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DEVELOPING INFOGRAPHIC MEDIA OF PHYSICS BASED ON ETHNOSCIENCE

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Abstract

This research develops an ethnoscience physics infographic using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model as an innovative solution to support the learning process. This systematic and structured development model aims to produce a valid and practical infographic capable of presenting physics material information accurately in a simple and easily digestible format. The validation process was conducted through expert assessment using validation sheets, while practicality was evaluated through student response questionnaires. Research results showed that the ethnoscience physics infographic achieved a highly valid category, indicating its suitability as a supporting medium for introductory physics lectures. Student responses were highly positive, with high ratings on attractiveness, ease of understanding, and practical usage. The research significantly contributes to developing innovative and effective learning strategies in higher education.

Keywords: Infographic Media, Ethnoscience Physics, Basic Physics Lectures, Learning Media Development, ADDIE Model

Abstrak

Penelitian ini mengembangkan media infografis etnosains fisika menggunakan model ADDIE (Analysis, Design, Development, Implementation, Evaluation) sebagai solusi inovatif mendukung proses pembelajaran. Model pengembangan sistematis dan terstruktur ini bertujuan menghasilkan media infografis valid dan praktis, mampu menyajikan informasi materi fisika akurat dalam format sederhana dan mudah dicerna. Proses validasi dilaksanakan melalui penilaian ahli menggunakan lembar validasi, sedangkan kepraktisan dinilai dari angket respons mahasiswa. Hasil penelitian menunjukkan media infografis etnosains fisika memperoleh kategori sangat valid, mengindikasikan kelayakan sebagai media pendukung perkuliahan fisika dasar. Respons mahasiswa sangat positif, dengan penilaian tinggi pada aspek kemenarikan, kemudahan pemahaman, dan kepraktisan penggunaan. Penelitian memberikan kontribusi signifikan dalam mengembangkan strategi pembelajaran inovatif dan efektif di perguruan tinggi.

Kata Kunci: Media Infografis, Etnosains Fisika, Perkuliahan Fisika Dasar, Pengembangan Media Pembelajaran, Model ADDIE

INTRODUCTION

Information and communication technology rapidly develops, resulting in technological disruption in various fields (Pyke, 2018). Technological disruption is also a challenge in education (Picatoste et al., 2018). Various educational media developments are carried out to answer this challenge so that students can compete in the industrial era 4.0 (Asrizal et al., 2018; García-Peñalvo & Mendes, 2018; Wongwatkit & Nupap, 2018). Classroom learning provides much information to students through books and other media. Some students find it challenging to absorb all the information that is very large and diverse.

For this reason, students are highly expected to simplify information to make it easier to understand learning. One of the media that can be used is infographic media. Infographic media is proliferating today. Infographic media allows readers to get brief information so that very long information exposure can be made in one slide ((Ardianto & Zahra, 2023; López-Pintor et al., 2023). This ease of understanding information on infographics is beneficial for the field of education. Infographics are becoming more significant because they can be made. It is easy to see the content as a whole because infographics make a very long text that can be explained through photos alone (Alyahya & Nasser, 2019; Ardianto & Zahra, 2023; López-Pintor et al., 2023; Taspolat et al., 2017).

It is further explained that infographic media is a visual representation by combining various elements, such as text, images, charts, and icons, so that the delivery of information with infographic media is easier to understand and, at the same time, visually appealing (Alyahya & Nasser, 2019; Taspolat et al., 2017). Infographic media aims to convey information concisely and clearly and is easy to remember. Various advantages of infographic media, namely (1) infographic media is easy to understand because it utilizes visualization in conveying information, so students can more easily understand complex concepts (Firdaus et al., 2021). (2) Interesting visual design on infographic media can increase students' curiosity to read it (Hersita et al., 2020); (3) Concise information can help students reduce fatigue in reading long texts (Dewi et al., 2021). (4) Data visualization can help students understand patterns easily (Rizawati, 2022). (5) improving retention or memory by combining visuals and text in infographic media (Afriani et al., 2022). Although it has advantages, infographic media also has disadvantages, namely (1) limited information due to limited space in infographics, making the information too concise so that some important details may be missed. (2) the complexity of infographic design requires good design skills because if not well designed, it can cause information confusion. (3) the appropriateness of the content may be difficult to realize because not all texts can be designed in the form of infographics. Infographic media can be a medium to support learning, namely by using infographic media to explain complex concepts in a concise form so that they are easy to understand; besides its concise form, infographic media can summarize essential points visually and understand patterns in data (Afriani et al., 2022; Firdaus et al., 2021; Hersita et al., 2020). Infographic media can also motivate students to learn because of its attractive visual form.

