

Development of Problem Based Learning (PBL) Oriented Digital Comics to Improve Students' Science Literacy

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DOI: [10.29303/jppipa.v8i2.1349](https://doi.org/10.29303/jppipa.v8i2.1349)

Article Info

Received: January 37, 2022

Revised: March 27, 2022

Accepted: April 20, 2022

Published: April 30, 2022

Abstract: The integrated thematic learning process in elementary schools tends to be conventional and uses limited learning resources such as textbooks without being accompanied by learning media, so that students are dominantly bored and lazy to study. Students are given scientific literacy questions, the results obtained by students are still low. The research objective is to produce digital comics as an alternative technology-based learning media that can improve students' scientific literacy. The type of research chosen is R&D research with the ADDIE development model, namely Analyze, Design, Development, Implementation, and Evaluation. Research instruments in the form of questionnaires or questionnaires, tests, and documentation. The research design used was a pretest and posttest in the form of multiple-choice evaluation questions containing the domain of scientific literacy with a total of 18 questions for Indonesian subjects, 12 questions each for Mathematics and SBDP subjects. Comic validation involves five validators, each from a material, media design, and constructor expert. The results of the validity of comics obtained an average score of 89 (B) for the media, the average score of 89 (B) for the material, and the average construct was 92 (SB). Students' scientific literacy obtained an average score of 86.30 Indonesian (B) with a mastery percentage of 89%. Mathematics 85.00 (B) with 89% completeness percentage. The average SBDP score is 92.10 (SB) with a 100% completeness percentage. Thus, the development of PBL-oriented digital comics to improve students' scientific literacy is declared valid, practical, and effective.

Keywords: Comics; Problem-based learning; Science literacy.

Citation: Mutiaramses, M., & Yanti Fitria. (2022). Development of Problem Based Learning (PBL) Oriented Digital Comics to Improve Students' Science Literacy. *Jurnal Penelitian Pendidikan IPA*, 8(2), 699-704. <https://doi.org/10.29303/jppipa.v8i2.1349>

Introduction

Education is the future asset in the process of continuous learning development and innovation. One of the breakthroughs made in the effort to innovate learning in Indonesia is the development of the 2013 curriculum which has been running from the 2013/2014 school year until now. According to Desyandri, et al (2019), the curriculum is an important element in the implementation of education in schools, with the 2013 curriculum, several subjects are combined to become an integrated thematic. The emphasis of developing the 2013 curriculum is improving the mindset, strengthening curriculum governance, deepening and

expanding the material, strengthening the learning process, and adjusting the learning load (Wati & Jailani, 2016). Furthermore, the implementation of learning in each educational unit begins with learning planning, implementation of the learning process, and ends with an assessment of learning outcomes to improve the efficiency and effectiveness of the achievement of graduate competencies (Permendikbud No 22 of 2016). To achieve learning objectives, students need creativity in developing their knowledge so that they can find ideas or ideas for a concept in the material being studied (Wahyuni et al., 2021). One of the students' ability to find ideas or ideas can be seen from the students' scientific literacy.

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According to Odja & Payu, (2014) scientific literacy contains three scientific competencies, namely identifying scientific issues, explaining scientific phenomena, and using scientific evidence. The international organization concerned with the development of the world of international education is the OECD (Organization for Economic Co-operation and Development). The OECD regularly conducts the Program for International Student Assessment (PISA) every three years. Students' scientific literacy is one of the aspects assessed in this program. Indonesia is one of the countries that consistently participates in the PISA assessment. The following is a picture of the results of the PISA assessment from 2000 to 2018.

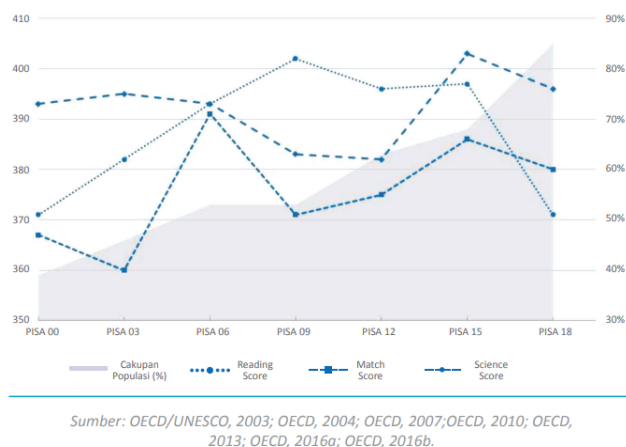


Figure 1. PISA Assessment Results from 2000 - 2018 (OECD 2019)

Although Indonesia's PISA scores showed a slight increase from 2000 to 2018, Indonesia's scores have relatively fallen in all areas. The sharpest declines occurred in the fields of reading and science (OECD, 2019). To increase the PISA score or assessment of Indonesian education, the government through the ministry of education and culture is trying to find solutions to overcome this. One of them is by promoting the School Literacy Movement (Megawati et al., 2019). The school literacy movement taken by the government is contained in the regulation of the Minister of Education and Culture number 23 of 2015 (in Maemunah, 2018) which is applied to all levels of education.

