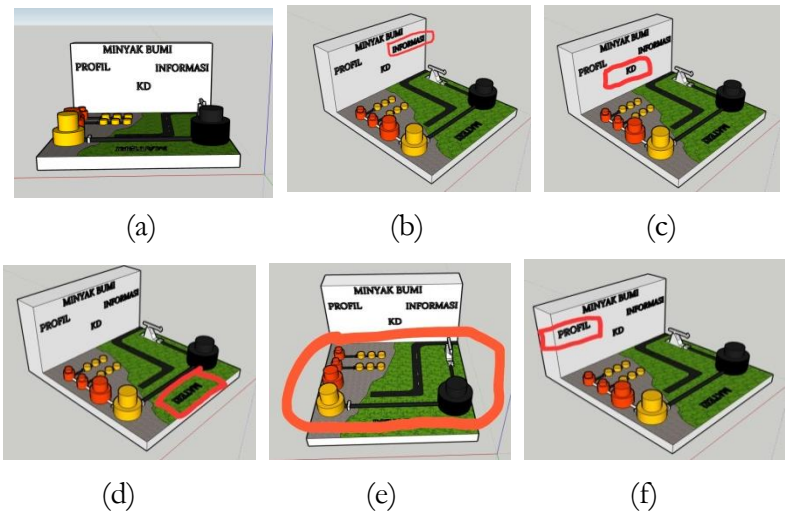

Figure 1. Three-dimensional wall art, (a) three-dimensional wall art section, (b) information section, (c) basic competency section, (d) material section, (e) miniature section, (f) profile section

A *storyboard* can be interpreted as a graphic organizer such as a collection of illustrations or images displayed sequentially for the purpose of visualizing moving graphics. The existence of a storyboard makes it easier for someone to convey ideas or story ideas with arranged images so that people can understand the essence of the desired idea (Janottama, 2024).

A storyboard is a whole picture that explains a story. Storyboards contain a step-by-step arrangement of designs that can make it easier for developers to create applications. With a storyboard, it will be easier to describe the appearance. The storyboard is prepared by choosing the background, writing, colors, use of images(Nauly,2024).

Next, validation is carried out by media experts and material experts. In media expert validation, this product is very valid and worthy of being tested in the field without revision, with a validity percentage of 97% because it is in the range of 81%-100%. Next, validation by material experts is in the form of a questionnaire. The three-dimensional wall panel assessment by material experts received a percentage of 98.3% which was categorized as very valid because it was in the range of 81%-100%.

Table 3 Data Calculation of Overall Validity Test Results (Media Design Expert and Learning Material Expert)

No	Media Validity Variable	Ideal Percentage
1	media expert	97 %
2	material expert	98 %
	average	**97,3 %**

Based on the calculations in the table above, it is clear that the overall percentage of expert assessments is very valid. Because it is in the range of 81% to 100%, three-dimensional wall-mounted chemistry learning media has been said to be suitable for testing in schools.

4. Limited Trial Phase

Three-dimensional wall media products that have been validated by media experts and material experts are tested in schools. The trial was carried out at MAN 2 KAMPAR, namely on 2 chemistry teachers and 10 class XI science students. In the results of the practicality test carried out by the chemistry teacher, the practicality percentage was found to be 100%, so the media is included in the very practical category because it is in the range of 80%-100%. The results of the student response test were tested on 10 class XI Science students. This student response questionnaire is in the form of a semi-open questionnaire consisting of 4 aspects, namely the media format aspect, the media quality aspect, the media clarity aspect, and the student interest aspect which consists of 8 questions.

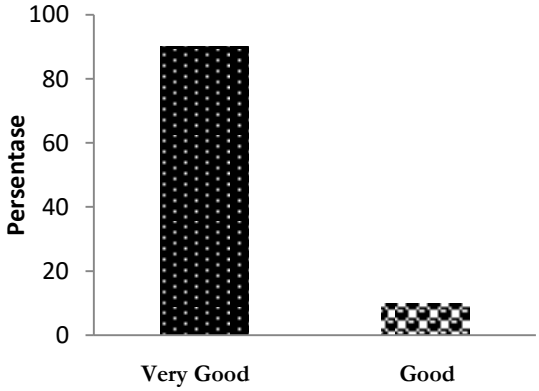

Figure 2. Student responses to the entire three-dimensional wall magazine

Figure 2 shows that 90% of students gave a very good response to the entire three-dimensional media on petroleum material, and 10% of students gave a good response to the entire three-dimensional media. This shows that three-dimensional wall coverings based on petroleum materials can be used as supporting teaching materials for learning.

5. Final product stage

The final appearance of this three-dimensional wall-mounted chemistry learning media on petroleum material is as follows:

(a) (b)

Figure 3. (a) Front view of the three-dimensional wall (b) Three-dimensional side view of the wall

At this stage, the learning media that has been tested in schools is revised according to suggestions and input obtained from both teachers and students. The final stage of revision was carried out to produce the final product, namely chemistry learning media based on three-dimensional wall paper. The advantages of three-dimensional wall-mounted chemistry learning media: 1) this three-dimensional wall-mounted chemistry learning media has advantages in presenting petroleum material so that students can easily understand the material, 2) it is very interesting so this learning media supports students in understanding petroleum material, 3) is very practical so that this learning media makes it easier for teachers and students in the teaching and learning process. Weaknesses of three-dimensional wall-mounted chemistry learning media: 1) the need to add sound or audio to the media so that it is more interesting, 2) the need to add questions to the evaluation so that students' mastery of the material they have studied is visible.

CONCLUSION

This product was designed using a modification of the borg and gall model. At the initial information gathering stage, the material structure and content of petroleum as well as media content were obtained. At the planning stage, mapping, prototypes and storyboards were produced which were then developed using three-dimensional wall coverings to produce products in the form of valid learning media, namely 97% and 98.3%.

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