

Student worksheets on environmental education based on project-based learning for the 4r topic in elementary school

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Abstract

The environmental problem, especially related to environmental education on the topic of reduce, reuse, recycle, replace (4R), is the learning problem for elementary school students. Project-based learning is very important to be developed in environmental education at the elementary school level, such as in grade IV. The development of student worksheets can be an innovation in developing environmental education that is more relevant to current conditions. The purpose of this study is to develop student worksheets based on project-based learning on the topic of the 4Rs for grade IV elementary school students. The research method used is research and development through the ADDIE approach. The results of this study show that the scores for the validated student worksheet products are 90.00% and 92.50%, indicating a very valid category and can be used in learning. The results of this study also confirm that efforts to develop student worksheets align with efforts to develop students' 21st-century competencies. The conclusion of this study is that the innovation of student worksheets based on project-based learning on the topic of 4R can be used in learning in elementary school.

Abstrak

Kata kunci

lembar kerja siswa; pendidikan lingkungan hidup; sekolah dasar

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Masalah lingkungan, khususnya terkait dengan pendidikan lingkungan hidup pada topik *reduce, reuse, recycle, replace* (4R), menjadi masalah dalam topik pembelajaran bagi siswa. Pembelajaran berbasis *project-based learning* sangat penting untuk dikembangkan dalam pendidikan lingkungan hidup pada jenjang Sekolah Dasar (SD), seperti pada kelas IV. Pengembangan lembar kerja siswa bisa menjadi salah satu inovasi dalam mengembangkan pendidikan lingkungan hidup yang lebih relevan dengan keadaan zaman. Tujuan dari penelitian ini adalah untuk mengembangkan lembar kerja siswa yang berbasis *project-based learning* pada topik 4R untuk kelas IV SD. Metode penelitian yang digunakan adalah *research and development* dengan ADDIE. Hasil dari penelitian ini menunjukkan bahwa skor dari produk lembar kerja siswa yang sudah divalidasi yaitu sebesar 90,00% dan 92,50% mengindikasikan kategori sangat valid dan dapat digunakan dalam pembelajaran. Hasil penelitian ini juga mengkonfirmasi bahwa upaya pengembangan lembar kerja siswa sudah sesuai dengan upaya dari pengembangan kompetensi siswa dalam abad 21. Kesimpulan dari penelitian ini adalah bahwa inovasi lembar kerja siswa berbasis *project-based learning* pada topik 4R dapat digunakan pada pembelajaran di SD.



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INTRODUCTION

Environmental education requires various breakthroughs and innovations related to learning tools. Currently, the use of learning tools in environmental education is still largely based on increasing knowledge alone. The needs of 21st-century learning developments require the 4Cs: critical thinking, creative thinking, collaboration, and communication (Khoiri et al., 2021; Quieng et al., 2015). These four skills are often referred to in Indonesian as critical thinking, creative thinking, collaboration, and communication, which students must possess them.

Learning based on these 4Cs can certainly have different characteristics from those of conventional learning. One particularly important aspect to cultivate is creative thinking and collaboration (Alkhatib, 2019; Suganda et al., 2021). The use of appropriate learning strategies will facilitate the improvement process students' abilities to overcome problems faced in environmental learning. Developing learning tools is one option to pursue in this research, particularly for elementary school students. The abilities of fourth-grade elementary school students can be improved by developing student worksheets.

One topic that could be discussed in this learning is environmental management efforts through the principles of reduce, reuse, recycle, replace (4R). This effort can be implemented by improving waste recycling efforts (Avan et al., 2011; Chierrito-Arruda et al., 2018). Numerous studies have shown that recycling efforts have been quite successful in reducing waste. These efforts must be updated by implementing a curriculum that is more integrated with environmental education. This integration can be achieved through various worksheets that support the improvement of learning quality in elementary schools.

Student worksheets are a learning tool that can be developed to improve the quality of environmental education. Several other studies on student worksheets have been conducted, including those related to environmental education on environmental pollution topic. Another study relevant to this research on environmental pollution used a website with an eco-friendly theme (Fitriani et al., 2018). This media facilitates learning about environmental topics on a small scale and enhances the quality of learning. The use of this medium is highly relevant to environmental problems encountered in efforts to address them in the area around students.

Based on this description, the development of student worksheets is urgently needed in the near future, given the crucial role of learning tools in supporting the quality of learning. The purpose of this research is to develop student worksheets on environmental education, specifically on the 4R topic, for fourth-grade elementary school students who need to improve their skills. The use of project-based learning in this case is a positive sign for efforts to improve student skills, as this model can enhance abilities, particularly among fourth-grade elementary school students.

RESEARCH METHOD

This research was conducted in April 2026 at Mohammad Husni Thamrin University. The research method used was research and development. The stages used were based on the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model approach (Branch, 2009). This model approach was chosen because it was considered the most relevant among other approaches.