Based on the results of observations and interviews conducted at SD IT Hj. Djalaluddin and SD Plus Marhamah Padang City, in general, students' scientific literacy skills are still lacking, it can be seen when given some scientific literacy questions, students can't answer well. Lack of scientific literacy is also one of the causes of the low learning outcomes obtained by students. On the other hand, several problems were also found, such as the implementation of learning which is still teacher-centered so that students tend to be passive, the teacher does not provide opportunities for students to convey

their ideas and ideas so that learning seems one-way. Teachers do not use media and models in the learning process. To support learning, teachers should use media and learning models that are in accordance with learning conditions so that students are motivated and create fun learning. As mentioned by Hidayah (2017) that the use of media in the learning process can generate new interests, motivation and stimulation of learning activities, even bring psychological effects to students and the application of learning media will trigger a more pleasant learning atmosphere.

The use of media that is in accordance with learning conditions is also strengthened by the current state of learning, which is still in the covid-19 pandemic, which applies online schools through various media platforms such as WhatsApp, Zoom Meeting, Google Classroom and E-learning, even though the number of covid has fallen far. However, in general, schools still implement an online system. According to Maulah, et al (in Muliadi, 2021) online learning is learning that uses the internet network with access and connections to be able to interact. This has an impact on the difficulty of using concrete learning media because teachers and students do not meet face-to-face at school.

Media that can be used to improve students' scientific literacy in order to increase PISA scores and to adjust to online learning conditions, the alternative chosen is digital-based media. In line with the opinion of Wijaya et al, (2020) the selection of appropriate media should be a concern because it will have a positive effect on the quality of learning. According to Rezeki et al, (2021) digital media is a teaching tool that is systematic and structured so that it makes it easier for students to understand knowledge and can learn independently because it can be used anytime, anywhere without time limits.

One type of digital media that can be developed in lower grades, especially grade 3 elementary schools, is digital comics. Besides being able to be used in online learning, digital comics can also be used in face-to-face learning if learning conditions have recovered. Comics are usually liked by students because they display pictures in each story. Comics are pictures and symbols in a certain order to convey information from the reader (Yasa et al., 2018). To make it more attractive and efficient, a touch of technology is given in its design and preparation, which is better known as digital comics. Digital comics are comics that are designed and compiled by involving applications such as comic life. The purpose of digital comics is to translate verbal (written) sources, make it easier for students to imagine (imagine) the events contained in the pictures, and help students express ideas based on the accompanying narrative images (Yasa et al., 2018).

Based on the description above, the comics produced will be more focused if they are designed with

a learning model. This means that the development of digital comics is structured based on the learning model listed in the Permendikbud. One of these learning models is Problem Based Learning (PBL). According to Barrows (in Amalya, 2021) Problem Based Learning model is an active learning and very effective in creating knowledge, and can improve the ability of analysis, evaluation and creation. In other words, the Problem Based Learning model is able to make students active and improve their analytical skills. Meanwhile, Fitria, (2020) stated that Problem Based Learning (PBL) is student-centered learning that uses an integrated approach, where students work with problems in real situations. Furthermore, Arends (in Hartati, 2016) states that there are five steps in the PBL model, namely: 1) Problem orientation, 2) Organizing students for learning, 3) Guiding student investigations independently or in groups, 4) Developing and presenting results. works, and 5) Analyzing and evaluating the problem-solving process.

Therefore, digital comic learning media is designed and developed according to the steps of the Problem Based Learning (PBL) learning model. Thus, the digital comics developed are expected to be able to arouse students' motivation to read so that they can have an impact on increasing students' scientific literacy.

Method

The research was conducted at SD IT Hj. Djalaluddin, Agam Regency and SD Plus Marhamah, Padang City, with 19 students each. The type of research used is development research. Research development is a simplification of the term from research and development or Research and Development (R&D). Research and development aims to produce an effective product, in line with Gay in Alfianiawati et al, (2019) stated that the purpose of research and development is to develop effective products for use in various schools. This study uses the ADDIE development model which consists of five steps, namely: analysis, design, development, implementation, and evaluation.

