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Android-Based Interactive Learning Media With Ethnophysics Approach To Improve Students Conceptual Understanding

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Abstract. The purpose of this study is to describe the feasibility of android-based interactive learning media with an ethnophysical approach, describe the increase in students understanding of concepts, and describe students responses to android-based interactive learning media with an ethnophysical approach. The study was conducted in class XI C at SMAN 6 Bengkulu City in the 2024/2025 academic year. The method used is Research and Development using the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. Interviews, observations, and questionnaires were used in the study to collect data. Based on the product validity test, an average total validation of 80.20% was obtained, which met the criteria for being very suitable. The results of student responses through the response questionnaire to the media obtained an average score of 82.90%, with a very good category. The results of the N-Gain value through the pretest and posttest tests obtained a score of 0.68, which is included in the moderate classification. It can be concluded that developing android-based interactive learning media with an ethnophysical approach to parabolic motion material received a very good response.

Keywords: Android, Ethnophysics, Media

1. Introduction

One of the interesting things about learning these days is video-based learning [1]. Basically, physics is a science that underlies technological development, so when learning physics, technology should be used well. The application of physics concepts occurs a lot in everyday life [2]. With the development of sophisticated technology, because of the availability of audio, visual and audiovisual media can be developed to be used as learning media. So that the influence of learning media can be felt by students and teachers who utilize learning media in the learning process [3]. Physics is a subject that requires visualization that can make it easier for students to understand the concepts being studied. One of the learning media that displays visualizations by utilizing technology is android-based learning media.

Using cultural aspects in learning is a way that can be done to improve the quality of the physics learning process [4]. Ethnophysics is an approach that integrates the concepts of physics with culture [5]. Bengkulu City is one of the cities in Bengkulu Province which has a variety of local wisdom such as traditional houses, traditional clothing, traditional dances, folk games and many more. Folk games are one of the local wisdoms that are often played by children in Bengkulu, one of which is the lompek kodok game.

Lompek Kodok is a regional language of Bengkulu which in Indonesian is 'Lompat Katak'. This game is played by boys and girls who are usually around 6 to 12 years old. The number can be up to six children. Although it is also played by boys, this game is actually a girl's game. The tools or equipment used in this game are usually ceramic shards or Dutch money made of copper. And drawn on the ground or on the cement floor. Physics as part of science, its concepts can be observed in traditional games Learning with a cultural approach can be one way of cultural inheritance because it provides students

with an understanding of the environment and activities carried out by the community [5]. Applying physics concepts in traditional games can be used as physics teaching materials so that students are more interested in studying physics and are able to understand physics material well. [6]. This is also a way to preserve folk games.

Android is an open platform for developers to create applications for developers [7]. One of the communication tools that students already have that can be used as a learning medium is a mobile phone with an Android operating system. In addition to being owned by students with Android media, students can learn anywhere and anytime while doing social media activities or entertainment via Android. Android-based learning media can be used in learning activities because it is quite effective in improving student learning outcomes, and can increase the effectiveness and efficiency of learning [8]. Animated images, sound, text, navigation buttons are available in Android-based learning media so that it is more interesting and creates interaction between the learning media and the person using it [9]. This android-based learning media is designed according to basic physics learning materials. With interactive media, the learning process has its own appeal for students and can help improve students conceptual understanding of the material given.

The ability to understand concepts can be interpreted as a person's ability to understand and correctly understand an idea or idea, without changing the meaning of the concept [10]. Students can be said to understand if they can use their own words that are different from those in the book. Basically, physics includes aspects of products, processes and attitudes. According to Nana Sudjana in his book entitled assessment of the results of the teaching and learning process, understanding concepts is divided into three categories, namely translation understanding, interpretation understanding, and extrapolation understanding.[11]. With this understanding, students are asked to prove that they understand the simple relationship between facts and concepts.

