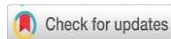


Improving Rational Thinking Skills Using Unity-Based Learning Media in Solid State Electronics

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ABSTRACT

The advancement of information technology has had a positive impact on the education industry. The teaching methods used today tend to be less engaging and monotonous, as some still rely on conventional methods. Therefore, the development of learning materials is seen as a necessary solution. This research aims to develop a simulation design for multimedia learning applications on the topic of electronic semiconductor materials to support the learning process at Surabaya Aviation Polytechnic. Solid-state electronics encompass the use of semiconductors and related materials in electronic component design. This research primarily employs multimedia development as its approach. The model applied is the 4D model, which focuses on the simulation design of semiconductor electronics learning materials. The research subjects are students of Surabaya Aviation Polytechnic. Data collection involves various tools, including media validation tables and pre- and post-tests. The analysis results, using the N-gain score test on test results (before and after), yielded a score of 0.57. Descriptively, this score can be categorized as moderate, as it is greater than 0.3 but less than 0.7 ($0.3 \leq g \leq 0.7$). Based on this data, it is considered appropriate and effective to implement semiconductor electronics teaching aids for academic purposes at Surabaya Aviation Polytechnic.

INTRODUCTION

The rapid advancement of information and communication technology has brought about positive impacts in various sectors, including education. Presently, educational materials tend to be less engaging and monotonous due to the continued reliance on traditional teaching methods for certain subjects. The significant role of instructional media in the success of the learning process cannot be underestimated. As an instructional tool, instructional media have the capability to enhance students' understanding (Alenezi, 2020; Haleem et al., 2022; Suprpto & Made, 2020). By utilizing various forms of instructional media, teachers can efficiently disseminate knowledge to students (Abbas et al., 2021; Kamelia, 2019; Nurrita, 2018; Rasita et al., 2021). (Chukwuebuka, 2016; Karmakar et al., 2021; Zhu et al., 2021). These semiconductor devices are employed to regulate electric currents and amplify electrical signals within electronic circuits. This subject matter is fundamental in the realm of Electronics and demands a profound and comprehensive understanding for mastery. In the context of Solid State Electronics instruction, students are typically provided with learning materials in the form of textbooks and classroom presentations. However, more interactive and captivating instructional media, such as digital and modern games or simulations, can aid students in comprehending the principles and concepts in Solid

process. Serving as a source of learning, instructional media can assist teachers in enriching students' understanding. An application is a ready-to-use program designed to execute various commands in accordance with its intended purpose (Abdurahman & Riswaya, 2014). In this research, the author has developed an instructional software/application based on Android (Cahya et al., 2020). The objective of this application is to effectively and interactively deliver Solid State Electronics instruction, enabling trainees to grasp critical information related to basic electronics. The utilization of this application can also bolster students' enthusiasm, comprehension, and skills during the learning process.

RESEARCH METHOD

The method applied in designing this application is the Research and Development (R&D) Method (Safitri et al., 2019). According to (Solikin & Amalia, 2019), Research and Development (R&D) methods are used to develop and test products that are being developed in the education sector. There are various research models that can be used as a reference in the R&D approach, including the 4D development model. This model, as explained by (Maydiantoro, 2021) involves four stages in the development process, namely :

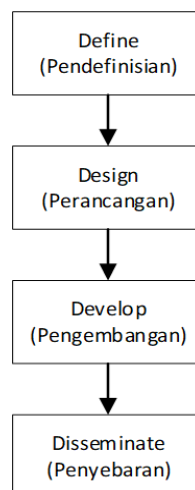


Figure 1. Research Flowchart

1. Define

This stage is often referred to as the needs analysis stage. Aims to find out how far learning is currently developing. At the define stage you can also analyze the writer's needs in collecting data such as application menus and materials. In this research, there are several requirements needed both in terms of software and hardware. Learning media on solid state electronics designed by Android-based researchers makes it more efficient in creating a learning process.

