IJIS Edu : Indonesian J. Integr. Sci. Education, 8 (1) 2026

Volume 8 Issue 1 , Januari 2026
P-ISSN: 2655-2388, E-ISSN: 2655-2450

Application of the Lurik Pedan Klaten Local Wisdom Booklet using the RWPS Model to Empower Students' Environmental Literacy

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Abstract: This study aims to investigate the effectiveness of using the Lurik Pedan Klaten Local Wisdom Booklet with the Real World Problem Solving (RWPS) model to empower environmental literacy in VII students in science learning. This studi user a quasi-experimental method with a pretest-posttest control group design. The sample consisted of VII students at SMP N 1 Kebakkramat, selected using cluster random sampling. The research instrument used was a environmental literacy test with pretest and posttest and environmental literacy questionnaires. Quantitative data analysis used descriptive statistic, prerequisite test, and hypothesis testing using t-test. The results showed that the Sig. (2-tailed) value was 0.000 < 0.05 with a significance level of 5%. The average knowledge test scores for the experimental class (73.9) and the control class (66.4), the average attitude questionnaire scores for the experimental class (34.4) and the control class (34.4), and the average behavior questionnaire scores for the experimental class (34.16) and the control class (33.9) showed significant differences. It can be concluded that the experimental class that used the Lurik Pedan Klaten local wisdom booklet with the RWPS model significantly influenced students' environmental literacy skills. The implications of these research results indicate that the application of the Lurik Pedan Klaten local wisdom booklet using the RWPS model can be a learning resource in science education to empower students' environmental literacy, so that students can more easily understand concepts through problems that are relevant to their daily lives.

Keywords: Booklet, Local Wisdom, Lurik Pedan Klaten, RWPS, Environmental Literacy

How to cite this article :

Firdaus, P., Suciati, S., Utami, B., Gunawan, K., & Bramastia, B. (2026). Application of the Lurik Pedan Klaten Local Wisdom Booklet using the RWPS Model to Empower Students' Environmental Literacy. *IJIS Edu : Indonesian Journal of Integrated Science Education, 8*(1). doi:http://dx.doi.org/10.29300/ijisedu.v8i1.9080

1. Introduction

In the 21st century, globalization has emerged as a defining feature of the world landscape, reshaping the way countries, businesses, and individuals interact and operate on a global scale. Globalization can facilitate the expansion of information about the world's cultures (Kavita, 2023). Local wisdom is an idea from the local community that consists of values of wisdom that passed down from one generation to the next (Uspayanti et al., 2021). Local wisdom can equip young people in the era of globalization by strengthening their character and love for local cultural values. In addition, loval wisdom can be a source of values rooted in tradition, thus becoming a philosophy of life praticed by its adherents to preserve the continuity of indigenous generations (Faiz & Soleh, 2021).

Although the potential to incorporate local wisdom such as Lurik Pedan into science learning can improve 21st-century skills and global competitiveness (Santoso et al., 2023; Mubarat et al., 2024), practical research on its application in schools is still limited. According to Mahdiana (2019), students' knowledge and understanding of local wisdom is still low. In addition, teachers' knowledge of local wisdom is relatively low, with only 27.30% knowing what local wisdom is, so teachers have not integrated local wisdom into science education (Rikizaputra et al., 2021). Research by Sholihah (2023) shows that teachers at SMP N 1 and 3 Pedan still mostly use textbooks and modules as learning resources, so students are unfamiliar with Lurik Pedan, and there is no experimental evidence measuring the results of special teaching materials on students' knowledge and abilities.

Environmental problems can arise from the relationship between humans and nature (Nugroho, 2022). In addition, environmental problems can originate from natural resources that are utilized by humans as local wisdom (Hidayati & Zakianis, 2022). Environmental problems originating from local wisdom cannot yet be resolved because the community's knowledge of the values of local wisdom is being eroded by the rapid pace of globalization and development (Endayani, 2023). The local wisdom of Lurik Pedan can be a source of environmental problems because many lurik fabric craftsmen use synthetic dyes in their production. The low level of public knowledge about the dangers of using synthetic dyes in Lurik Pedan is partly due to a lack of information (Kusumastuti, 2022).