The first stage of this research was to analyze needs in the field. The second stage was to design the product to be developed, in this case, the student worksheet. The third stage was to develop the product and validate it with learning experts to obtain a validation score. The fourth stage was to implement the student worksheet in the classroom. The fifth stage was to evaluate the student worksheet product implemented in the classroom. In this study, the fourth and fifth stages were not carried out; only the development stage was. This study did not cover all research stages, only the development stage, or the third stage. The validation categories for the developed student worksheet are as follows.

Table 1. Validation Categories

Percentage Score	Categories	Eligibility Statement
81 % - 100%	Very Valid	Can be used without repair
61 % - 80%	Valid	Can be used with minor improvements
41 % - 60%	Less Valid	Can be used with many improvements
21 % - 40%	Invalid	Must not be used
0% - 20%	Very Invalid	Must not be used

Sources: (Akbar, 2013)

After developing the student worksheets based on project-based learning on the 4R topic, the worksheets were revised. These revisions were based on input from validators or experts, who scored the student worksheets. These revisions are crucial to ensuring improvements compared to the previous worksheets.

RESULTS AND DISCUSSION

The results of this study indicate that student worksheets for environmental education, developed through project-based learning on the 4R topic, are considered highly valid following expert validation. Details of the expert validation results can be seen in the following table.

Table 2. Expert validation results for the developed student worksheets

Expert	Percentage Score	Category
Learning Expert I	90.00%	Very Valid
Learning Expert II	92.50%	Very Valid

More detailed expert scores are explained in the following table. The assessment indicators for expert validation are reviewed with respect to presentation and language aspects. For more details, see Table 3.

Table 3. Results of validation by learning experts and percentage scores for each aspect

Expert	Aspect	Percentage Score
Learning Expert I	Worksheet Presentation	90.00%
	Language Use	90.00%
Learning Expert II	Worksheet Presentation	90.00%
	Language Use	95.00%

Developing student worksheets for fourth-grade elementary school students is crucial because they need an early understanding of nature and the environment to develop their character. The worksheets developed are as follows.

Figure 1. Developed Student Worksheet

The student worksheet provides guidance for fourth-grade students and teachers to better direct environmental learning. The results of the student worksheet, assessed by experts, indicated some

improvement in the clarity of the color display, so the color was adjusted to green. The project-based learning can be reflected in the box that students must fill in, which says "project to be created." The details can be seen in Figure 2.



Figure 2. Top view of the student worksheet

Environmental education using project-based learning is essential for improving students' understanding of environmental issues. Project-based learning enables students to develop creative outputs, enhancing their learning. Project-based learning offers several advantages, including fostering creativity, enhancing environmental stewardship, and increasing the economic value of discarded items. This makes project-based learning a recommended model for environmental education. The content is related to the 4R movement, which stands for reduce, reuse, recycle, and replace as shown in the image below.



Figure 3. Display of the contents of the student worksheet related to 4R Movement behavior.

The 4R activities that students need to incorporate are those related to daily activities, such as replacing items with more environmentally friendly ones. This can be done by replacing disposable water bottles with refillable ones. The second activity is recycling, such as recycling used paper into new paper. The third activity is reusing objects for other purposes, such as food cans repurposed as plant pots. The fourth activity is reducing the use of items that generate waste, such as using reusable food containers to reduce the use of disposable food-wrapping paper. These activities can be incorporated fourth-grade into environmental education in elementary school.

Efforts to improve the quality of learning are very important to ensure that the learning outcomes align with the abilities needed in the 21st century. Some abilities that are very important for students in the 21st century include critical thinking and creative thinking, communication, and collaboration (Adams & Muthiah, 2020; Dwyer et al., 2014; Lay & Osman, 2018). These four skills are crucial to improving to improving the quality of learning in the 21st century, particularly regarding environmental education, particularly in the 4Rs. Environmental issues that can be addressed with

the 4Rs can be easily learned using innovative environmental education strategies, one of which is student worksheets developed for the 4R.

Environmental education is a subject that fourth-grade elementary school students must understand. This is crucial because environmental education provides the foundation for environmentally friendly behavior (Bamdad, 2019; Lange, 2022; Liu et al., 2020). Behavioral changes in environmental education need to be accompanied by intensive knowledge delivery to enhance students through teaching materials. Developing teaching materials to enhance students' knowledge could be one option for improving environmental education (Mcguire, 2015; Nwankwoala, 2015; Wang et al., 2022).

CONCLUSION

Based on the research conducted, it can be concluded that environmental education developed as student worksheets on the 4R topic, using project-based learning, is suitable for use in learning. The development of learning tools such as these student worksheets is expected to improve creative thinking and collaboration skills in fourth-grade elementary school students. This is because the project-based learning model improves students' abilities.

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