Information and communication technology development has also impacted changes in the lecture curriculum at higher education institutions. The curriculum must support technological developments but focus on holistic learning based on real life, including the introductory physics curriculum (Primarni, 2016). Learning about physics is closely related to

learning about life (Ramadani & Nana, 2020). Physics is present in every aspect of the life of creatures and the surrounding nature (Harefa, 2019). However, simple things that happen in nature and its surroundings must be understood as related to physics (Priyadi et al., 2018). This makes physics learning seem distant from everyday life (Kallesta & Erfan, 2017). The quality of learning in this information and communication technology era must be adapted to the times but still be holistic (Musfah, 2012; Yuliana & Fahri, 2020). One way that can be done to improve the quality of the learning process is to use aspects of local culture (ethnoscience) in learning (Harefa, 2017). Ethnoscience transforms indigenous science (knowledge that develops in the community) into scientific science (Fahrudin & Maryam, 2022; Harefa, 2017). This research aims to develop ethnoscience-based physics infographic media to support valid and practical introductory physics lectures.

METHOD

This research method uses a development method using the ADDIE model. The ADDIE development model consists of five stages: analysis, design, development, implementation, and evaluation (Abad & Galleto, 2020). The ADDIE development research steps in this study are presented in Figure 1.

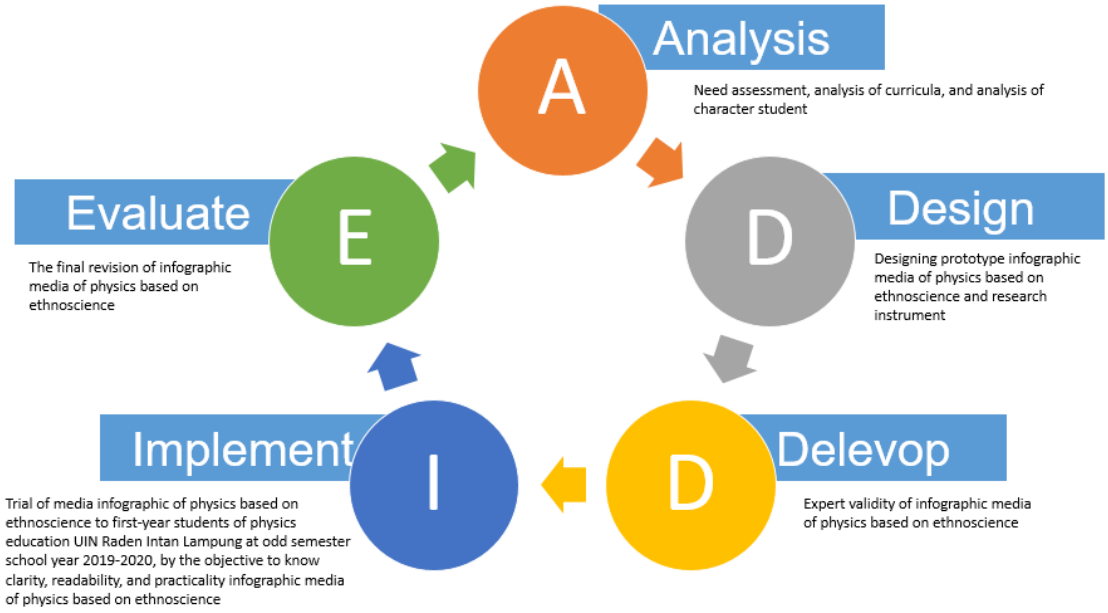

Figure 1. Development steps using the ADDIE model

Table 1 below outlines each step, including objectives, data sources, data collection, and analysis.

