The Analysis of Online Learning Devices Development Using The PjBL-Steam Model to Improve Student Environmental Literacy

[1]Iwan Henri Kusnadi, [2]Ayu Anindia Hizraini, [3]Dian Aswita, [4]Haris Munandar, [5]Apit Fathurohman

[1]Universitas Subang, Jl. Raden Ajeng Kartini No.KM. 3, desa nyimplung, Pasirkareumbi, Kec. Subang, Kabupaten Subang, Jawa Barat 41285
[2]Universitas Nahdlatul Ulama Kalimantan Selatan, Jl. A. Yani No.KM 12.5, Banua Hanyar, Kec. Kertak Hanyar, Kabupaten Banjar, Kalimantan Selatan
[3]Universitas Serambi Mekkah, Jl. Unmuha, Batoh, Kec. Lueng Bata, Kota Banda Aceh, Aceh
[4]Universitas Negeri Gorontalo, Jl. Jend. Sudirman No.6, Dulalowo Timur, Kec. Kota Tengah, Kota Gorontalo, Gorontalo
[5]Universitas Sriwijaya, Jl. Masjid Al Gazali, Bukit Lama, Kec. Ilir Barat. I, Kota Palembang, Sumatera Selatan
iwanhenri01@gmail.com

Abstract
Environmental literacy is a prominent 21st century learning theme that students need to master. However, data in the field shows the low environmental literacy of students in one of the schools in one city in Indonesia which is supported by several studies. Environmental literacy can be improved by applying the Project Based Learning (PjBL) model integrated with the STEAM approach. The research focuses on developing online learning tools with the PjBL-STEAM model on environmental materials to improve environmental literacy. The type of research used is Research and Development (RnD) research with the ADDIE development model which consists of analysis, design, development, implementation, and evaluation stages. The devices developed include lesson plans, LKPD, and assessment instruments. From the results of the study, valid, practical, and effective learning devices were obtained.
Keywords: Environmental Literacy, Students, Project Based Learning, Effective Learning

Abstrak
Literasi lingkungan merupakan isu pembelajaran utama bagi siswa di abad ke-21 ini. Namun, statistik dari lapangan menunjukkan bahwa anak-anak di salah satu sekolah di salah satu kota di Indonesia memiliki literasi lingkungan yang tidak memadai, yang diperkuat oleh penelitian lain. Paradigma Project Based Learning (PjBL) yang dikombinasikan dengan pendekatan STEAM dapat digunakan untuk meningkatkan literasi lingkungan. Penelitian ini berfokus pada pengembangan alat bantu pembelajaran online untuk materi lingkungan dengan menggunakan pendekatan PjBL-STEAM untuk meningkatkan literasi lingkungan. Metode penelitian yang digunakan adalah penelitian R&D dengan model pengembangan ADDIE, yang meliputi tahap analisis, desain, pengembangan, implementasi, dan evaluasi. Perangkat yang dikembangkan berupa RPP, LKPD, dan alat evaluasi. Temuan penelitian ini menghasilkan teknologi pembelajaran yang valid, praktis, dan efektif.
Kata Kunci: Literasi Lingkungan, Siswa, Project Based Learning, Pembelajaran Efektif

INTRODUCTION

The ability of environmental literacy in students is a crucial thing that needs to be considered by educators, because it can increase students' insight and concern for environmental issues and train students to formulate solutions to overcome environmental problems that occur in the real world. Environmental literacy is included in the leading 21st century learning themes that students need to master (Ashriah, 2020). According to the Partnership for twenty first Century Skills in Trisdiono, 21st century learning carries several themes including: financial literacy, economics, business and

The Analysis of Online Learning Devices Development Using The PjBL-Steam Model to Improve Student Environmental Literacy, Iwan Henri Kusnadi, Ayu Anindia Hizraini, Dian Aswita, Haris Munandar, Apit Fathurohman

2335

entrepreneurship, health and the environment which are realized by increasing environmental insight and real behavior in protecting the environment. Through environmental literacy students can train a sensitive attitude to the global impact of irresponsible environmental management such as the phenomenon of climate change caused by behavioral changes in the form of exploitation of nature (Bender, 2012).