The validity of learning media products in the form of digital comics was obtained from 4 lecturers and 1 validator teacher.

Table 1. Percentage and Interpretation Criteria Score

Percentage	Criteria
81-100	Very valid
61-80	Valid
41-60	Sufficiently valid
21-40	Less valid
0-20	Very inValid

(Riduwan, 2012)

Meanwhile, practicality was measured by questionnaires distributed to 3rd grade elementary school students, and effectiveness was carried out in two

elementary schools. SD IT Hj. Djalaluddin was designated as a class where treatment was carried out by carrying out learning using comic media, and SD Plus Marhamah as a comparison class by applying conventional learning. Effectiveness is measured by an evaluation test in the form of multiple-choice questions that have been prepared with the domain of scientific literacy.

This study uses an experimental class and a control class as a comparison to get the effectiveness of using digital comics.

Table 2. Research Design

Classes	Pretest	Treatment	Posttest
Experiment	O1	X1	O2
Control	O1	X2	O2

Description:

- O₁ : Pretest result data of students before it is done treatment
- X₁ : Treatment using comic-based PBL
- X₂ : Treatment does not use PBL-based comics
- O : Posttest result data after being given treatment different

Result and Discussion

This research is focused on developing PBL-based comics learning media in thematic learning in grade 3. In accordance with the objectives and development procedures in the research that the researchers have carried out, the data obtained from the research results are as follows:

Analyze

Researchers analyzed problems in the field regarding the use of learning media and students' scientific literacy through interviews with teachers who teach in third grade. Furthermore, the researchers conducted several analyzes, namely analysis of learning media needs, curriculum analysis, material analysis, media analysis, and student analysis.

The results of the needs analysis, including: (1) students need high motivation towards learning, (2) students need literacy in understanding the lessons in student books, (3) students need more activity during the learning process, (4) teachers and students require innovative learning media. Followed by curriculum analysis, namely KI, KD, indicators, materials, and assessments.

Basic Competence (KD) researchers set Theme 1 Sub-theme 1 Learning 1 and 3 and Sub-theme 2 Learning 3 in this study with the content of three subjects, namely Indonesian Language, Mathematics, and SBdP. The KD for elementary thematic learning in this study, namely: Indonesian 3.4 Observing the vocabulary in the text about the concept of characteristics, needs (food and a

place to live), growth and development of living things in the local environment presented in oral, written, and written forms. visual, and/or environmental exploration. Mathematics KD 3.1 Explaining the properties of arithmetic operations on whole numbers, and SBdP KD 3.2 Knowing the forms and variations of rhythm patterns in songs.

The results of the analysis are continued. Learning indicators are: Indonesian 3.4.1 Mention one characteristic of living things (needs food), Mathematics 3.1.1 Numbers 1,000 to 10,000, and SBdP 3.2.1 Mention the same and different rhythm patterns in songs. In Sub-theme 2 Learning 1, namely Indonesian 3.4.1 Mention the characteristics of growth in humans, Mathematics 3.1.1 Counting the sum results with the technique of storing, and SBdP 3.3.1 Mentioning weak hand movements in dance, 3.3.2 Mentioning strong hand movements in dance. While the learning materials in this study are the characteristics of living things (Indonesian), counting the numbers from 1,000 to 10,000 and the addition of thousands (Mathematics), as well as rhythm patterns in songs and strong and weak hand movements (SBdP).

Design

Researchers designed comics based on Problem Based Learning, starting with the preparation of comic material, namely 6 lessons on theme 1, sub-themes 1 and 2, followed by compiling scientific literacy test questions using Google Forms (Google Form), selecting media, namely digital comics based on PBL by making using Comic Life 3 application, choosing the format by making a design and the components of the learning media that are made.

In designing the media, the researcher first made a storyline, made a picture of the original character using HVS paper according to the comic Stoyline, scanned with a Camscanner on the comic character, colored the comic character using Paint and Paint 3D applications, and made PBL-based Digital Comic Media in learning at Theme 1 with comic life application 3. The final result is

comics in PDF form that can be distributed via flash disk, WhatsApp, share it, messenger, and a link on the google form.

Development

At this stage, the validity test is carried out, digital comic learning media. The statement items in the validity test questionnaire are appearance, readability, ease of use, content and learning objectives, communicativeness, conformity to student development, and thematic learning. The results of the media, material and construct validity tests are in Tabel 3.