From the results of observations that have been conducted at SMAN 6 Bengkulu City, it was found that the teaching media used is LKS. Non-printed teaching materials are not yet available to support learning activities. Learning media such as electronic media that have an attractive appearance and contain learning videos in them are also not yet available. So students have difficulty in learning physics because the teaching materials used are only focused on LKS. Through interviews, physics teachers at SMAN 6 Bengkulu City stated that students conceptual understanding of parabolic motion material is still lacking. Students have not been able to understand the concepts that have been taught well because the teaching materials used are only printed teaching materials. Students need media that can contain the concept of parabolic motion that relates events in the surrounding environment or in everyday life so that students are able to understand the concept of the material better. From the analysis of student needs, it was found that some students like physics learning and some do not like it because of the difficulty in understanding physics material using the learning media used. Students need learning media that can improve students conceptual understanding and media that can help students learn independently. Students are more interested in non-printed teaching materials because they can be accessed anytime, anywhere and practically using a cellphone.

Based on the results of observations, interviews, and student needs analysis, students conceptual understanding of parabolic motion material is still lacking. Students have difficulty in learning parabolic motion material because the media used is only printed teaching materials. Students need interactive learning media that contains material that relates physics material to everyday life. Therefore, it is necessary to develop interactive learning media based on android with an ethnophysical approach to help students in the learning process and improve students conceptual understanding. So the objectives to be achieved in this study are: a). To describe the feasibility of interactive learning media based on android with an ethnophysical approach. b). To describe students responses to interactive learning media based on android with an ethnophysical approach. c). To describe how interactive learning media based on android with an ethnophysical approach can improve students conceptual understanding.

2. Method

This type of research is Research and Development (RND). RND consists of two words, namely research and development. Where the activities carried out in this type of research are carried out

sequentially. Where research is carried out first, then development is carried out. This is done to obtain a problem and potential so that considerations are obtained to create a product design. [12]. This research was conducted in the odd semester of the 2024/2025 academic year. This research was conducted with the research subjects of class XI C students at SMAN 6 Bengkulu City.
The development of this interactive learning media uses the ADDIE model which has five stages in it, namely: analysis, design, development, implementation, and evaluation [13]. The ADDIE model scheme can be seen in Figure 1 [14].

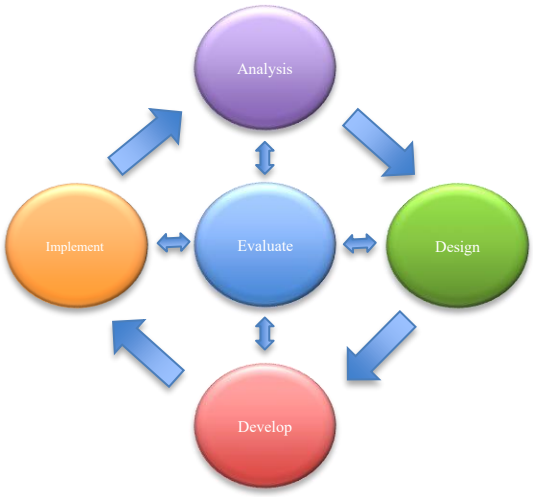

Figure 1. ADDIE development model scheme.

This study uses data collection techniques, namely observation, interviews, questionnaires, pretests and posttests. By using research instruments in the form of observation sheets, interview sheets, needs questionnaire sheets, validation questionnaire sheets, and pretest and posttest sheets. The pretest and posttest sheets that are compiled include three indicators of conceptual understanding. The indicators used are Translation, Interpretation, and Extrapolation.

Data analysis techniques are carried out in several stages. Data analysis is a series of actions taken to process the data that has been collected [12]. The initial data analysis stage is product feasibility analysis. The product feasibility test aims to determine the feasibility of the product being developed. The trials conducted produce input and suggestions as a basis for revision so that the resulting product is truly worthy of being tested as a learning medium. Product feasibility analysis uses a Likert scale in the form of categories, which can be seen in Table 1[15].

