

## The Influence of Integrated Instructional Design of Environmental Education and Teaching Modules in IPAS Learning on Environmental Literacy (Ex Post Facto Method Analysis in the Context of the Merdeka Curriculum)

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### ABSTRACT

*This research explores the impact of implementing Instructional Design and Teaching Module devices in Natural and Social Sciences (IPAS) education, in line with the Merdeka Curriculum, on environmental literacy in primary schools. The aim of this research is to determine the influence of Integrated Environmental Education IPAS Instructional Design and IPAS Teaching Module in IPAS learning on students' environmental literacy at the primary school level. The research method employs an ex post facto approach to identify and analyze the influence of these variables after implementation, without direct intervention in the learning situation. The results show that both instructional devices significantly contribute to students' environmental literacy. Students' environmental literacy learning outcomes in IPAS education using the Integrated Environmental Education IPAS Instructional Design (average score of 80) are better compared to IPAS Teaching Module (69). In conclusion, the research findings indicate that Integrated Environmental Education IPAS Instructional Design significantly positively influences the improvement of students' environmental literacy compared to IPAS Teaching Module.*

**KEYWORDS** Environmental Literacy, Instructional Design, Teaching Modules, IPAS Learning, Independent Curriculum



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## INTRODUCTION

Environmental Education in Primary Schools (SD) plays a central role in socializing sustainability values to the younger generation, which is reinforced by the implementation of the Merdeka Curriculum. Environmental education in primary schools becomes the main focus with the adoption of the Merdeka Curriculum (Lutfiana, 2022);(Harahap & Sos, 2022);(Anggraini et al., 2022). This curriculum emphasizes the integration of environmental concepts in education, recognizing its important role in shaping students' understanding of sustainability issues (Nihwan & Widodo, 2020);(Jamaluddin et al., 2019);(D. M. D. P. Nugraha, 2022). In this context, environmental literacy becomes a critical aspect shaping students' understanding and awareness of global environmental challenges.

Teaching modules for IPAS (Natural and Social Sciences) are also considered an effective approach in enhancing environmental literacy in primary schools (Kusumaningrum & Nugroho, 2018). In this context, it is important to understand the contribution of Instructional Design and Teaching Modules to environmental literacy, in line with the principles of the Merdeka Curriculum (Haryanto, 2017). The adoption of the Merdeka Curriculum as a national educational innovation demands a holistic and sustainability-oriented approach. Therefore, this research focuses on the influence of two main variables, Instructional Design and Teaching Modules, in IPAS learning in primary schools on students' environmental literacy.

In designing Merdeka Curriculum-based learning, it is important to understand the extent to which Instructional Design and Teaching Modules can integrate sustainability concepts into IPAS materials. Their roles are crucial in shaping students' understanding of the connection between IPAS and the environmental challenges faced by society. Although efforts to develop environmental literacy in primary schools have been made, there is limited research specifically examining the influence of Instructional Design and Teaching Modules in IPAS learning on environmental literacy at the primary school level, especially in the implementation of the Merdeka Curriculum (Anderson & Wilson, 2019 (Stefaniak & Reese, 2022). Therefore, a comprehensive analysis is needed to understand the real contribution of these two variables in enhancing students' environmental literacy.

Instructional design is the basis for developing and designing practices by introducing better learning (Sibagariang et al., 2021). Instructional design is the process of designing a learning program that includes identifying learning needs, selecting learning strategies, developing learning materials, developing learning objectives, and evaluating the learning program (Al Azizi, 2022). Within the Merdeka Curriculum, the implementation of the learning process by considering the abilities or characteristics of students (differentiated learning) is also important so that learning objectives can be achieved more optimally (Anggraini et al., 2022);(Hartoyo & Rahmadayanti, 2022). Characteristics or aspects of abilities are used as references in the implementation of differentiated learning (Soleimani & Mohammadi Hoseini, 2021).

The implementation of the Merdeka Curriculum as part of efforts to improve learning, previously referred to as a prototype curriculum, was developed as a more flexible curriculum, focusing on character and competency development of students, as well as essential content (Suryana & Iskandar, 2022). The main characteristics

of the Merdeka Curriculum that support learning improvement are project-based learning for soft skills development and character according to the Pancasila student profile.

