Development of Learning Media Based Interactive Multimedia on Geometric Optical Materials

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Abstract. Teacher innovation in making learning media is still very lacking. The research objective is to develop interactive multimedia-based learning media that are practically used in the learning process at school. The ADDIE development model is used in the type of study that is conducted, which is research and development. The research subjects were 13 high school students in class XI SMAN 1 Kutalimbaru in the small class and 20 people in the large class who were selected by random sampling. Data collection techniques used were validation questionnaires, user responses and test questions, all of which were analyzed quantitatively and qualitatively. It was concluded that the interactive multimedia-based learning media that had been developed were valid, practical and effective.

Keywords: Learning Media Based Interactive Multimedia, Geometic Optical.

1 Introduction

21st century education is a modern education with academic and educational nuances by applying science and technology. Advances in science and technology offer abundant learning resources to be accessed easily, more flexibly, and in various ways [1]. The development of science and technology is growing rapidly, especially in the field of education which affects the quality of the learning process in schools. The learning process is an activity or teaching and learning activity between two subjects, namely teachers and students. The learning process in schools must be managed professionally using standardized and competent competencies in various fields of science that are taught and honed continuously by utilizing learning media.

Learning media can assist teachers in conveying information, feedback, positive responses, increasing motivation and attention and concentration of students' learning [2]. Utilization of learning media is used as a result of the development of technology and information. The expected competency achievement is that an educator is required to carry out various learning management innovations that are able to meet the criteria and success in the learning and teaching process in schools. Good learning management must be developed based on appropriate teaching principles and take into account all aspects, systematically designed, conceptual but practical, realistic and flexible, both concerning issues of classroom interaction, teaching, and assessment in teaching [3].

The results of observations, interviews, experiences of teachers and students at school show that the learning media that are available on the internet, links and YouTube are rarely used in the learning process in the classroom. One of them is interactive multimedia learning. The cause of the infrequent use of interactive multimedia is due to limited internet quota access for students and computer/android devices that not all students have personally at home. Students have difficulty obtaining internet quotas with large enough data to be able to access the required learning media. The obstacles faced make it difficult for students to learn independently and be directed to understand various materials in the learning process at school, the opportunity to do practicum in the laboratory is limited and the lack of equipment to carry out practicum, and manual handbooks are considered less attractive because they cannot be carried anywhere. The technological literacy abilities of teachers in schools have mostly entered a young age and tend to be a problem with the development of the times for students, having an impact on a lot of subject matter delivered manually. The results of observations in schools that were carried out stated that teachers were less innovative in terms of processing learning media, especially when carrying out practicums in the classroom so that many students only received manual explanations from information sources, namely student handbooks.

The problems faced show that the learning used in the teaching and learning process has not been effective, especially in designing and using learning products. The phenomenon that occurs makes it important for researchers to innovate by designing learning media according to the demands of existing needs as a supplement to support learning activities using technological equipment that cannot be separated from students' daily lives, for example using computer/android electronic media and making learning media in the form of interactive multimedia.

Interactive multimedia is an interactive and innovative media that can increase the effectiveness and efficiency of learning activities [4]. Interactive Media is able to develop skills, recognize problems, coordinate, evaluate, and provide information. Presentation of material in interactive media can be accompanied by sound, images and videos, making it easier for students to understand the material, being more varied and making learning exercises not boring. Interactive media using computers and the internet can be used as a substitute for laboratory equipment. Students who are included long enough in learning become intelligent independently and collectively [5], [6].

2 Method

The type of research carried out is the Research & Development. The development model in research follows the ADDIE development model which includes the Analysis, Design, Development, Implement and Evaluate stages. The subjects of this study were class XI MIA SMA Negeri 1 Kutalimbaru as subjects of the implementation of learning media and two material experts and media experts as subjects of validity testing for interactive multimedia learning media.

There are two data collection techniques in development research, namely test and non-test. The test technique was carried out to determine the effectiveness of interactive multimedia-based learning media by collecting pretest and posttest data. The non-test technique is a questionnaire that is distributed to obtain product data results from media experts and material experts, learning experts (teachers) and students.

There are two data analysis techniques used in this study, namely quantitative and descriptive qualitative data analysis. Quantitative data analysis was used to analyze the data collected from the questionnaire, while descriptive qualitative analysis was used to process the data results from the critique questionnaire and suggestions by learning media experts, learning experts, and material experts.

3 Result and Discussion

The development research was carried out in 5 stages based on the concept of the ADDIE development model, namely Analysis, Design, Development, Implementation and Evaluation to answer research questions. Development research produces a quality interactive multimedia-based learning media product that can be used with the results of data analysis obtained and measured by indicators that development research meets valid, practical and effective criteria.

3.1 The Validity of Learning Media Based on Interactive Multimedia

The validation of interactive multimedia-based learning media was carried out by two experts, namely media experts and material experts. Validation is carried out using content validation and construct validation to produce a product that is valid and feasible to use. The aspects assessed by the media validation team are the display aspect, namely written text (font shape, and legibility), images (animation, illustrations, simulations), audio (sound quality and accompanying music), color and brightness aspects, namely display color (text, writing). and background), usability and language aspects. Meanwhile, the aspects assessed by the material validation expert team are aspects of appearance, quality of learning materials, content/content, usability and language. These criteria refer to the characteristics of learning media that contain representative material content in visual, audio, and audio visual forms, have the power of color and object resolution language, varied types of learning, develop self-evaluation principles in measuring learning processes and outcomes, and can be used classically and individually [7]. Interactive multimedia-based learning media with valid, practical and effective categories can and are feasible to be used as learning media in schools [8]. Valid interactive multimedia-based learning media used in the learning process can increase students' understanding of physics concepts [9].