Table 1. Likert scale product feasibility test.

Category	Score
Very Eligible	4
Eligible	3
Not Eligible	2
Very Unligible	1

Calculation of the percentage (V) of the question items using equation 1

$$V = \frac{\text{total score obtained}}{\text{maximum score}} \times 100\% . \quad (1)$$

The percentage obtained is converted according to the statement in the table, to determine the feasibility of the interactive learning media developed. Interpretation of the feasibility assessment percentage can be seen in Table 2 [16].

Table 2. Percentage scale of product feasibility assessment.

Category	Score
0 - 25%	Very Unligible
26% - 50%	Not Eligible
51% - 75%	Eligible
76% - 100%	Very Eligible

The improvement of students conceptual understanding is seen by using a comprehension test from the pretest and posttest questions. The pretest and posttest scores are calculated using the N-Gain calculation [17]. The normal gain formula can be seen in Table 3 [18].

$$\text{Normal Gain} = \frac{\text{Score PostTest} - \text{score PreTest}}{\text{Score Ideal} - \text{score preTest}} \quad (2)$$

Table 3. N-gain level criteria.

Average	Criteria
g > 0.7	High
0.7 > g > 0.3	Medium
g < 0.3	Low

The response questionnaire given by students is to see the level of practicality of the learning media developed. In the response questionnaire there are questions or statements related to the use of media [19]. Data analysis of student responses using the Likert scale is shown in Table 4.

Table 4. Likert scale of student response questionnaire.

Category	Score
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

The calculation of the percentage of student responses is calculated using the formula:

$$\text{R} = \frac{\text{total score obtained}}{\text{maximum score}} \times 100\% \quad (3)$$

where R is the percentage of student responses.

The percentage of responses obtained is then converted into an assessment statement according to the table, to see the eligibility criteria of the learning media that has been developed. The following is a scale for assessing the percentage of student responses, which can be seen in Table 5 [20].

Table 5. Interpretation of Response Questionnaire Assessment Scores.

Category	Score
0% - 20%	Very Poor
21% - 40%	Poor
41% - 60%	Good
61% - 80%	Very Good

3. Results and Discussion

Android is an operating system for mobile devices based on Linux that contains the operating system, middleware and applications. Android provides an open platform for developers to create their own applications for later use. Android is commonly used on smartphones and tablet PC [21]. The following is a menu of interactive learning media based on Android which can be seen in Figure 2.

Figure 2. Android-based media learning menu display.

The advantages of this Android-based learning media are that it can be used in learning activities because it is quite effective in improving student learning outcomes, and can increase the effectiveness and efficiency of learning [8]. Students can learn anywhere and anytime while doing social media activities or entertainment via Android. Teachers only need to share links to students and students download the media that has been shared. This Android-based learning media can be used offline without requiring an internet network, so it can be accessed anytime and anywhere. There are also zoom in and zoom out features so that it is easier to use and can increase students interest in learning [5]. While the limitations are that the media requires larger storage, which is approximately 150 MB. So students need to provide sufficient storage space. In addition, iOS users cannot use this media because it can only be used by Android users. The development of interactive learning media based on Android with an ethnophysical approach was carried out using the ADDIE development model stages, namely :

3.1. Analysis Stage

The analysis stage was carried out by interviewing two physics teachers, analyzing needs using a needs questionnaire for 108 grade XI students, and observing the school conditions directly. Based on the findings obtained from the observation results, it was found that the teaching media used were still focused on printed teaching materials. Non-printed teaching materials were not yet available to support learning activities. Through interviews with physics teachers, it was found that students' conceptual understanding of parabolic motion material was still lacking. Students have not been able to understand the concepts that have been given properly due to limited teaching materials. And based on the results of the student needs analysis, it was found that most students liked student learning, only students had difficulty in learning due to the learning media used. So it is necessary to use interactive learning media that can improve students conceptual understanding.