Environmental literacy at a higher level involves understanding and knowing environmental issues such as having morals, attitudes, concern, and ethics towards the environment, understanding, having the ability, and intention to act with responsible behavior towards the environment, having involvement and social engagement related to the environment, as well as having the skills to evaluate data and draw conclusions to form their own opinions and collaborate with stakeholders to solve environmental problems (Kusumawati, 2022). Environmental literacy is a conscious attitude in maintaining the environment to be clean, sustainable, and maintaining its natural balance (Jirásek et al., 2017).

Environmental literacy will cultivate awareness among primary school students about real environmental issues around them, understanding, knowing, and taking actions that provide solutions to existing environmental problems (Aeni, 2022). Environmental literacy will foster caring, empathy, and active participation in environmental activities. Environmental literacy is crucial to be developed and instilled as part of the life skills of primary school students, in accordance with their developmental level. The level of environmental literacy in primary schools should be developed by involving them in real actions according to their lives or by showing real contextual issues and real activities related to environmental conservation (Nugraha et al., 2021).

Increasing awareness as well as responsibility for the importance of environmental literacy needs to be continuously pursued. To support this, a learning tool is needed to provide knowledge and build attitudes and responsibilities towards the environment by students. IPAS learning tools are needed to accommodate the enhancement of environmental literacy in primary school students (Jerald & Me, 2020). IPAS Teaching Modules are learning tools used in the learning process to achieve learning objectives.

This research aims to identify and analyze the influence of Integrated Environmental Education IPAS Instructional Design and IPAS Teaching Module in IPAS learning on students' environmental literacy in primary schools. This research problem is initiated to respond to the need for empirical evidence on the extent to which Instructional Design and Teaching Modules in IPAS learning, in line with the Merdeka Curriculum, can strengthen students' environmental literacy at the primary school level. The benefits of this research are practical and conceptual. Practically, the research results can serve as a basis for teachers, curriculum developers, and education policymakers to design effective strategies in enhancing environmental literacy in primary school students. Conceptually, this research is expected to complement the academic literature in the field of environmental education, especially in understanding the role of Instructional Design and Teaching Modules in achieving the goals of the Merdeka Curriculum.

## **RESEARCH METHOD**

This study adapts the *Ex Post Facto method* to analyze the influence of the Integrated IPAS Instructional Design for Environmental Education and IPAS Teaching Modules in IPAS Learning on environmental literacy. This approach is in line with the development of the Independent Curriculum-Based Science Learning Teaching Module Widyastuti (2024), ensuring suitability to the elementary school context. Thus, it is hoped that this study can provide a clearer picture of the extent to which the use of Integrated IPAS Learning Instructional Design for Environmental Education, on the one hand, and IPAS Learning Teaching Modules, on the other hand, can improve environmental literacy in Class V Elementary Schools, especially in the context of the implementation of the Independent Curriculum.

## RESULT AND DISCUSSION

### IPAS learning using IPAS Teaching Modules

In the learning process that prioritizes student-centered learning strategies, continuous efforts are needed. This is done to enhance the competencies of students in the 21st century, where students are expected to have creative thinking skills, critical thinking skills, communication skills, and collaboration skills. The student-centered learning approach will stimulate active participation of students in the learning process. Thus, students have ample opportunities for learning according to their potential, interests, and individual comfort. This is one implementation of the Merdeka Curriculum. Students are expected to have a better understanding and absorption of material that is linked to daily life. The student-centered approach will provide students with new, more factual experiences so that they become more resilient, motivated, and enthusiastic in participating in the learning process.