The results of the validity test by media experts are very valid categories, the average number is 82%. The results of the material validity test in the very valid category, the average number is 87%. Before being tested and validated, the media and material were revised first by correcting and correcting the media from expert input, namely the use of capital letters, background, color, sound and audio. The validation results refer to the validation criteria which are in the range of 61% < P 80.00 % with valid category and > 80.00 % very valid category [10].

3.2 Practicality of Learning Media Based on Interactive Multimedia

The results of the assessment were taken from the distribution of a teacher response questionnaire consisting of two teachers in the field of physics studies with an assessment of 88% in the very practical category. The practical results obtained from the overall teacher

response questionnaire data reached the aspect of convenience, namely the media is easy to operate and use in learning. Aspects of clarity, namely the clarity of the material presented, clarity in using the function of buttons and icons on the media and clarity of achievement of learning objectives in accordance with the competencies and indicators on the syllabus. In addition, the suitability aspect also includes the suitability of letters, images, colors and backgrounds, as well as audio, simulation and material in interactive game media. The display aspect is also interesting and motivating, providing feedback when using media in learning, fun and able to help students understand the material presented.

Interactive multimedia developed through collaborative learning tools is used by students in learning by packaging material in learning videos. In the learning video there is a main page and core competencies, indicators and goals that must be achieved by students. Learning videos really help students understand the material freely because the files are easy to store, the display is attractive and motivating. This is in line with previous research by [11] that the use of videos in physics learning is effective in improving student learning outcomes and encouraging students to be active in learning.

The practicality of interactive multimedia-based learning media is also seen from the aspect of the benefits that students use as learning videos that can be accessed both online and offline, easy to carry everywhere and can be repeated and studied without a time limit, stored in an unlimited period of time and can understood as an independent learning medium. Interactive learning multimedia with an attractive display accompanied by pictures, animations, videos and audio makes students very enthusiastic, very interested, wanting other physics material using the same media and can be used as a source of independent learning [12].

While the LKPD which is packaged through a virtual laboratory practicum helps students hone their skills in using media, explore experiences in abstract learning so that they become more real, easy to access and use. The practicality of using learning media is seen from the aspect of the ease with which students understand the concept of geometric optical material about reflection and refraction through LKPD which is carried out through a virtual lab practicum directly using PhET coloradu.edu.

PhET simulation media may be used to teach physics topics to students and instructors in an efficient manner. It also pairs well with inquiry learning methods and has the benefit of being able to clearly explain abstract physics concepts. The opportunity for students to learn more, apply what they learn, and enhance performance in executing tasks in accordance with the learning objectives will expand with the usage of creative learning media. [13]. PhET (Physics Education Technology) Through the creation of imitations of the kind of experience more closely resembling the real atmosphere of walking in a risk-free circumstance, interactive simulation is able to offer a more concrete learning experience. [14].

The practicality of using learning media from the aspect of attractiveness can be applied through wordwall educational games that make students more enthusiastic about working on questions in an interesting, joyful and fun atmosphere. Students feel motivated to use more fun and interesting media so that the learning atmosphere is more varied, not boring, and improves student achievement [15]. The wordwall application can boost students' interest and enthusiasm for learning while assisting pupils in remembering the subject being taught [16]. It is crucial to understand how teachers and students respond to developed media in order to determine its applicability.

The developed media is said to be practical if the media can be implemented in the field with easy implementation and increase students' understanding of physics concepts. The practicality test on teacher and student responses was carried out after using the developed

learning media. The trial was conducted in class XI MIA-1 with a small group of 13 people and class XI MIA-3 in a limited group of 20 people.

The trial's findings in a small group revealed a percentage of 81.4% in the "extremely practical" category. While the outcomes of tests in a small sample revealed a value of 83% in a highly useful category. The results of the overall recapitulation of the average student answer data from 33 students showed that 82.3% of the data fell into the category of being extremely practical to be used in the classroom learning process.

3.3 Effectiveness of Interactive Learning Media

The effectiveness of interactive multimedia-based learning media in terms of the consistency of student learning outcomes in small groups and limited groups. This refers to the criteria for the effectiveness of interactive learning media. Student learning outcomes after using learning media are consistent in achieving the expected learning objectives with classical mastery of at least 84% of all students. Classical completeness in the small group reached 84% with an average of 81.5 and the limited group reached 95% with an average of 87.3. A media is declared effective if it meets the effective category and can be used in field trials.

The posttest results obtained by students from the data above indicate that interactive multimedia learning media can increase students' motivation, interest in learning and understanding of concepts [17]. Interactive multimedia can help students and teachers in the learning process [18]. Teaching Physics using interactive multimedia learning media can save 40% of time so that students who have a learning speed above the average will get more and more in-depth material enrichment. Thus, it can be predicted that their learning outcomes will be better than students who study physics with conventional learning.

The results of the effectiveness data test that has been carried out on interactive multimedia-based learning media have a relationship with the criteria aspect of the distributed response questionnaire. These aspects include aspects of convenience, clarity, suitability, appearance and attractiveness because the students who were tested stated that interactive multimedia-based learning media were in the category of easy, clear, appropriate, and interesting to use so that students achieved the expected value of learning completeness criteria. This refers to previous research [8] which states that there is a relationship between the level of effectiveness and practicality in interactive multimedia learning media.

4 Conclusion

Based on the data analysis and discussion in the description of the previous chapter, the conclusion from the development research conducted regarding interactive multimedia-based learning media is that the interactive multimedia-based learning media that have been developed are included in the valid, practical and effective categories.

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