



Development of E-Comic Based on Local Wisdom to Improve Scientific Literacy

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Abstract: This research is the development of local wisdom-based e-comics to increase scientific literacy. Learning media can help achieve learning objectives. This study aims to develop e-comic learning media based on local wisdom to improve scientific literacy in grade IV elementary school. The type of research used is Research and Development with the ADDIE development model namely Analyze, Design, Development, Implementation, and Evaluation. This study used test subjects by carrying out validity tests on media experts, material experts, learning experts and the responses of ten fourth grade elementary school students. Data collection using a questionnaire instrument. Research data were analyzed by means of descriptive quantitative and descriptive qualitative. The results of the media expert validator are categorized as very valid. The results of the material expert validator are categorized as very valid. The results of the learning expert validator are categorized as very valid. As well as the results of the responses of ten fourth grade elementary school students categorized as very valid. The overall results of the validator test are categorized as very valid so that e-comic media based on local wisdom can be used with learning alternative energy sources in grade IV Elementary School Science lessons.

Abstrak: Penelitian ini merupakan pengembangan e-komik berbasis kearifan lokal untuk meningkatkan literasi sains. Media pembelajaran bisa membantu tercapainya tujuan pembelajaran. Penelitian ini bertujuan mengembangkan media pembelajaran e-komik berbasis kearifan lokal untuk meningkatkan literasi sains kelas IV SD. Jenis penelitian yang dipergunakan yaitu Rearch and Development dengan model pengembangan ADDIE yakni Analyze, Design, Development, Implementation, dan Evaluation. Penelitian ini menggunakan subjek uji coba dengan melaksanakan uji validitas terhadap ahli media, ahli materi, ahli pembelajaran serta respon sepuluh peserta didik kelas IV SD. Pengumpulan data menggunakan instrument angket. Data penelitian dianalisis dengan cara deskriptif kuantitatif dan deskriptif kualitatif. Hasil validator ahli media dikategorikan sangat valid. Hasil validator ahli materi dikategorikan sangat valid. Hasil validator ahli pembelajaran dikategorikan sangat valid. Serta hasil respon sepuluh peserta didik kelas IV SD dikategorikan sangat valid. Hasil keseluruhan dari uji validator dikategorikan sangat valid sehingga media e-komik berbasis kearifan lokal dapat dipergunakan dengan pembelajaran sumber energi alternatif pada pelajaran IPA kelas IV SD.

Keywords: development, e-comics, alternative energy sources, scientific literacy.

INTRODUCTION

Education is very crucial to face the development of science and technology (Yao & Guo, 2018). Education is an important investment in the creation of human resources (Graham, 2020). Good education is one of the means to produce quality human resources.

One of the efforts to improve the quality of human resources is through learning (Kang et al., 2021). Learning means a process organized by teachers to teach students in the learning process to acquire and process knowledge, skills, and behavior (Cofré et al., 2019). Conceptually, learning activities must be close to the environment (Liu et al., 2019). Learning activities should take advantage of the potential of the environment and local wisdom so that learning is more meaningful, but in reality this has not been done by teachers. Learning can be achieved through experience, learning media, environment, and cognitive strategies (Hu et al., 2018).

One of the fundamental scientific disciplines is science learning, because science continues to follow the times (Arneson & Offerdahl, 2018). Science learning has objectives based on (Kemendikbud, 2020) namely increasing intellectual abilities (thinking at a high level), solving problems systematically, achieving high learning outcomes, practicing expressing ideas, and developing student characteristics.

Facing the life of this century, students need to be literate towards science (Rahmadani et al., 2018). Literate on science such as science, math and language skills as the minimum basic skills needed to survive in an increasingly complex and competitive life (Yacoubian, 2018). Literate comes from the word literacy which means "literate" (Pasek, 2018). It is important for students to master this scientific knowledge in terms of how to understand the environment, economy, health and other problems faced by modern society which is very dependent on progress and technology and the development of knowledge (Queiruga-Dios

et al., 2020). Literate in science is referred to as scientific literacy (Höttecke & Allchin, 2020).