One factor contributing to low environmental literacy among students is that they are not sufficiently trained to solve environmental problems, resulting in suboptimal environmental literacy (Nugraha et al., 2021). This is supported by the research results of Muhammad & Subekti (2023) that students' environmental literacy is relatively low with an average score of 27,7. When planning solutions to problems, students are not yet able to use scientific knowledge and new information and relate it to environmental problems and their consequences. Low environmental literacy has an impact on students' ability to solve environmental problems (Ural & Dadli, 2020; Rokhmah et al., 2021). In addition, the learning models used by teachers have not trained students in solving everyday problems that are relevant to their lives (Nurhasanah & Luritawaty, 2021).

Based on these problem, students need to be trained in environmental problem-solving skills based on local wisdom to develop their environmental literacy skills. One problem-based learning model that can be applied to train students' problem-solving skills and shape their experiences in solving environmental problems is the Real World Problem Solving (RWPS) model (Ogah et al., 2025; Jurdak, 2016). RWPS is a learning model that trains students to think comprehensively in facing and solving real-world problems that require decision-making (Nurvazillah & Kamza, 2022; Jurdak, 2016). The RWPS model has four syntaxes, namely: 1) understanding the problem; 2) devising a plan; 3) carrying out the plan; and 4) looking back (Polya, 1957). Real-world problem-based models can be used to improve students' environmental literacy (Lewinsohn et al., 2015). This is supported by research by Siddiq et al. (2020) that problem-based models can improve environmental literacy with an average score of 12,59.

Local wisdom can be integrated through booklets as learning resources that feature image and real examples of the material being studied, thereby making students interested in learning and improving learning outcomes. Research by Sholihah (2023) states that the use of the Lurik Pedan booklet as a learning resource can increase the knowledge of students and teachers regarding the scientific knowledge of science contained in the local wisdom of Lurik Pedan and its potential for empowering environmental literacy.

2. Method

This study was conducted at SMP Negeri 1 Kebakkramat in the 2024/2025 academic year with the subchapter Human Impact on the Ecosystem. This study used a quantitative research design with a quasi-experimental method and a pretest-posttest control group design. The experimental class used the Lurik Pedan local wisdom booklet with the RWPS model, while the control class applied the RWPS model without the booklet. The research sample was taken using cluster random sampling after conducting normality and homogeneity tests on the Penilaian Sumatif Akhir Semester (PSAS) scores for the entire population of seventh grade classes. The test would be accepted if the Sig. value was > 0.05, meaning that the population was declared normal and homogeneous.

The test instruments used were multiple-choice questions to measure four indicators of environmental literacy in the knowledge aspect, with a total of 20 questions, as well as a questionnaire on the attitude and behavior aspects using Likert scale data measurement with answer options of Sangat Setuju (SS), Setuju (S), Tidak Setuju (TS), and Sangat Tidak Setuju (STS). Points for each answer correspond to positive or negative statement categories. Before being administered, all instruments underwent validity and reliability tests. The validity test results showed high values, and the reliability test met high reliability criteria.

The data analysis technique consisted of prerequisite tests in the form of normality and homogeneity tests as well as hypothesis testing. The normality and homogeneity tests showed a significance value of more than 0.05, so it can be said that the data was normally distributed and homogeneous. Hypothesis testing used the t-test to

Online ISSN 2655-2450 | Print ISSN 2655-2388

determine the difference in environmental literacy skills before and after learning using the RWPS model. The hypothesis decision was stated as follows: if the calculated Sig. value was < 0.05, then H1 was accepted, while if the calculated Sig. value was > 0.05, then H1 was rejected (Basuki et al., 2021).