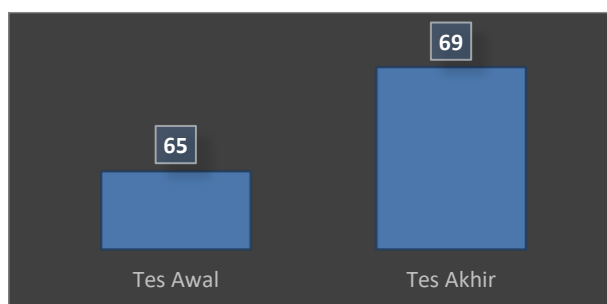
To achieve the learning objectives maximally, adequate teaching aids are necessary. Teaching aids in the Merdeka Curriculum are called Teaching Modules, while in the previous curriculum (Kurtilas), they were called Lesson Implementation Plans (RPP). Teaching Modules are prepared by educators before conducting the learning process. The teaching strategies outlined in the teaching aids in the Teaching Modules of the Merdeka Curriculum are used by educators during teaching. In this study, an analysis of learning in Grade V primary schools was conducted using the Merdeka Curriculum Teaching Modules on IPAS subjects. It started with giving pre-tests to students. Then after the learning process was completed, post-tests were conducted. Table 1 below presents the average results of pre-tests and post-tests of student learning.

**Table 1 Average scores of IPAS learning using IPAS Teaching Modules in Grade V Elementary School**

Description	Pre-Test	Post-Test
IPAS Teaching Module	65	69

Based on the Table 1 above, the average Post-Test score (69) is higher than the Pre-Test score (65). The results of pre-tests and post-tests for students show that there is a difference in IPAS learning outcomes. Students after being taught using

IPAS Teaching Modules showed improvement. The implementation of learning strategies using IPAS Teaching Modules builds independence in students to produce good knowledge. Students need to play an active role during the activities. The culture of independent learning with educators as facilitators is already apparent. The improvement in the IPAS learning process using IPAS Teaching Modules when Pre-Tests and Post-Tests were conducted is 4 points, as seen in Figure 1.



**Figure 1 Average scores of IPAS learning using IPAS Teaching Modules**

After conducting a paired T-test from the T-statistic test, a value of -4.5464 was obtained, which is smaller than the critical value (-2.0452), while the P-value ( $8.92995E-05$ )  $< \alpha$  (0.05), so the null hypothesis is rejected. Based on this test, it can be concluded that there is a significant difference between the results of Pre-Tests and Post-Tests in IPAS learning using IPAS Modules.

### **IPAS learning using Integrated Environmental Education Instructional Design**

Instructional design in education serves as the foundation for designing practices to promote more effective learning Tan (2023), informing instructional design choices. Despite its benefits, instructional designers struggle to apply and understand instructional design due to inconsistent and unclear language used in the field.

The term "integration" means combining, unifying, or merging. Based on this understanding, education is known as integrated education. Integrated learning is a concept of teaching approach that involves multiple subjects to provide meaningful and beneficial learning experiences for students. An effectively integrated learning process will help create broad opportunities for students to see and build interconnected concepts. Learning is more effective when educators can connect or integrate field findings with school learning implementation. Thus educators can integrate learning and student subject matter with the living environment (Wilujeng, 2018).

Traditionally, instructional design theory has been useful as a primary means to advance knowledge and research in instructional design, a conceptual tool to enhance educational practices, and support for understanding different perspectives and conveying instructional design solutions in learning (Costa, 2018);(Mansoor & Abdullatif, 2020). Furthermore, theory or content is an important part of decision-making in instructional design practice, enabling practitioners to develop problem-

solving, design, new possibilities, and debate different perspectives (Stefaniak & Reese, 2022).

The concept of independent learning is part of Society 5.0, which can be seen from the use of technology to solve problems faced by educators and participants. Independent learning uses the concept of self-regulated learning, which provides space for educators and participants to learn at their own pace. This learning process provides opportunities for participants to have educators as facilitators, and the essence of independent learning is freedom of thought for participants and educators (Maifa, 2022).

In the implementation of the Merdeka Belajar Curriculum, teachers have the freedom to apply and choose various teaching aids they want to use so that the learning process can be adjusted to the abilities and needs of students. The development of science and technology not only has negative impacts but also has positive impacts on life, especially for educators and students. Government programs in education aim to strengthen the character of students to be in line with the Pancasila Student Profile, in accordance with the understanding of education according to Ki Hadjar Dewantara, which generally means efforts to promote the growth of intellectual, physical, and character strengths.