The government is making efforts to determine the position of the science achievements of Indonesian students with other countries, namely by participating in several international assessments, namely the Program For International Students Assessment (PISA) and the Trend in International Mathematics and Science Study (TIMSS) (Hopfenbeck et al., 2018). In terms of the results of the PISA measurement, the OECD announced that Indonesia's scientific literacy score until 2018 was still low (Graesser et al., 2018). PISA conducts measurements involving 12,098 students from 399 schools in several regions of Indonesia which are considered representative (Nasution et al., 2019). The number of Indonesian students in the field of science still have competence below the minimum level of 66%, in the field of reading, which is 75%, and in the field of mathematics, which is 76%. (Putra & Agusnita, 2021).

Variations of learning media by involving the senses make it easier for students to absorb and process lesson content; the more senses involved, the better it can be understood and remembered (Jauhari, 2018).

The description above confirms that the availability of learning media in the form of digital comics is the perfect step to increase the interest of students in carrying out the literacy movement (Fitri et al., 2021). The existence of the media is the most important solution that can be done to overcome the obstacles in the cultivation of numeracy literacy in relation to environmental factors (Hidayati et al., 2020). Learning media in the form of picture story books got a very high score according to the validity test from learning media experts and learning material experts (Lorah, 2018). So that it serves as a tool to increase literacy (Rosvita & Anugraheni, 2021).

E-comic learning media can be used in learning (Lee et al., 2021). From research in increasing students' learning motivation

using comics learning media in mathematics, e-comic media is expected to make it easier for students to understand the material on problem solving abilities (Fadella & Prabowo, 2018).

F-E-comic learning media are usually of interest to students at the age of 6-12 years because e-comic is an interesting book that has pictures in it (Rina et al., 2020). Comics are picture story books that contain cartoon features to attract the reader's attention (Stephens Griffin, 2019). So it can be concluded that comics can help students in improving scientific literacy practically (Riwanto & Budiarti, 2020). This can be shown from the iconic visual illustrations in comic media (Schreiber & Struminksi, 2018). So that students do not immediately learn to use concrete media but use interesting cartoon images as the topic of learning material (Hartel & Dunst, 2019).

G-According to Lorah (2018) the advantages of comic media are: 1) developing reading skills and vocabulary mastery; 2) presenting stronger visual and story elements. According to Höttecke et al., (2020) the benefits of comics in the learning process are increasing learning motivation and making the learning process effective. According to Cofré et al., (2019) mentions that comics help educators to convey messages from the implementation of the learning process. Comic media can attract students, make it easier to understand the material and make learning fun (Liu et al., 2019). According to Khotimah et al., (2019) that visual media is so effective that it is strengthened by imagination activities. The shortcomings of comics according to Arneson et al., (2018), namely: 1) Comics present material briefly; 2) Sometimes the material delivered is not on target.

H-Local wisdom is a form of belief, as well as customs from ancestors as a form of wisdom towards the environment in an area (Yacoubian, 2018). According to Queiruga-Dios et al., (2020) local wisdom is a combination of policies that develop from a sociological, theological and cosmological perspective. The local wisdom that is

integrated into the comic is the Kalimasada tree which is sacred to the people of Karimunjava. It is said that it is often used by Sunan Kalijaga for propaganda media. The benefits of this wood can increase spiritual energy, wirid power and magical antidotes.

I-Comic media based on local wisdom in the Karimunjava Islands contains material in the form of narrative text, pictures of tourism potential where Karimunjava has been designated as a biosphere reserve by UNESCO, as well as comic characters wearing traditional clothes in accordance with the multi-ethnic local environmental conditions. The material in comic media contains explanations about activities in coastal areas and PLTS alternative energy sources. Apart from this material, there is a Google Drive link where the comic content can be accessed by students wherever they are. This local wisdom-based e-comic media can be accessed via a cellphone/computer by accessing the Google Drive link. Local wisdom-based e-comic media in the Karimunjava Islands is in pdf format and can be printed for offline learning.

J-One of the interesting themes in learning in elementary school is on theme 9 which is My Country's Rich. This is in line with the problem that there is a lack of learning that relates to the environment around students in Jepara Regency, namely the Karimunjava Islands which utilizes alternative energy sources, namely Solar Power Plants (PLTS). Students who live in the area should really understand the material about these alternative energy sources. Many types of energy sources are close to their environment but in fact they think that environmental material is material that is difficult to understand in learning.

Based on students' interest in comics (Ruch et al., 2018). So that e-comic learning media can be used as media to facilitate students during the teaching and learning process and will have an impact on the success of students in learning (Mustikasari et al., 2020).