3. Result and Discussion

Result

Environmental Literacy Test Intrument

Environmental literacy skill data was obtained through a multiple-choice test consisting of 20 questions. The data was obtained from the experimental class and the control class, each consisting of 32 students. The description of the student environmental literacy skill test instrument data is presented in Table 1.

Table 1. Environmental Literacy Test Instrument Data

Description	Experimental Class		Control Class	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Avarage	64,22	73,91	59,10	66,40

Based on Table 1, the average pretest score in the experimental class was 64,22 and in the control class was 59,10. After the treatment, each class experienced an increase in the average posttest score, namely 73,91 for the experimental class and 66,40 for the control class. The experimental class showed an average increase of 9,69 points, while the control class showed an increase of 7,30 points.

Environmental Literacy Attitude Questionnaire Instrument

Environmental literacy skill data was obtained through a questionnaire consisting of 20 statements. The data was obtained from the experimental class and the control class, each consisting of 32 students. The description of the data from the student environmental literacy skill attitude questionnaire is presented in Table 2.

Table 2. Environmental Literacy Attitude Questionnaire Instrument Data

Description	Experimental Class		Control Class	
	Early	*Final*	*Early*	*Final*
Avarage	33,00	34,40	34,30	34,30

Based on Table 2, the average initial questionnaire score in the experimental class was 33,00 and in the control class was 34,30. After the treatment, the experimental class experienced an increase in the average final questionnaire score, which was 34,40, while the control class did not experience an increase. The experimental class showed an average increase of 1,40 points, while the control class showed an increase of 0 points.

Environmental Literacy Behavior Questionnaire Instrument

Environmental literacy skill data was obtained through a questionnaire consisting of 20 statements. The data was obtained from the experimental class and the control

class, each consisting of 32 students. The description of the data from the environmental literacy behavior questionnaire is presented in Table 3.

Table 3. Environmental Literacy Behavior Questionnaire Instrument Data

Description	Experimental Class		Control Class	
	Early	*Final*	*Early*	*Fnal*
Avarage	32,38	34,16	33,30	33,90

Based on Table 3, the average initial questionnaire score in the experimental class was 32,38 and in the control class was 33.30. After the treatment, each class experienced an increase in the average final questionnaire score, namely 34,16 in the experimental class and 33,90 in the control class. The experimental class showed an average increase of 1,78 points, while the control class showed an increase of 0,60 points.

Discussion

Environmental literacy in this study was measured by dividing it into three aspects, namely knowledge, attitude, and behavior. The knowledge aspect refers to the skills to identify, investigate, analyze, and evaluate environmental issues based on knowledge of environmental and socio-political fundamentals. The attitude aspect refers to a person's empathy and concern for the environment and willingness to take appropriate action to help and solve environmental problems. The behavior aspect focuses on the belief of an individual or group of individuals in their ability to influence the outcome of environmental issues.

The average pretest and posttest scores for environmental literacy skills in the experimental class were 9,69 and 7,30 in the control class, respectively, indicating a significant difference between the two classes, as evidenced by the higher average score in the experimental class. The average scores for the initial attitude questionnaire and final attitude questionnaire for environmental literacy skills in the experimental class were 1,44 and 0,00 for the control class, respectively, indicating that there was a significant difference in the experimental class, as evidenced by the higher average score in the experimental class than in the control class. In addition, the average score for the initial behavior questionnaire and the final attitude behavior questionnaire for environmental literacy skills in the experimental class was 1,78 and in the control class was 0,60, so it can be said that there was a significant difference in the experimental class, as evidenced by the higher average score in the experimental class than in the control class. This is because the experimental class used the Lurik Pedan local wisdom booklet as a learning resource with the RWPS model, while the control class only used the RWPS model without the booklet.