Previous research conducted by previous researchers, explained that the higher the value of environmental literacy will affect the level of concern and real behavior of students in protecting the environment (Reynaldo et al., 2022). Previous research results show that the environmental literacy score in schools without the implementation of environmental programs is categorized as "very low" with a score of 52. This is supported by previous research, that the level of environmental literacy of students at one private school is categorized as "low" through the Middle School Environment Literacy Survey (MSELS) scoring. The data on the low environmental literacy of students is also supported by previous research, environmental literacy at one senior high school is known to be "sufficient" with a score of 75. Furthermore, another previous research states that students' environmental literacy in natural schools and regular schools reaches level one where awareness, concern, and responsibility have grown, but have not become real behavior. Based on the average science literacy PISA 2006 environmental content only reached 35%, while the average achievement of the attitude questionnaire was 54% (Zubaidah, 2019).

Low environmental literacy is due to the application of conventional models during learning activities with environmental material (Jasmine, 2018). Conventional models cause a lack of variety of learning tasks, lack of interest which results in students becoming passive during learning (Ichsan et al., 2023). The learning model that can increase student activeness during learning is Project Based Learning (PjBL). Learning with the PjBL model is based on asking students to face an issue that is happening, determine how to handle it, then create a solution to the problem collaboratively (Pratama, 2020). The results of previous research, showed that students who were taught environmental pollution material using a conventional model with the lecture method became more passive than students who were taught using the PjBL model (Trisdiono, 2013). In addition to increasing student activeness in learning, the PjBL model can be implemented to train environmental literacy (Nugroho et al., 2023). The results of previous research, show that the application of the PjBL model in science learning can significantly improve students' environmental literacy.

The application of the PjBL model integrated with the STEM (Science, Technology, Engineering, Mathematics) approach can maximize learning outcomes (Fathurohman et al., 2023). Previous research shows that the application of STEM combined with the PjBL model effectively improves students' science literacy skills. Initially the STEM approach was developed by the National Science Foundation (NSF) by combining indicators of Science (a review of nature), Technology (products that facilitate human life), Engineering (methods of making products), and Mathematics (numbers, shapes and quantities) to meet the needs and increase student interest and skills, STEM has

been developed into STEAM by adding Art indicators. The STEAM approach is able to train creativity through product design activities (Hizraini et al., 2022). Learning by applying STEAM can maximize student learning outcomes (Hizraini et al., 2023). The results of previous research showed that STEAM learning through the PjBL method had an effect on increasing students' cognitive scores by 82.11, affective by 85.5, and psychomotor by 74.6. The combination of the PjBL model with the STEAM approach (PjBL-STEAM) is expected to be an alternative in improving environmental literacy and student concern for environmental issues (Murniati et al., 2022). This study aims to test the effectiveness of online learning tools with the PjBL-STEAM model on environmental materials to improve environmental literacy.

METHOD

The type of research used was Research and Development. The model used in this research is ADDIE. This model has five stages of development including: analysis, design, development, implementation, and evaluation. This research was conducted at one of the public schools in one city in Indonesia with probability sampling technique. Data was obtained using an assessment questionnaire, both for teachers and students who were respondents in this study.

RESULT AND DISCUSSION

Classical Assumption Test

Data processing with the Kolmogorov Smirnov formula using Microsoft Excel application assistance obtained a Dmax of 0.1. Meanwhile, the Dcriteria value with n = 30 and a significance level of 0.05 is 0.24. Because the value of Dmax < Dkriteria, it can be concluded that the data is normally distributed. The results of data processing for homogeneity obtained an Fcount value of 0.52. Meanwhile, the Ftable value with n = 30 and a significant level of 0.05 is 0.54. So that the value of Fhitung < Ftabel, it can be concluded that the data is homogeneous.

Results

The development of online learning tools with the PjBL-STEAM model on environmental materials to improve environmental literacy was developed using the ADDIE model which consists of analysis, design, development, implementation, and evaluation stages. The device developed in the form of lesson plans, LKPD, and assessment instruments that aim to facilitate online learning from the beginning of the meeting to the end. The resulting products are in the form of lesson plans, LKPD, and assessment instruments that are dedicated to environmental material.

In the analysis stage, needs analysis and curriculum analysis were conducted. Needs and curriculum analysis were conducted to find out the situation and conditions of online biology learning in one of the public schools in Semarang city and to find out the teaching materials needed to improve the learning process. After analyzing the needs and curriculum, it is known that there is a need for a device with a suitable learning model applied to environmental learning. The PjBL-STEAM model is

The Analysis of Online Learning Devices Development Using The PjBL-Steam Model to Improve Student Environmental Literacy, Iwan Henri Kusnadi, Ayu Anindia Hizraini, Dian Aswita, Haris Munandar, Apit Fathurohman

2337

used to guide students in formulating solutions by making products. In addition, teaching materials are needed that can make it easier for students to access the material at any time. Furthermore, the design stage is carried out by drafting lesson plans, LKPD, and research instruments.