Table 1. Description of Research Steps, Sources, Data Collection and Analysis Techniques

Steps	Objectives	Data Source	Data Collection	Data Analysis Technique
Analysis				
Needs Analysis	Knowing the need for ethnoscience-based infographic media to be developed as learning support	Document	Collecting various learning media documents available in introductory physics lectures	Content Analysis
Curriculum Analysis	Identifying the relationship between material and local culture	Document	Collecting various documents such as curriculum, SSP, and teaching materials in introductory physics lectures	Content Analysis
Student Character Analysis	Knowing the character of students and their relationship to courses	Students of UIN Raden Intan Lampung Semester 1	Distributing questionnaires	Descriptive analysis
Design	Menghasilkan prototype media infografis fisika berbasis etnosains			
Develop	Knowing the validation of ethnoscience-based physics infographic media experts	Expert judgment	Rating categories: strongly disagree (1) disagree (2) neutral (3) agree (4) strongly agree (5)	$V = \frac{T}{U} \times 100\%$ Description: V = Validity value T = Score obtained U = Highest Score Assessment Criteria (modified from Riduan, 2008). 0 ≥ V < 20% = very invalid 21% ≥ V < 40% = not valid 41% ≥ V < 60% = moderately valid 61% ≥ V < 80% = valid 81% ≥ V < 100% = very valid
Implement	I know student responses related to clarity, readability, and practicality of	Physics Education Students 1st Semester	Student response sheet Rating category: strongly disagree	$P = \frac{Q}{R} \times 100\%$ Description: P = Validity value

	ethnoscience-based physics infographic media.	(1) disagree (2) neutral (3) agree (4) strongly agree (5)	Q = Score obtained R = Highest Score Assessment Criteria (modified from Riduan, 2008). 0 ≥ P < 20% = very invalid 21% ≥ P < 40% = not valid 41% ≥ P < 60% = moderately valid 61% ≥ P < 80% = valid 81% ≥ P < 100% = very valid
Evaluate	The final revision of the development		

RESULTS AND DISCUSSION

Analysis Stage

The needs analysis was conducted by reviewing the infographic media available in the field. The results of the reviews show that the available infographic media mostly contain figures in the development of physics. Infographic media in an integrated form with ethnoscience is currently not available.

The primary physics curriculum was analyzed by analyzing the basic physics lecture syllabus. The material in the physics course includes competencies related to quantities and units, the concept of kinematics and dynamics, and energy and conservation of energy, effort, and power. The primary competency expected is that students can apply the principles and basic concepts of mechanics to solve physics-related problems in everyday life.

First-semester students are still in the transition period of the learning process from previously being students to becoming students. Some characters and methods of learning in college are also still adapting, whereas learning in college is more of an independent process with little guidance from lecturers.

Design Stage

The design of infographic media begins with integrating the syllabus with ethnoscience. The ethnoscience used in this research is Jukung. Jukung has been a means of transportation for a long time in Lampung. Juking is commonly used in rivers, but in the Lampung area, juking is even used at sea. This proves the toughness of Lampung residents navigating the sea for a long time. The name Jukung itself is even immortalized as the name of a beach in the Lampung area. The integration of ethnoscience in primary physics course material can be seen in the following Table 2.

Table 2. Integration of Ethnoscience (Jukung) in Fundamental Physics Lecture Material

Material	Integration with ethnoscience (Jukung)
Measurement, Magnitudes, and Units in Physics.	Density: The density of the wood used to make Jukungs is smaller than that of water. This causes the Jukung to float in the water.
One-dimensional Motion	Speed: The Jukung moves with the assistance of the umbrellas on both the right and left sides. Wind and water currents can slow down or accelerate the speed, depending on the direction or vector of the juking's speed.
Two-dimensional Motion	
Laws of Motion	Newton's Law III: When the Jukung is in the water, it presses downward with its weight, which is the action force. This weight force gets an upward response from the water as a reaction force.
Laws of Motion (Continued)	
Energy	Energy Kinetic energy: As the jukung moves the oar, the tip of the oar is made wider. This helps to move more water mass so that even at slow paddle speeds, less kinetic energy is required to move the jukung.
Momentum and Collision	Torque: The hand should be perpendicular to the oar arm to maximize the torque, making rowing easier and less tiring.
Rotational Balance and Rotational Dynamics	
Solids and Fluids	Archimedes Law: When the Jukung is at sea, it presses against the surface of the seawater so that the jukung gets an upward force from the seawater as much as the water displaced by the jukung. This is the concept of Archimides' law.

Jukung ethnoscience infographic media was designed using the Canva online application on infographic templates. The title was designed to be attractive and readable for students. It also includes an image that shows the traditional shape of the Yukon. The title can be seen in Figure 3 below.