Based on the above explanation, the Integrated Environmental Education Instructional Design in this study is a systematic design to solve effective learning problems through planning and activities aimed at changing human behavior and attitudes to preserve everything around humans, by combining responsibility for the quality of life for the future and present through education.

Environmental literacy will raise the awareness of elementary school students about real environmental issues around them, understanding, knowing, and taking actions that provide solutions to existing environmental problems (Aeni, 2022). Environmental literacy will foster attitudes of concern, empathy, and active participation in environmental activities (Maslamah et al., 2020). Environmental literacy is important to be nurtured as part of the skills of elementary school students, in accordance with their level of development. The level of environmental literacy in elementary school should be developed by encouraging them to take real actions or show real contextual issues or engage in real activities related to environmental conservation (F. Nugraha et al., 2021).

Increasing awareness as well as concern and responsibility for the importance of environmental literacy need to be continuously pursued. To support this, a useful learning tool is needed to provide knowledge and build attitudes and responsibilities towards the environment carried out by students. IPAS learning tools are needed to accommodate the improvement of environmental literacy in elementary school students (David et al., 2022).

Meanwhile, the students in this study, to support and provide continuous knowledge through education at school. Although previously learning tools already existed in the form of Teaching Modules, this learning tool was developed by researchers in the form of Integrated Environmental Education Instructional Design. In student learning, not only IPAS material is provided but also includes environmental education aspects. Thus, it is expected that students have individual and group capabilities to interpret and decide on appropriate actions to restore,

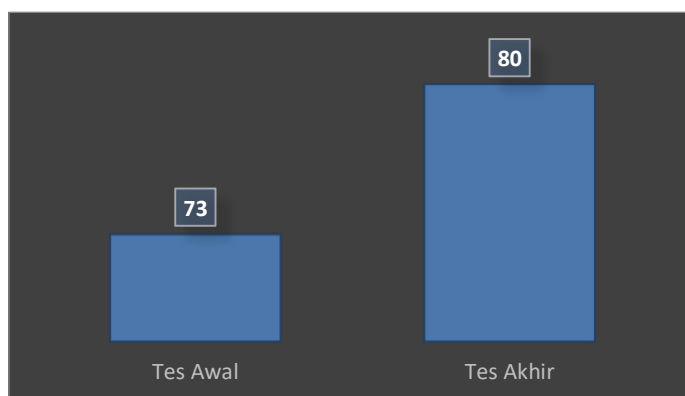
understand environmental conditions, maintain and improve environmental conditions towards a better direction.

In this study, an analysis of the implementation of IPAS learning using Integrated Environmental Education Instructional Design, its influence on students' environmental literacy, was conducted. The average scores of environmental literacy are presented in Table 2 below.

**Table 2 Average scores of environmental literacy using Integrated Environmental Education Instructional Design**

Learning Outcome	Pre-Test	Post-Test
Environmental literacy	73	80

Based on Table 2, the testing results of the second hypothesis where Pre-Test vs. Post-Test, the average Post-Test score (80) is higher than the Pre-Test score (73). Meanwhile, the T-Statistic from the paired T-test is -1.671, which is smaller than the critical value (-2.0452). P-value (0.120778236) >  $\alpha$  (0.05), thus failing to reject the null hypothesis. From the above test results, the instructional design in the form of Integrated Environmental Education Instructional Design can influence students' learning outcomes in IPAS subjects integrated with environmental education. In conclusion, there is no significant difference between the average scores of the Pre-Test (73) and Post-Test (80) in IPAS learning using Integrated Environmental Education Instructional Design, although the score difference reached 7 compared to IPAS Modules, which had a score difference of only 4. The influence of Integrated Environmental Education Instructional Design on environmental literacy can be illustrated in the following histogram:



**Figure 2 Average environmental literacy scores of students using Integrated IPAS Instructional Design Environmental Education**

### **Differences in environmental literacy learning outcomes in IPAS instruction between IPAS Modules and Integrated Environmental Education Instructional Design.**

Based on the data description of the research results presented in the table above, statistical analysis was further conducted on the difference between pre-test and post-test environmental literacy learning outcomes between the two instructional tools, IPAS Modules and Integrated Environmental Education Instructional Design.