In the first syntax of RWPS, **understanding the problem**, students are given a phenomenon and then asked to form groups, observe, and analyze the phenomenon presented. The phenomenon given is the result of the use of synthetic dyes on lurik fabric, which can have an impact on the surrounding environment. By providing phenomena from the real world, students are expected to work together in small groups to solve problems, so that they are actively involved and gain practical

Online ISSN 2655-2450 | Print ISSN 2655-2388

experience in problem solving. In this syntax, students use the Lurik Pedan local wisdom booklet as a learning resource that contains scientific knowledge about how to make Lurik Pedan with natural dyes that are more environmentally friendly to identify problems from the phenomena presented.

Student activities in this syntax can empower environmental literacy skills in knowledge elements (including environmental knowledge, socio-political knowledge, knowledge about environmental issues, and cognitive skills) where students are given the opportunity to identify and understand real problems that have been presented using their prior knowledge. This is supported by research by Arma (2024), which states that science learning should emphasize the provision of real contextual problems related to the environment to improve students' skills in observing, understanding, and researching their environment through scientific methods. Thus, the use of the Lurik Pedan local wisdom booklet as a learning resource in the syntax of understanding the problem can empower students' environmental literacy skills through activities of identifying and understanding problems in the phenomena presented.

In the syntax of **devising a plan**, students are guided by teachers to develop a plan to solve problems from the phenomena presented. In this syntax activity, students are asked to formulate problems and hypotheses relevant to the presented phenomena together with their group using the Lurik Pedan local wisdom booklet as a learning resource. This process trains students to organize information systematically in order to plan problem-solving steps.

Student activities in this syntax can empower students' environmental literacy skills in knowledge elements (including environmental knowledge, socio-political knowledge, knowledge about environmental issues, and cognitive skills). This is in line with the research by Putri et al. (2019), which found that students can actively determine strategic plans to solve problems, especially real and relevant environmental problems in everyday life. By formulating problems and hypotheses, students are expected to integrate their environmental knowledge with their thinking skills in problem solving. Thus, the use of the Lurik Pedan local wisdom booklet in the syntax of devising a plan can empower students' environmental literacy skills through activities of formulating problems and hypotheses that have scientific knowledge to strengthen students' environmental problem-solving strategies.

In the syntax of **carrying out the plan**, students conduct experiments on the effect of fabric dye types on the survival of organisms and analyze the data based on information tables, theories, and booklet content. In this syntax, students work in groups to investigate how polluted and unpolluted environmental conditions can affect the survival of fish, as seen from the fins and eyes of the fish. When analyzing the experimental data, students are given several analytical questions and are encouraged to relate the experimental data to the information in the Lurik Pedan local wisdom booklet.

Student activities in this syntax can empower environmental literacy skills in three elements, namely knowledge, attitude, and behavior. In the knowledge element, students gain more understanding about environmental issues. This occurs

when students make direct observations of fish behavior in unpolluted and polluted environments. Through these observations, students can see the differences in the impact of pollution on living things in real life. In the attitude element, direct involvement in activities can foster students' concern and responsibility for the environment. This occurs when students conduct experiments on the effects of dyes on fish survival, where students gain direct experience. Through direct experience, students can see firsthand how a polluted environment can affect fish, making it easier for them to develop a caring attitude and awareness to protect the environment. In terms of behavior, students learn to take concrete actions that are responsible for the environment. This occurs when students already know the impact of environmental pollution on the condition of fish. Through this knowledge, students are encouraged to be more concerned and responsible in maintaining the cleanliness and sustainability of the surrounding environment. Students can do this in various ways, such as not littering, sorting waste, and planting plants as a form of caring for the environment. Students use the Lurik Pedan local wisdom booklet as a learning resource to support the experiments they conduct. This is supported by research by Putri et al. (2019), which found that learning activities will be more meaningful and encourage students to think ahead and be aware of sustainable values if they apply scientific knowledge in their daily lives related to environmental issues. Thus, the use of the Lurik Pedan local wisdom booklet in the third syntax can empower students' environmental literacy skills.