2. Design

This stage is followed by planning or designing initial product ideas. The aim is to ensure that the products produced can operate effectively in accordance with society's needs. This step involves creating storyboards, application usage mechanisms, and content planning.

3. Development

The development stages in the 4D method involve implementation, design or construction plans that have been previously designed. This includes the actual

process of construction, installation, or work that occurs on the project.

4. Disseminate

This stage serves as a method to confirm or evaluate the suitability of the product design. In this step, an assessment is carried out by experts in the field. The input provided is used to improve the content and design of the products that have been designed. At this stage, efforts are made to obtain responses, responses, or input from the target audience of product users.

5. Evaluation Step of Test Pretest dan Posttest.

The pretest and posttest given are used as a medium to determine differences in learning outcomes. This difference can be seen when application users learn before using the application and after using the application.

RESULTS AND DISCUSSION

Data analysis techniques using material expert validation and pretest and posttest question sheets are used to measure cadets' abilities. Data analysis used in this research involves calculating the percentage of responses given by respondents. The correct answer score for each observation aspect will be divided by the ideal answer score for all observation aspects, then the result will be multiplied by 100% (Wahab & Junaedi, 2021).

$$N\text{-Gain} = \frac{Skor\ posttest - Skor\ Pretest}{Skor\ ideal - Skor\ Pretest} \times 100$$

The N-Gain score is carried out to identify the impact of increasing thinking processing abilities which can be seen through the difference between pretest and posttest results (Adnan et al., 2021; Guntara, 2021). This process begins by giving the user an initial exam (pretest) before using the application, and then continues with a final exam (posttest) after using the application. After the data is collected, the next step is to calculate the total number of users who have reached the completeness level. This is done by comparing the pretest score with the posttest score (Gul Malik & Alam, 2019; Shivaraju et al., 2017).

The pretest and posttest results show that the calculation using the N-gain score test in calculating the results obtained a value of 0.57. It can be interpreted descriptively that this value is included in the medium category because 0.57 is a greater value than 0.3 and less than 0.7 ($0.3 \leq g \leq 0.7$). Furthermore, in the effectiveness assessment category, the percentage obtained was 57.14%.

Table 1. N-Gain Score Distribution.

No	N-Gain Score	Category
1	$g \geq 0,7$	High
2	$0,3 \leq g \leq 0,7$	Medium
3	$g \leq 0,3$	Low

	Post test	Pre test	Post-Pre	Ideal Score	N-Gain Score%
Mean	81,3634	53,6363	27,72727	70	57,14285

At the disseminate stage, validity is checked by document and communications experts. The results of the expert assessment are checked and the results become a guide for making improvements until the multimedia learning application is ready for use.

Validity assessment is achieved by evaluating aspects with criteria relating to: Complete content, language and appearance. The validation results obtained, namely 80.76%, can be classified as achievable.

Feasibility test:

$$\text{Kelayakan \%} = \frac{\text{skor yang diperoleh}}{\text{skor maksimal yang dapat diperoleh}} \times 100\%$$

$$\text{Kelayakan \%} = \frac{42}{52} \times 100\%$$

$$\text{Kelayakan \%} = 0.8076 \times 100\%$$

$$\text{Kelayakan \%} = 80.76 \%$$

Evaluation of language suitability involves two points, namely clarity of language use in the application so that it is easier to understand and avoiding various interpretations.

CONCLUSION

The conclusion of this research shows that the results of validation by media validators of 80.76% can be categorized as valid and feasible. Apart from that, the calculation results from the pretest and posttest using the N-gain score test obtained a value of 0.57. It can be interpreted descriptively that this value is included in the medium category because 0.57 is a greater value than 0.3 and less than 0.7 ($0.3 \leq g \leq 0.7$). Based on these data, the application of solid state electronic learning media is feasible and effective for learning activities at the Surabaya Aviation Polytechnic. The results of this research can be used by lecturers as a facility in the learning process. The results of this research can also improve students' computational thinking skills. The learning methods used by lecturers have become more diverse and in line with current developments.

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