Picture 3. Title of Jukung ethnoscience infographic media

The integrated physics concept consists of the concept of Archimedes in a fluid material, the concept of Newton's law III in force material, the concept of density in

measurement material, the concept of kinetic energy in energy material, the concept of torque in momentum and collision material, and the concept of speed and vector in motion material. The following are pictures of the design that has been made.

Figure 3a. Integration of archimides law in Jukung ethnoscience

Figure 3b. Density integration in Jukung ethnoscience

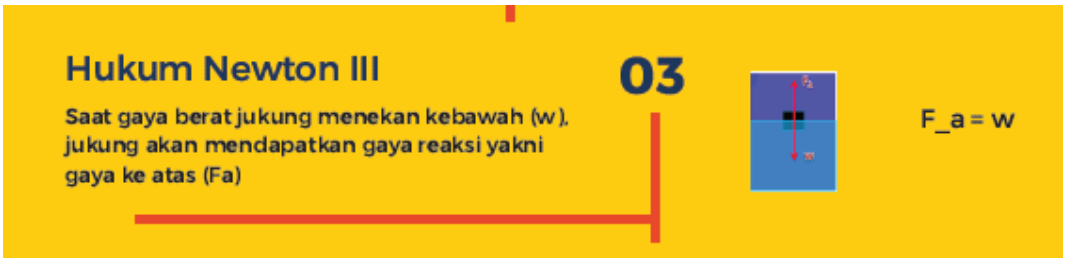

Figure 3c. Integration of Newton's Law III in jukung ethnoscience

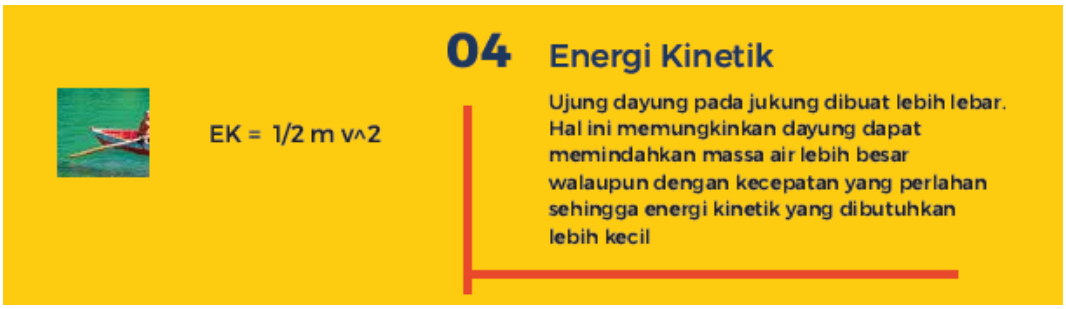

Figure 3d. Integration of kinetic energy on Jukung ethnoscience

Figure 3e. Integration of torque on Jukung ethnoscience

Figure 3f. Integration of velocity and vector in Jukung ethnoscience

Develop Stage

After completing the design stage, which produces a media prototype, the next step is to start the development stage. Validators validate this development stage. Four people were involved in this study: two essential physics experts and two learning media experts. The validation results can be seen in Figure 4 below.

Figure 4. Validation results

The validation results can be seen in Figure 4, with a score of more than 80, so the results can be declared very valid. This means that the infographic media that has been designed gets very valid validation results in terms of material and media concepts. After validating and obtaining validation results, the next step is to conduct student trials to determine student responses regarding the attractiveness of physics infographic media integrated with Jukung ethnoscience prepared by researchers.

Implementation Stage

The response test of the attractiveness of physics infographic media integrated with Jukung ethnoscience to students was conducted on physics education students of UIN Raden Intan Lampung semester I class A; this attractiveness test was conducted on 18 students. The results of the test of the attractiveness of physics infographic media integrated with Jukung ethnoscience can be seen in Figure 5 below.