In the **looking back** syntax, teachers encourage students to evaluate and reflect on the experiments they have conducted. In this syntax, teachers guide students to review with questions such as "What were the results of the experiments?", "Did they match the hypotheses?", and "How did the type of dye affect environmental conditions?" These questions encourage students to review the steps of the experiment, compare their observations with the hypothesis, and relate the information to the Lurik Pedan local wisdom booklet.

Student activities in this syntax can empower environmental literacy skills in knowledge elements (including environmental knowledge, socio-political knowledge, knowledge about environmental issues, and cognitive skills). At this stage, students are invited to evaluate the results of the experiment, analyze the process that has been carried out, and reflect on the impact of environmental problems, such as the effect of dye types on fish survival. This is relevant to the research by Hudha et al. (2021), which found that the learning process involving questions and answers can build perceptions and explore students' knowledge related to their insights. Science learning that involves real-world problems can develop students' ability to explore and understand their surroundings scientifically and can lead to discovery and action, enabling students to gain a deeper understanding of the environment. Thus, the use of the Lurik Pedan local wisdom booklet as a learning resource in the looking back syntax can empower students' environmental literacy.

The implementation of the Lurik Pedan local wisdom booklet using the RWPS model can empower students' environmental literacy skills. This is because Lurik Pedan local wisdom has scientific knowledge based on the stages of lurik fabric

Online ISSN 2655-2450 | Print ISSN 2655-2388

production, thus having the potential to empower students' environmental literacy. Arma's (2024) research shows that integrating local wisdom into science learning can introduce students to scientific concepts through surrounding phenomena that can empower environmental literacy skills, making science learning more interesting and meaningful.

The implementation of the RWPS model in science learning can empower students' environmental literacy skills. The results of research by Agustina et al. (2025) show that problem-based models provide an increase in environmental literacy, as seen from the average achievement of the experimental class, which was in the fairly good category. This is because learning that uses problem-based models can train students in problem solving. The problem-based learning process begins with presenting a problem from a phenomenon (Sabora et al., 2022). Students involved in solving real-world problems have the potential to hone their problem-solving and environmental literacy skills and can improve their conceptual understanding and decision-making (Butai & Phang, 2024). In addition, the integration of local wisdom into the RWPS model can help students understand concepts involving real life in their environment, thereby training them in solving environmental problems (Tamaela et al., 2023). The application of local wisdom with the RWPS model provides opportunities for students to face problems in their daily lives and understand science concepts in real-life situations. The application of LurikPedan Klaten Booklet with RWPS model provides students with opportunity to face problems in their lives and understand science concepts in real life situations. Thus, the application of the Lurik Pedan local wisdom booklet with the RWPS model is effective in empowering students' environmental literacy skills.

4. Conclusion

Based on the research results and data analysis, it can be concluded that the application of the Lurik Pedan local wisdom booklet using the RWPS model has proven to be effective in empowering the environmental literacy skills of seventh-grade students. This is evidenced by the increase in the average results of environmental literacy tests and questionnaires in the experimental class.Tapak Jedah should not be used as a waste disposal site because in addition to being right on the side of the road, the area is also a protected forest. Despite the no-dumping signs put up by the Ministry of Environment and Forestry, people still dump their waste there.

This research has limitations in utilizing the entire scientific knowledge contained in the Lurik Pedan local wisdom booklet. There are six stages in the production of natural dyes for Lurik Pedan fabrics, but only one stage can be optimally integrated into the learning process, namely the scientific knowledge in the sixth stage. Although not all scientific knowledge from the Lurik Pedan local wisdom booklet was implemented, some of it could be used indirectly as discussion material or reinforcement during the learning process. These limitations indicate that the Lurik Pedan local wisdom booklet in learning with the RWPS model needs to be adjusted

to relevant learning materials and objectives. This is an important note for developing further research and learning so that the booklet can be used in more detail and integrated into science learning.

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