Based on this statement, researchers have carried out research aimed at developing e-comics to improve scientific literacy on alternative energy sources. Media is designed with the help of the Autodesk application. In e-comic media, there is an attractive pictorial display that explains local wisdom in the Karimunjawa Islands so that students can be motivated and can improve scientific literacy with this e-comic learning media.

METHOD

In this research, research and development (RnD) is used or also known as development research using the ADDIE model. The ADDIE development model is Analysis, Design, Development, Implementation, and Evaluation. The development of ADDIE was chosen because it is more appropriate to be applied in research to disseminate this e-comic learning media.

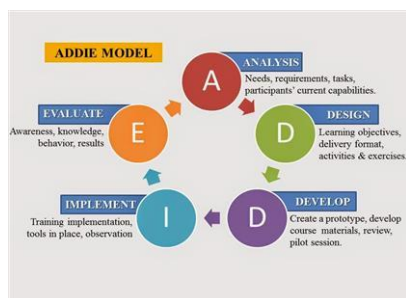


Figure 1 ADDIE Model

The development of e-comic learning media based on local wisdom goes through five stages and the product testing activities, namely expert testing and individual testing. The subjects of this study were media experts, material experts, learning experts (fourth grade elementary school teachers) and 10 fourth grade students of SDN 03 Pancur. The data collection method used is a non-test method in the form of a questionnaire. Validators and individual test subjects received a questionnaire to determine the feasibility of e-comic learning media based on local wisdom from media experts, material experts, and learning experts, while individual trials were conducted to determine the feasibility and

attractiveness of e-comic learning media based on local wisdom.

The data analysis technique used is quantitative descriptive analysis and qualitative descriptive analysis. Quantitative descriptive analysis was used to manage data from expert validation results as well as individual test-response questionnaires in the form of percentage descriptive.

Research on the development of learning media developed is e-comic based on local wisdom. This study aims to develop e-comic learning media based on local wisdom for fourth grade elementary school students and to determine the feasibility of e-comic learning media based on local wisdom on alternative energy sources in fourth grade elementary school. After that, data collection techniques were carried out with expert tests. Questionnaires are used to measure the validity of learning media through validation sheets of media experts, material experts, learning experts (practical test of teacher responses) and individual test responses of students.

RESULTS AND DISCUSSION

This research produced a product in the form of a comic product "Let's Get to Know Alternative Sources of Solar Power Plants (PLTS) in the Karimunjawa Islands and Jepara Steam Power Plant (PLTU), on Alternative Energy Sources material.

The results of development research are obtained through the ADDIE design, which is carried out at each stage, so that it can be described as follows:

1. Analysis Stage

At the analysis stage, four analyzes must be carried out, namely student analysis, curriculum analysis, goal specification and material analysis.

a. Analysis of the Nature of Learners

According to the results of the analysis of students, there were 10 fourth grade students at SDN 03 Pancur, the researchers conducted interviews with students in solving science problems with alternative energy sources using problem-solving steps. It turns out that

students have never used problem solving steps and feel restless.

b. Curriculum Analysis

The results of the curriculum analysis carried out in elementary schools were based on the 2013 curriculum. According to an interview conducted with Mrs. Siti Rokhani, S.Pd. as a fourth grade teacher at SDN 03 Pancur, it was found that when implementing the 2013 curriculum, teachers still used a scientific approach to teaching and learning activities. The teacher is more dominant and does not involve students in finding solutions to the problems at hand, resulting in students being less active and not accustomed to solving their own problems. In the 2013 curriculum, there are several skills that need to be developed, including problem solving skills. To encourage students to solve problems independently, it is necessary to develop learning media. The media offered is e-comic based on local wisdom with the aim of training students to solve problems, especially in alternative energy sources.

c. Destination Specification

After compiling indicators and determining basic skills, the researcher formulated the learning objectives to be achieved in using e-comic media. The formulation of learning objectives that are arranged contains elements of behavior, audience, grade and conditions.

d. Material Analysis

The material contained in this e-comic media is material regarding alternative energy sources related to basic competence 3.5 and related indicators using Bloom's taxonomy. Knowledge indicators are classified according to C2 to C6.

2. Design Stage

There are several stages in the design, namely the preparation of tests, media selection, format selection and the initial design that was selected according to the results of the analysis.

a. Test Compilation

Researchers compiled pretest and posttest questions based on valid and reliable test questions.

b. Media Selection

The media used in science learning materials for alternative energy sources is an attractive visual media and is used as an e-comic based on local wisdom to introduce students to the process of alternative energy sources, namely solar power plants (PLTS) in the Karimunjawa Islands and can develop problem solving skills to improved.