3.2. Design Stage

Design is a stage carried out to create a product design. The design created is the structure of the android-based interactive learning media activity that will be developed. Where there are seven learning menus, each menu contains submenus in it. The design of the learning media created is guided by research [5] which raises the topic of Android-based physics learning media by linking local wisdom in it. The media design can be seen in Figure 3.

Figure 3. Android-Based Interactive Learning Media Design.

3.3. Development Stage

The development stage contains the product design realization activities. The product developed will be designed using Canva software and will later be converted into an Android-based learning media in the form of an application using Smart apps Creator software. Researchers chose to design using Canva because it has many attractive displays containing animations, illustrations, and icons in it. The selection of font size and color is adjusted to the display background so that it can be read clearly. Products that have been designed with Canva are then converted using Smart apps Creator software. Researchers chose Smart apps creator because this software is easy to use. Furthermore, the media that is ready will be validated by three validators consisting of media experts and material experts using a questionnaire. Furthermore, the product revision after being validated by material experts and media experts is in accordance with the suggestions and directions of the validator when conducting validation to produce a feasible product. The results of the development of interactive learning media based on Android with an ethnophysical approach can be seen in Figure 4.

Figure 4. Learning menu display.

In the student competency menu, there is a learning achievement and learning objectives menu. This menu aims to find out the goals and achievements of students in studying the parabolic motion material integrated with the local wisdom of the Lompek Kodok game. In the concept map menu, there is a description of what materials students will learn. Next, the Lompek Kodok introduction menu, this menu is made specifically for students to get to know in more detail the local wisdom of the Lompek Kodok game originating from Bengkulu City. In this menu, there is information about the history of Lompek Kodok game, how to play it, and there is also a Lompek Kodok game video. The appearance of the Lompek Kodok introduction menu can be seen in Figure 5.

Figure 5. Display of the lompek kodok game.

In the learning menu, there is also a parabola menu (Lompek Kodok) that studies ethnophysics. This menu studies the concept of parabolic motion physics in the Lompek Kodok game regarding the Lompek Kodok game on the parabolic motion material. Where when the player throws the marbles, a parabolic motion will be formed and the relationship between the initial velocity of the marbles and the furthest distance. The display of the ethnophysics study menu in the Lompek Kodok game can be seen in Figure 6.

Figure 6. Display of ethnophysics study.

In the kinematics material menu, there is material in the kinematics chapter, including the definition of motion and quantities in motion, straight motion, parabolic motion, and regular circular motion. The kinematics material menu can be seen in Figure 7.