In the statistical test results for the pre-test, there is no difference in students' environmental literacy learning outcomes between IPAS instruction using IPAS Module and Integrated Environmental Education Instructional Design. This is indicated by the T-Statistic in the independent T-test, which yielded -1.1836, with a P-value ( $0.241556471 > \alpha (0.05)$ ), indicating no significant difference in pre-test environmental literacy learning outcomes in IPAS instruction between those using IPAS Module and Integrated Environmental Education Instructional Design.

Meanwhile, in the post-test results, based on the statistical test with an independent t-test, a T-Statistic of -2.1519 was obtained, with a P-value ( $0.035726229 < \alpha (0.05)$ ), thus it can be concluded that there is a significant difference in post-test environmental literacy learning outcomes in IPAS instruction between using IPAS Modules (mean score of post-test 69) and Integrated Environmental Education Instructional Design (mean score of post-test 80).

The research results also indicate that the implementation of both instructional tools, both Instructional Design and Teaching Modules in IPAS instruction, significantly contributes to the improvement of environmental literacy at the elementary school level. This finding is consistent with strategies for enhancing effective IPAS learning (Roberts & Brown, 2020). The integration of environmental concepts from Sustainable Education (Anderson & Wilson, 2019) has also been shown to have a positive impact on environmental literacy.

The importance of implementing the Merdeka Curriculum in Elementary Schools, as expressed by Simatupang and Tan (2017), is further strengthened by these findings, which demonstrate its relevance to improving students' environmental literacy. Meanwhile, students in this study, to support and continuously provide knowledge through education at school, the provision of education requires instructional tools. Although instructional tools already existed in the form of Teaching Modules, this instructional tool was developed in the form of Integrated Environmental Education Instructional Design. In student learning, not only IPAS material is provided but also includes environmental education aspects. Thus, it is expected that students have individual and group capabilities to interpret and understand environmental conditions, and to make appropriate decisions in restoring, maintaining, and improving environmental conditions for the better.

In this study, the influence of Integrated Environmental Education Instructional Design and Teaching Modules in IPAS instruction on Environmental Literacy in Elementary Schools has been investigated, applying the Ex Post Facto Method in the context of the Merdeka Curriculum. The research findings indicate that the implementation of both variables significantly improves students'



environmental literacy in elementary schools, consistent with the strategies proposed by Roberts and Brown (2020) in enhancing IPAS learning.

The integration of environmental concepts from Sustainable Education (Anderson & Wilson, 2019) in the curriculum has also been shown to have a positive impact. This finding is in line with the goals of implementing the Merdeka Curriculum in Elementary Schools, as expressed by Simatupang and Tan (2017), namely the relevance and suitability of learning approaches with sustainability principles.

Thus, the results of this research provide an important contribution to understanding how Instructional Design and Teaching Modules can effectively improve environmental literacy in Elementary Schools, and at the same time validate the principles of the Merdeka Curriculum in the context of IPAS learning.

## CONCLUSION

Based on the research that has been done, several findings were obtained as follows: 1. There is a significant difference between the average results of the Initial Test and the Final Test of environmental literacy in IPAS learning using the IPAS Module with a score difference of 4 between the average results of the Initial Test (65) and the average results of the Final Test (69). 2. There is no significant difference between the average results of the Initial Test and the Final Test of environmental literacy in IPAS learning using the Integrated IPAS Instructional Design for Environmental Education, even though it has a difference of 7 marks between the average results of the Initial Test (73) and Final Test (80), higher than the IPAS Module (with a difference of 4 marks). 3. There is no significant difference between the average results of the Initial Test of Environmental Literacy in IPAS learning between using the IPAS Module (average 65) and the Integrated IPAS Instructional Design for Environmental Education (average 73). 4. There is a significant difference between the results of the Final Test of environmental literacy in IPAS learning between using the IPAS Module (average 69) and the Integrated IPAS Instructional Design for Environmental Education (average 80).

By referring to the results / findings of the study, it can be concluded that the Integrated Educational Science Instructional Design has a positive significant influence in improving the environmental literacy of students compared to the IPAS Teaching Module.

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