Researchers developed an e-comic media based on local wisdom which is a modification of e-comic applied to science learning materials for alternative energy sources and the relationship between the media and local wisdom in the Karimunjawa Islands, Jepara Regency, Central Java Province. The e-comic media based on local wisdom in the Karimunjawa Islands contains material in the form of narrative texts, pictures of tourism potential where Karimunjawa has been designated as a biosphere reserve by UNESCO, and comic characters wear traditional clothes according to local environmental conditions which are multi-ethnic. The material in the e-comic media based on local wisdom in the Karimunjawa Islands contains an explanation of activities in coastal areas and alternative energy sources of PLTS. In addition to that material, there is a Google Drive link where the comic content can be accessed by students wherever they are and introduces local potential in Jepara to the wider community.

c. Format Selection

Before compiling an e-comic based on local wisdom, the researcher first developed a plot so that the image was in sync with the dialogue flow, designed a layout consisting of character images and narrative layouts, coloring images, and entering narration using the Autodesk application.

3. Development Stage

The results of the development of the initial e-comic design include a cover to clarify the content of the e-comic, giving comic characters so that students are interested in reading, giving an e-comic opener so that students know the topic of

discussion, the contents of the e-comic that contain narratives of alternative energy sources in the Karimunjawa Islands, as well as the depiction of comic characters wearing traditional clothes according to the environmental conditions of the Karimunjawa Islands which are multiethnic based on local wisdom in the e-comic media as an innovation in this e-comic.

The E-comic book product based on Local Wisdom "Let's Get to Know Alternative Energy Sources of PLTS in the Karimunjawa Islands and PLTU Jepara" has been registered with HKI, and is already in the status of "ACCEPTABLE" with number EC00202177738. Display of e-comic books based on local wisdom, students can access the google drive link (<https://drive.google.com/file/d/12cOthTl3iTeFVncjvIZtxKfjt8cGZ76Q/view?usp=sharing>).