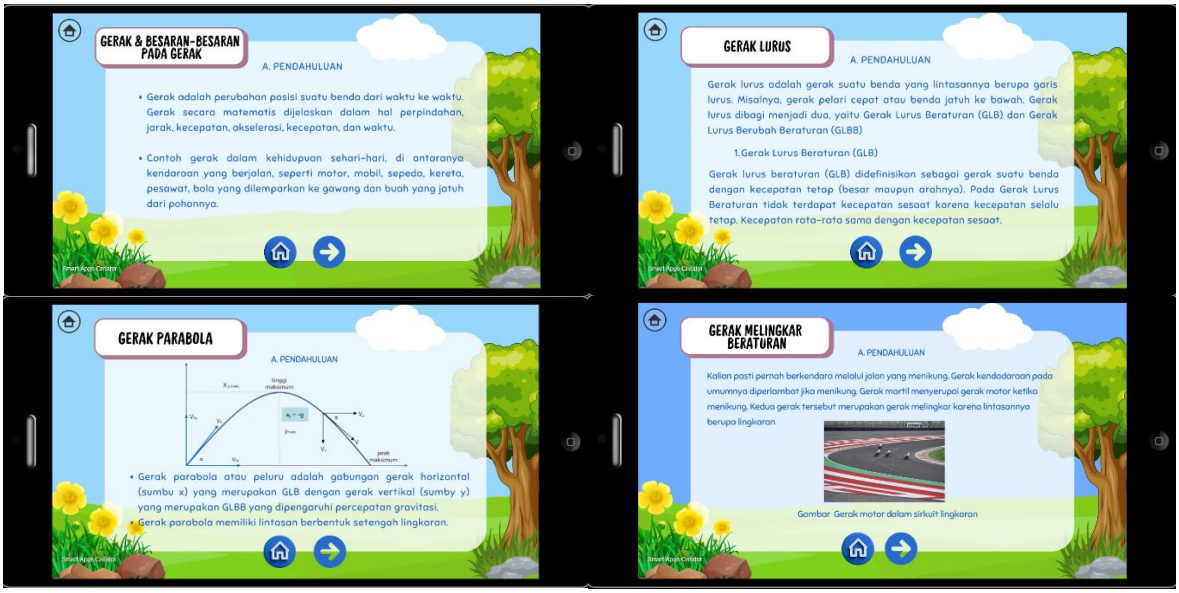

Figure 7. Display of kinematics material.

In the learning menu, there is an evaluation question menu that aims to determine students understanding in understanding kinematics material using android-based learning media with an ethnophysical approach. The evaluation questions are made interactive so that students immediately know the evaluation results. If students are wrong in answering the evaluation questions, there will be the correct answer to the question. The appearance of the evaluation question menu can be seen in Figure 8.

Figure 8. Evaluation question display.

After the product is developed, the next step is a product feasibility test to see how feasible the interactive learning media developed is. Where the feasibility test is carried out by 3 experts. The aspects assessed include the feasibility of content, presentation, language and media presentation. From the results of the feasibility test, improvements to this media include increasing the font size, text layout, and adding examples of questions that can help strengthen understanding. After the product feasibility test was carried out, the results were obtained as in Table 6.

Table 6. Feasibility test results.

Aspect	Percentage	Eligibility Category
Content Suitability	80.21%	Very Eligible
Presentation	62.50%	Eligible
Language	91.70%	Very Eligible
Media	83.40%	Very Eligible

Based on Table 6 above, it can be concluded that the four aspects get a percentage with a very feasible category. This is in accordance with previous research from Alvina Damayanti, Irnin Agustina Dwi Astuti, and Nurhayati in their journal entitled "Pengembangan Aplikasi Pembelajaran Interaktif Etnofisika Berbasis Android Pada Tari Salai Jin Maluku Utara" which states that a product can be said to be feasible if it meets the criteria for being feasible in the aspects being assessed. Thus, from table 6, this android-based interactive learning media with an ethnophysical approach is very feasible to use.

3.4. Implementation Stage

After the development stage, the next stage is the stage where researchers implement the media that has been developed to students to be tested in the learning process. To see whether the media developed can improve the conceptual understanding of class XI C students at SMAN 6 Bengkulu City. The first stage carried out in the implementation is to give students pretest questions, then the media is tested to students. After the media is implemented, the final stage carried out is to provide posttest questions to see the increase in students conceptual understanding after using interactive android-based learning media with an ethnophysics approach to the parabolic motion material. The results of the increase in students conceptual understanding can be seen in Figure 9.

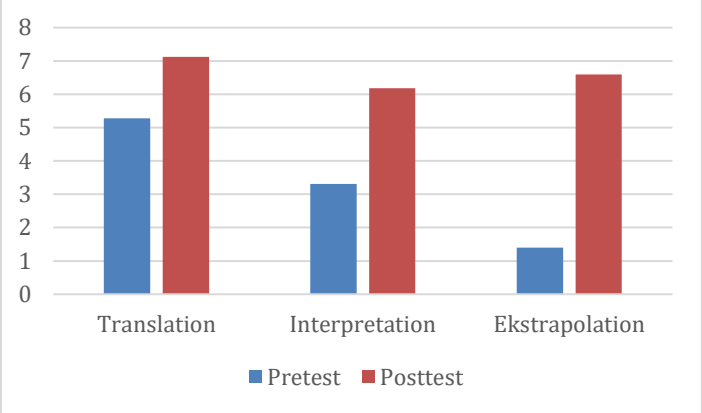

Figure 9. Graph of students concept understanding.