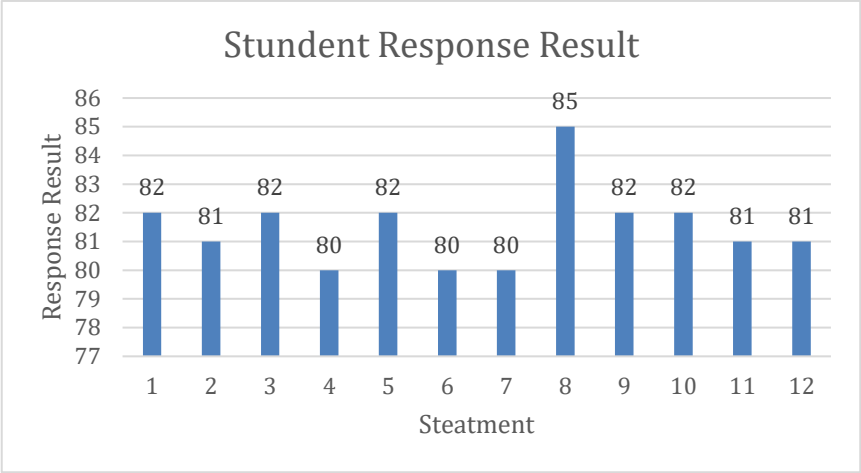

Figure 5. Student response results based on statements

Statements 1, 4, and 10 in Figure 5 show attractiveness, while statements 2, 5, 7, and 11 show convenience. Then, statements 3, 6, 8, and 12 state motivation. Figure 5 also shows that the results of student responses are above 80. This means that the practical results from student responses are efficient.

Evaluation Stage

Evaluation is carried out by reviewing the steps that have been done before. The selection of Jukung ethnoscience is based on the syllabus used in the introductory physics course, which can be integrated into all material in the introductory physics course. The Canva application was chosen as a tool for making infographic media because of its ease of use and many attractive templates. The design of infographic media has been designed in such a way as to provide good supporting media for fundamental physics and be able to increase students' curiosity and love for fundamental physics.

DISCUSSION

The ethnoscience-integrated physics infographic media helps students understand the interrelationship of ethnoscience and physics more easily. Infographics consist of several short messages that contain physics concepts that can and are easily understood (Mansur & Rafiudin, 2020; Tobing & Admoko, 2017). The ease of understanding of this infographic media can be seen from the readability level of the

short text, which only requires a short time to understand physics concepts. This ethnoscience-integrated physics infographic media also helps students analyze the relationship of physics concepts with daily life more fully, that in one object or activity, many physics concepts can be observed. This is the expected basic competence that physics concepts are closely related to everyday life, and students should understand and be able to apply physics concepts in everyday life as a solution to existing problems.

The development of physics infographic media was designed by first analyzing the availability of similar media. However, the review found no media availability in the form of infographics integrated with ethnoscience. Integration of learning with culture is one of the missions stated in the university mission of UIN Raden Intan Lampung. Therefore, lecturers should be able to assist students in integrating it into the courses they teach. This allows students not to forget the nation's cultural roots. However, this cultural integration must be done interestingly so that the cultural impression obtained becomes fresher and can motivate students to learn (Rahayu et al., 2022). Given that students are Generation Z who prefer to read short rather than long texts, providing media in the form of infographics is a good solution so that students are motivated to learn (Utami et al., 2017).

Validation of ethnoscience-integrated physics infographic media. In this case, the ethnoscience chosen is joking. Jukung is a water transportation tool for the Lampung people. Jukung has long been used since ancient times, even now. Jukung also possesses various elements in physics material that can be integrated into the material in the introductory physics course. The validation of ethnoscience-integrated physics infographic media obtained very valid results; this means that the infographic media developed has met the suitability of essential competencies and learning objectives for introductory physics courses. In addition, it also means that the ethnoscience-integrated physics infographic media developed can be a learning media that makes it easier for students to understand physics concepts integrated with ethnoscience.

The implementation test was conducted by looking at the student response to the ethnoscience-integrated physics infographic media developed. The student response test resulted in a score of more than 80 to get a convenient category. This means that the ethnoscience-integrated physics infographic media developed can be interesting to be used as learning media. In addition, it also means that the ethnoscience-integrated physics infographic media developed is easy to understand as a medium that connects physics concepts with everyday life. Another practical thing is that ethnoscience-integrated physics infographic media can motivate students to learn and add great curiosity to their learning.

CONCLUSION

Based on the research results, the ethnoscience-integrated physics infographic media can be used as supporting media in learning introductory physics courses, with validation showing very valid results that meet the suitability of essential competencies and learning objectives while making it easier for students to understand physics concepts integrated with ethnoscience; furthermore, its practicality scored more than 80, categorizing it as very practical, indicating that the media is attractive, easy to understand as it connects physics concepts with everyday life, and can motivate students in learning while adding great curiosity to students.

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