

DEVELOPMENT OF INTERACTIVE MULTIMEDIA BASED ON EDUCATIONAL GAMES OF PLANT PARTS AND THEIR FUNCTIONS TO IMPROVE STUDENT LEARNING OUTCOMES

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Abstract: Natural Science (IPA) is an activity to study nature systematically through actual activities and trains students to think critically and objectively to achieve learning objectives. Using learning media in the learning process can support success in the learning process. This study aims to determine interactive multimedia development's validity, practicality, and effectiveness based on the educational game "Plant World" material about plant parts and their functions. This research uses the R&D (Research and Development) method with the ADDIE model, which consists of 5 stages, namely 1) analysis, 2) design, 3) development, 4) implementation, and 5) evaluation. Data collection techniques using expert validation questionnaires, teacher and student responses, and pre-test and post-test evaluations were then analyzed using qualitative and quantitative descriptive. The results showed that the development of interactive multimedia based on the educational game "Plant World" with the validation of media and material experts obtained an average percentage of 86% very valid criteria, teacher responses received a percentage of 89% very practical criteria, and student responses obtained a percentage of 90% very good criteria. The effectiveness was obtained from the average pre-test result of 57.7 and the post-test of 81.7. It was found that the post-test value was higher than the pre-test value, and the specified KKTP was 75. Strengthened by the Paired Sample-test results obtained $0.001 < 0.05$, there is a significant difference between pre-test and post-test evaluation.

Keywords: *Interactive Multimedia, Educational Games, Parts of Plants and Their Functions, Learning Outcomes*

INTRODUCTION

Education is directing or providing knowledge, skills, and attitudes through learning or training with other people. A person's education will make them a quality human [1]. Education can take place at or outside of school to prepare students to play roles in various living environments in the future [2].

Natural Sciences (IPA) at the elementary school level is one of the subjects that must be taught to students. Natural Sciences (IPA) is a child's activity by systematically finding out about nature, so learning Natural Sciences is not just mastering a collection of facts, concepts, or principles but a process of discovery. [3]. Natural Science (IPA) subjects can train children's skills to think creatively and innovatively [4].

Learning media is one of the supporters of success in learning. Learning media is a tool used to convey messages from teachers to students [5]. Using learning media in the learning process can increase curiosity, new interests, and student motivation in learning [6]. Interactive multimedia is one of the learning media that can be operated by the user so that the user can choose what he wants for the following process [7]. Interactive multimedia media can help teachers interact directly with device users during learning [8].

A game is a game that is designed to be played according to specific rules [9]. An educational game is a game that makes its users increase their interest in learning [10]. Educational games used in the learning process are fun and aim to increase knowledge [11]. Educational games can motivate students to learn

actively and creatively through some of the challenges provided [12].

Learning outcomes are activities that involve processes and affect people functionally. Learning outcomes are experiences gained and cause changes in behavior after participating in the teaching and learning process in accordance with educational goals [13]. Assessment of learning outcomes can be known at the end of learning. If the learning outcomes obtained are good, then the success of learning is determined to influence student achievement and learning motivation greatly [14].

The results of observations and interviews are conducted by fourth-grade teachers at SDN Tiru Lor 2. It shows that in the science learning process material for plant parts and their functions in the implementation of learning, the teacher has yet to use interesting learning media in the learning process in class. Teachers need more innovation in learning methods, so students are only seen sitting, listening, and taking notes on the material, making students less active and less interested in learning. The results of the students' pre-test given during the pre-research obtained an average of 57.7. These results are below the KKTP (Complete Learning Objectives Criteria) determined by the school, which is 75. It happens because, in learning activities, students have difficulty memorizing the functions of plant parts.

Based on these problems, development was carried out by developing interactive multimedia based on the educational game "Plant World" material for

plant parts and their functions to improve learning outcomes for class IV students at SDN Tiru Lor 2.

RESEARCH METHODS

This research is development or R&D (Research and Development) with the ADDIE model. The ADDIE model is one of the model designs in which each development pays attention to the arranged primary stages [15]. The ADDIE development model comprises five stages: analysis, design, development, implementation, and evaluation [16]. The ADDIE development model develops media, teaching materials, learning models, and strategies [17].

The test subjects in this study were media expert validators and material expert validators, 10 class IV students at SDN Tiru Lor 2 and class IV teachers to carry out small group trials, and 24 class IV students at SDN Tiru Lor 2 and SDN Tiru Lor 1 to carry out large group trials. The methods used in this study were observation, interviews, questionnaires, and pre-test and post-test evaluations. Observations and interviews were conducted to find out the learning process and the needs of students and teachers in the learning process in class IV. Questionnaires are used to determine the validity of the developed media, while pre-test and post-test evaluations are used to measure the effectiveness of the use of the developed media.

This study uses qualitative and quantitative descriptive analysis techniques. Qualitative descriptive analysis is a technique or way to analyze data by compiling it into sentences, words, or categories so that general conclusions can be obtained [18]. This study

used descriptive qualitative analysis to classify interview data, suggestions, and comments for improving the developed media. At the same time, quantitative data analysis is data processing by systematically compiling in lift or percentage so that general conclusions can be obtained [19]. Quantitative descriptive analysis in this study was used to process the data obtained from the questionnaire results in the form of scores using a Likert scale. The criteria used to determine the decision-making is the achievement level conversion table, which consists of 5 criteria. The pre-test and post-test evaluation results are used to determine differences and the effectiveness of media use and are strengthened by paired sample-t tests.