Table 3. Digital Comic Media Validity Results

Validity Test	Result	Qualification
Media	89.00	Excellent
Material	87.00	Excellent
Constructs	92.00	Excellent

From the table above, comics media are declared valid because they have obtained the maximum average score with Very Good (SB) qualifications. This finding is supported by previous research conducted by Wijaya, S.N, et al (2020) with the title Development Of Learning Media Of Digital Comic Based On Indonesian Heroic Character On Circulatory System Material stating the percentage of material validation is 86.06% very good category and media validation 8, 25% in the very good category, thus the comic is worth trying out.

Implementation

The implementation phase is carried out with practicality tests and effectiveness tests. The practicality test was conducted by distributing questionnaires to 19 students. Meanwhile, the effectiveness test was carried out by distributing questions about scientific literacy skills to 19 experimental class students using media learning and 19 conventional class students. Practical results can be shown in the following table.

Table 3. Practical Results by Students

Question Items	Teacher's answer percentage	Percentage of student answers
Digital comics are easy to use	100.00	100.00
Interesting comic display	100.00	94.40
The learning flow in comics is easy to understand	100.00	100.00
Steps in digital comics according to the PBL model	100.00	88.90
Student motivation increases after using comics	100.00	100.00
Students' interest in learning increases	100.00	100.00
Students' scientific literacy will increase using comics	100.00	94.40
Comics can help students understand the subject matter	100.00	100.00
Comics can be used as independent teaching materials at home	100.00	83.30
The display of colors and images in comics looks interesting	100.00	100.00
The time allocation given by the teacher is according to the slides in the comic	66.70	66.70
Students don't need a long time to understand digital comics	100.00	77.80

From the table above, the results of practicality by the teacher show an average of 100%. Only the time allocation items given by the teacher according to the slides in the comics earned a percentage of 66.7%. Meanwhile, the students obtained seven items with a percentage of 100% and 5 items on average at a percentage of 80%. Thus, comics media are declared practical to be used in learning in Theme 1 grade 3 elementary school.

Furthermore, the results of the test of the effectiveness of digital comic media are the results of students' scientific literacy skills in the experimental class and the comparison or control class measured through test questions.

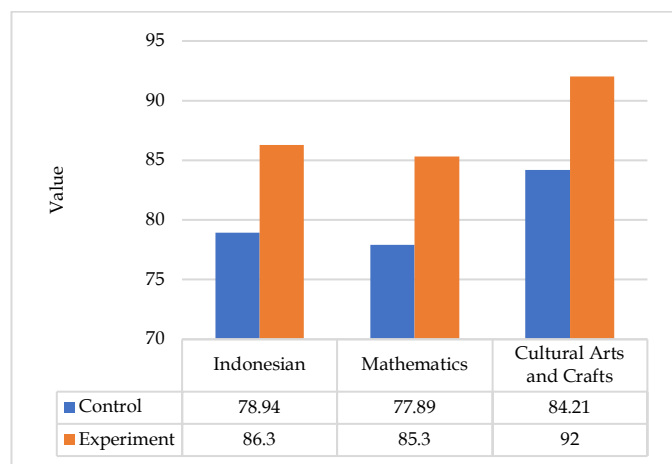


Figure 1. Students' Science Literacy Results

The average obtained from each subject content in the comparison or control class is 78.94 for Indonesian, 77.89 for Mathematics, and 84.21 for SBdP. Meanwhile, in the experimental class, the Indonesian language was 86.30, Mathematics was 85.30 and the SBdP was 92.00. Thus, comics media were declared effective in increasing students' scientific literacy because there was an increase in the results of the control class with experiments.

Evaluation

In this study, researchers measured the evaluation through students' perceptions with a questionnaire instrument that was given after the implementation of learning using comic media. The researcher's questionnaire was distributed online via the google form link. There are 11 questions in the questionnaire with the answers "yes and no".

Of the 11 questions, there are 2 questions that reach 100% answers. And 9 others an average of 90%. Thus, comics media have a positive impact on students in improving scientific literacy. These findings are supported by previous research by L. Mustikasari, et al (2020) with the title The development of digital comic on the ecosystem for thematic learning in elementary schools which states that digital comics developed can

increase student motivation in learning and are suitable for use based on the assessment of material experts. 3.51 (good), media expert 4.01 (good), and the assessment from teachers and students was 3.9 (good).

Conclusion

Based on the results of the explanation above, it can be concluded that the problem-based learning (PBL) oriented comics learning media in integrated thematic learning to improve students' scientific literacy in grade 3 Elementary School is valid, very practical, and very effective.

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