Based on Figure 9 on the concept understanding graph, it shows that there is an increase in students conceptual understanding through pretest and posttest data on parabolic motion material. This is in line with the statement of Aziza Greyta Gifani et al which states that android-based learning media containing ethnophysics concepts in spinning top games can improve conceptual understanding and is suitable for use in physics learning [22]. Furthermore, the data will be analyzed using N-gain analysis. The results of the N-gain analysis can be seen in Table 7.

Table 7. N-gain results.

Indicators	X Pretest	X Posttest	N-Gain	Criteria
Translation	5.28	7.12	0.67	Medium
Interpretation	3.31	6.18	0.61	Medium
Extrapolation	1.37	6.59	0.78	High
Average N-Gain			0.68	

Based on Table 7, it is found that the average N-gain value is 0.68 with moderate criteria. Where in the three indicators of conceptual understanding, the extrapolation indicator is the indicator with the highest increase value, which is 0.78 with high criteria. Then the translation indicator with an increase value of 0.67 with moderate criteria, and the interpretation indicator with a value of 0.61 with moderate criteria. This is based on research by Abdul Wahab, Junaedi, and Muh. Azhar in his research [23] that the N-gain result with an N-gain value of 0.68 is stated to have moderate criteria. Thus, based on Table

7 it can be stated that there is an increase in students conceptual understanding before and after using android-based learning media with an ethnophysical approach.

Furthermore, after students have finished learning through android-based learning media and get the results, students are asked to fill out the survey on the response questionnaire with a Likert scale of 1-4. From the results of the survey given, a very good response or response was obtained. The average result states that there is student interest in using the designed learning media. The results of the analysis of student responses to learning using android-based learning media can be seen in Table 8.

Table 8. Results of student response analysis.

Aspects	Percentage	Category
Learning Media	81.51%	Very Good
Materials	82.81%	Very Good
Benefits	84.37%	Very Good

From the results of student responses in table 8, it was found that the three aspects of student responses received a percentage in the very good category. This is based on the research of G A Pazah, E Risdianto and A Purwanto which stated that with the very good response result category, the media developed can be said to be effective for use [15]. So, based on the response results obtained with very good criteria, the Android-based interactive learning media with an ethnophysical approach is useful, very good and effective for use.

3.5. Evaluation Stage

The evaluation stage is revised according to the evaluation results or needs that have not been met. This stage is carried out at every stage in the research. At the analysis stage, revisions are made to adjust the alternative answers to the Likert scale used. At the design stage, revisions are made to the product design to add a kinematics chapter material menu containing 4 materials. At the development stage, revisions are made according to the criticism and suggestions on the validation sheet. The revision suggestions given are increasing the font size, text layout, and adding sample questions. Each improvement given is made so that the media developed is feasible and effective for use as a learning medium that can help improve students understanding of concepts.

4. Conclusion

From the research that has been done, it was found that the development of interactive learning media based on android with an ethnophysical approach is very feasible to be used as a learning media. This is evidenced by the results of product validation with an average score of 80.20% with a very feasible category. Furthermore, the results of the student response questionnaire analysis obtained a value of 82.90% with very good criteria, so that interactive learning media based on android with an ethnophysical approach can be said to be beneficial for students. The results of the N-gain test obtained a result of 0.68 with moderate criteria, so that there was an increase in students conceptual understanding before and after using interactive learning media based on android with an ethnophysical approach. Thus, it can be concluded that interactive learning media based on android with an ethnophysical approach is useful and very feasible to be tested in the learning process to improve students conceptual understanding of parabolic motion material.

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