Figure 2 Cover E-comic



Figure 3 Introduction of E-comic Characters



Figure 4 Opening E-comic

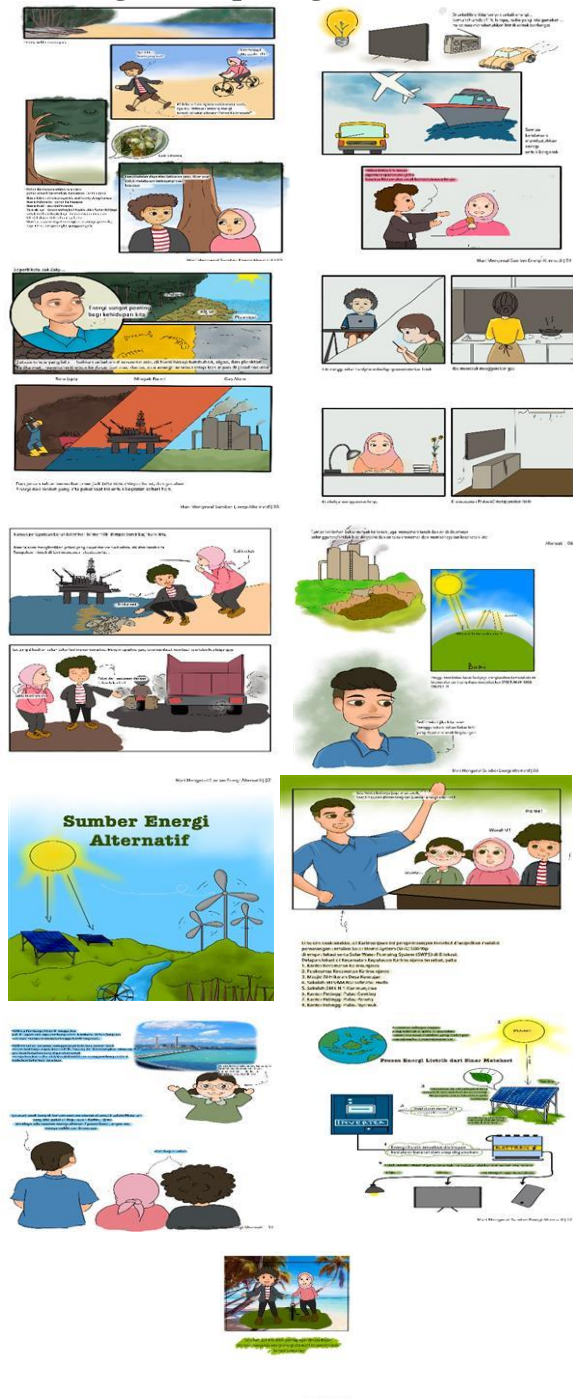


Figure 5 Contents of E-comic

The last stage after the learning media was developed, the media was validated by media experts, material experts, learning experts and individual tests. Evaluation by experts is done by filling out the questionnaire that has been provided. The following is a validation test conducted by experts.

a. Media Expert Validator

The expert validation of the learning media developed was carried out by content

creators/youtubers from YouTube, Tinari Bramantyo and Domo Bramantyo, namely Mr. Setiyo Aji Galih Domo Bramantyo, S.Kom. Media expert validation is carried out by providing media development questionnaires and e-comic books to experts.

b. Material Expert Validator

The validation of material experts from the developed e-comic media was carried out by a lecturer at Muria Kudus University, namely Mrs. Jayanti Putri Purwaningrum, S.Pd., M.Pd. Material Expert Validation is carried out by providing a questionnaire for the development of e-comic media.

c. Practicality Test Validator

The validation of the learning experts developed was carried out by the fourth grade teacher at SDN 03 Pancur, namely Mrs. Siti Rokhani, S.Pd. Validation is done by providing a questionnaire and an e-comic book.

4. Implementation Stage

The comic learning media that had been developed was then tested on fourth grade elementary school students consisting of ten students. Then based on the results of the evaluation assessment carried out by ten grade IV SD students, it achieved a score of 429 with a percentage of 89.375% as a result of which it could be classified as very valid to use.

5. Evaluation Stage

The evaluation stage was carried out to analyze the validity and practicality of the learning media for Local Wisdom Based Comics.

1) Validity Test Results

Media Expert Validation, there are 8 elements of questions, which include 6 elements of graphical aspects and 2 elements of linguistic aspects. According to the results of media experts, the developed e-comics achieved a score of 29 with a percentage of 90.6%, as a result it can be classified as very valid to use.

Material Expert Validation, according to a score of 10 elements which include 4 elements of content feasibility aspects, 2 elements of language feasibility aspects and 4 elements of presentation feasibility aspects. The results of the expert evaluation of e-comic media development reached a score of 37 with a percentage of 92.5%, as a result it can be classified as very valid to use.

2) Practicality Test Results

According to the results of the assessment carried out by learning experts who developed a score of 53 with a percentage of 94.64% as a result it can be classified as very valid to use.

There is a difference in the increase in scientific literacy in students who use e-comic based on local wisdom which is higher and significant than the class that uses science textbooks, namely in the medium category with the N-gain value obtained is 0.40 in the aspect of science knowledge and 0.37 on the aspect of scientific competence. The experimental class N-gain value which is higher and significant than the control class is found in aspects of knowledge, competence and scientific attitude and the experimental class N-gain value which is not higher and significant than the control class is found in indicators of content knowledge, procedural knowledge, explaining phenomena scientific knowledge, interpreting scientific data and evidence and reflecting on the importance of science from a personal perspective.

CONCLUSION

The design of e-comic learning media based on local wisdom uses the ADDIE development model, which includes the Analyze, Design, Development,

Implementation stages, only up to individual trials, and Evaluation. The results of the media expert validator get a score of 29, the percentage of 90.6% is categorized as very valid. The results of the material expert validator get a score of 37, the percentage of 92.5% is categorized as very valid. The results of the learning expert validator get a score of 53 percentages of 94.64% categorized as very valid. And the results of the responses of ten fourth grade elementary school students got a score of 429 with a percentage of 89.375% categorized as very valid. It can be concluded that the development of e-comic media based on local wisdom can be used to improve scientific literacy of alternative energy sources for fourth grade elementary school students.

Learning by using comic media based on local wisdom can be used as an alternative for teachers to add a variety of learning media, so it can increase understanding of concepts because the media helps students improve scientific attitudes, remember material and make learning more fun. Comic media based on local wisdom applied in this study can be developed into new research products for further researchers that are better and more efficient, so that they have a higher level of influence that has been made by researchers.

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