RESULT AND DISCUSSION

This research uses the ADDIE model, which consists of 5 stages: analysis, design, development, implementation, and evaluation. In the analysis stage, an analysis of learning materials is in accordance with the learning achievements and learning objectives in the odd semester. As well as analyzing the needs of teachers and students using interviews with teachers and questionnaires with students.

At the design stage, the media layout is carried out, consisting of data collection and storyboards. At the development stage, the creation of interactive multimedia based on the educational game "Plant World" is carried out according to the storyboard that has been made. The development results are shown in Figure 1 below, as follows.



Figure 1. Results of the Development of Educational Game-Based Interactive Multimedia "Plant World"

After doing the development, they implemented it by validating the media validator and material validator to determine the media development's validity. They conducted small group trials with ten students and class teachers as respondents to assess the practicality of using media. The questionnaire was

given to media expert lecturers, namely Mr. Sutrisno Sahari, M.Pd and subject matter expert lecturer in Natural Sciences, Mr. Bagus Amirul Mukmin, M.P., as well as 10 grade IV students and class teacher Mrs. Siti Masrikati, S.Pd.

Table 1. Percentage of Validity Score Results and Practicality

Subject	Validity Results	Criteria
Media and material validators	86%	Very valid
Teacher response	89%	Very practical
Student response	90%	Very good

Based on the results of the validation scores by the media and material validators, a percentage score of 86% was obtained with very valid criteria. The teacher's response received a score percentage of 89% with very practical criteria, and the teacher's response obtained a percentage of 90% with very good criteria.

After conducting small group trials, they conducted large group trials with 24 student respondents to determine the effectiveness of using the developed media. Effectiveness is obtained from the students' pre-test and post-test evaluation results. The results of the pre-test and post-test evaluations are shown in the table below.

Table 2. Pre-Test and Post-Test Evaluation Results

Evaluation	Average
Pre-Test	57.7
Post-Test	81.7
KKTP	75

Based on the results of the pre-test evaluation, the average was 57.7, and the post-test was 81.7. It can be seen that the post-test evaluation results are higher than the pre-test and the specified KKTP (Learning Objective Completeness Criteria). Reinforced by the results of the paired sample-t test, a significance result (2-tailed) was $0.001 > 0.05$, which is known to have a significant difference between the pre-test and post-test evaluation results. So, it can be concluded that interactive multimedia based on the educational game "Plant World" is very valid, practical, very good, and effective for improving student learning outcomes in class IV on plant parts and their functions.

This research produces learning media in the form of interactive multimedia based on the educational game "Plant World." Using interactive multimedia based on educational games in the learning process effectively increases student motivation and activity [20]. This study uses the ADDIE development model. The ADDIE development model consists of 5 stages: analysis, design, development, implementation, and evaluation. This study was developed systematically based on learning design theory that is structured programmatically to solve problems [21].

Based on the results of research on interactive multimedia media based on educational games, "The World of Plants" is very valid, very practical, very good, and effectively used as learning media in the

learning process. It can be seen from the validation results by media validators and materials with very valid criteria. Meanwhile, in the implementation of small group trials, it was known that the results of teacher responses and student responses were in very practical and very good categories. The results of the pre-test and post-test evaluation in the large group trial showed that the post-test scores were higher than the determined pre-test and KKTP (Learning Objective Completeness Criteria) scores, and there was a significant difference between the pre-test and post-test scores. Test based on research conducted by Raharjo, he stated that interactive media containing educational games is interesting, effective, and appropriate for use in the learning process. There is an increase in children's learning activities after using interactive media containing educational games [22].

Interactive multimedia based on the educational game "Plant World" is very valid, very practical, and effective as a learning medium in Natural Science subjects on plant parts and their functions. It is known from the preparation of material in this media that it is adjusted to the learning outcomes and learning objectives in class IV. Based on research conducted by Netrilina, the development of interactive multimedia in learning can improve student learning outcomes in terms of pre-test and post-test results [23-24]. Learning media benefits teachers, making it easier for teachers to convey material, and students can understand material easily [25-26]. The implication of this research is to develop learning media by utilizing technology so that students can learn independently and freely in using this media.

This interactive multimedia based on the educational game "Plant World" has several advantages, namely the presentation of complete and interesting material, making it easier for students to memorize the functions of plant parts, interactive media so that it can attract students' interest in learning. There are games with levels that make students enthusiastic to complete games fast. However, this media also has drawbacks, namely that it can only be used on smartphones and requires large storage.

CONCLUSION

Interactive multimedia media based on educational games and "plant world" material about plant parts and their functions makes students active and interested in the material. In addition, it can improve student learning outcomes in material parts of plants and their functions. Interactive multimedia validation based on the educational game "Plant World" by media and material validators obtained an average of 86% with very valid criteria, the teacher's response obtained a percentage of 89% with very practical criteria, student responses obtained a percentage of 90% with very good criteria, the media also stated effective for improving student learning outcomes.

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