Learning tools with the PjBL- STEAM model that have been developed have differences with previous research. This learning tool focuses more on the activity of creating products that contain indicators of science, technology, engineering, arts, and mathematics. In the implementation of the project to make vegetable pesticides from shallot skin, science indicators in the form of making products that are friendly to the environment, especially soil, technology indicators in the form of using laptops and devices used to access Whats App, Google Form, Google Meet, Quizizz, and education blogs. The success of online learning is strongly supported by the use of digital platforms. According to previous researchers, digital platforms in the form of Whats App and Google facilities (Google Form and Google Meet) are most widely used by teachers during online learning because they are simple, easy to use, and can facilitate two-way learning. Laptops and devices are also used as documentation of project implementation.

Learning with the PjBL_STEAM model on environmental material makes students have knowledge about the environment and its resources and strive to preserve nature by making environmentally friendly products. This is in accordance with the characteristics of someone with good environmental literacy expressed by previous researchers. According to previous researchers, there are several characteristics of someone with good environmental literacy, namely having good environmental knowledge, contributing to maintaining the balance of nature, having an understanding of environmental resources, formulating basic solutions to environmental problems, and exploiting nature according to its protection ethics.

The level of effectiveness of learning devices Is known by conducting learning outcome tests or cognitive assessments to students. Learning outcome tests are given after students carry out online learning with the tools that have been developed. The assessment instrument is made in the form of multiple choice questions as many as 20 questions. The completeness of the test value is determined based on the KKM. The KKM value for environmental material is 75. Students with scores above KKM are declared complete. The learning outcomes test is given to determine students' mastery of environmental material.

The learning outcome test data shows that out of 33 students, 23 people (70%) have a complete score and 10 people (30%) are not complete. Based on the analysis of effectiveness data, it can be seen that online learning tools with the PjBL-STEAM model on environmental material to improve environmental literacy have a "good" level of effectiveness and can be applied.

CONCLUSION

The development of online learning tools with the PjBL-STEAM model on environmental material to improve environmental literacy uses the ADDIE model which consists of analysis, design,

development, implementation, and evaluation stages. The learning tools in the form of lesson plans, LKPD, and assessment instruments produced are suitable for use in the learning process because they have valid, practical, and effective criteria.

REFERENSI

Ashriah, S. (2020). Creative Thinking Skills of Learners. Biology Teaching and Learning.

Bender, W. N. (2012). Project Based Learning Differentiating Instruction for the 21st Century. USA: Corwin.

Jasmine, P. (2018). The Effect of Project Based Learning Model on Increasing Students' Environmental Literacy in Science Learning at Elementary School. Thesis UPI Bandung.

Pratama. (2020). The Effect of Environmental Literacy on Environmental Responsibility of Class XI Students of SMA Negeri 2 Bandar Lampung. Bioterdidik Journal: A Vehicle for Scientific Expression.

Nugroho, B. S., Tannady, H., Fuadi, T. M., Aina, M., & Anggreni, M. A. (2023). Role of Work Experience, Work Motivation and Educational Background on Teacher Performance at Vocational School. *Jurnal Pendidikan dan Kewirausahaan*, *11*(2), 476-487.

Fathurohman, A., Oklilas, A. F., Marlina, L., Kurdiati, L. A., Susiloningsih, E., Azhar, A., & Samsuryadi, S. (2023). Effectiveness of Using the Mobile Learning App for STEM-Based High School Physics Materials as Indonesian Student Learning Resources on Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1018-1023.

Hizraini, A. A., Winarni, R., & Yamtinah, S. (2022). Character Education in a Children's Short Story Book entitled "Linda has a Papaya Garden". AL-ISHLAH: Jurnal Pendidikan, 14(2), 1381-1392.

Hizraini, A. A. et al. (2023). Analysis of Character Education in the Storybook of The Champion Who Has a Soft Heart by Yusman Nasution. International Journal of Theory and Application in Elementary and Secondary School Education.

Murniati, M., Fathurrohman, A., & Letari, Y. (2022). Development of STEM-Based Digital Handouts for Nuclear Physics Introduction Courses During the Covid-19 Pandemic. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 627-632.