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IMPLEMENTATION OF PROJECT-BASED LEARNING BASED ON ECOPEDAGOGY AS A STRATEGY TO STRENGTHEN THE PROFILE OF PANCASILA STUDENTS IN THE MERDEKA CURRICULUM

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ABSTRACT

Social Studies (IPS) learning in junior high schools in Sukoharjo Regency is challenged by students' low ecological awareness, limited variation in learning models that encourage active engagement, and the suboptimal implementation of the Merdeka Curriculum integrated with the Pancasila Student Profile. These conditions result in a lack of critical thinking, creativity, and environmental awareness among students. This study aims to develop a Project-Based Learning–Ecopedagogy (PJBL_EP) model as an alternative instructional strategy to strengthen the Pancasila Student Profile at the junior high school level. The research employs a Research and Development (R&D) method, referring to the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The research subjects involved teachers and students from JHS 3 Nguter, JHS 5 Sukoharjo, and JHS Muhammadiyah Kartasura, with an extended trial involving 40 Social Studies teachers from 12 sub-districts in Sukoharjo Regency. The PJBL_EP model is designed through the integration of project-based learning with ecopedagogy principles, emphasising ecological awareness, critical thinking, creativity, independence, collaboration, and noble character development. Validation results showed an excellent feasibility score (92; 88.75; and 91.67). Field trials identified challenges in teachers' mastery of content, classroom management, and students' literacy; however, improvements in syntax, group management, and teaching modules enhanced practicality. Overall, PJBL_EP effectively makes Social Studies learning more contextual, creative, and environmentally oriented, while simultaneously strengthening the values of the Pancasila Student Profile.

Keywords: *ecopedagogy; environmental awareness merdeka curriculum; pancasila student profile; project-based learning (PjBL)*

INTRODUCTION

The Merdeka Curriculum offers flexibility in learning and emphasises essential content to develop students' competencies as lifelong learners with Pancasila character (Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia No. 12 of 2024). These competencies encompass faith and devotion to God Almighty, a noble character, collaboration, critical reasoning, global diversity, independence, and creativity. At the junior high school level, particularly in Pancasila Education, the curriculum allocates 72 weeks of intracurricular learning and 36 weeks of Pancasila Student Profile strengthening projects, totalling 108 instructional hours (Regulation of the Minister of Primary and Secondary Education of the Republic of Indonesia Number 13 of 2025). The curriculum aims to strengthen students' critical reasoning, creativity, collaboration, independence, and communication, as well as their sense of creation, feeling, and initiative through deep learning.

Schools are also required to implement the Movement for Environmentally Caring and Cultured Schools (Gerakan PBLHS) in accordance with Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.53/MENLHK/SETJEN/KUM.1/9/2019. This movement promotes conscious, voluntary, and collaborative actions to cultivate environmentally responsible behaviour in schools. Education plays a crucial role not only in developing students' cognitive abilities but also in shaping their character, which can be supported through the application of Project-Based Learning (PJBL) (Law of the Republic of Indonesia Number 20 of 2003). Learning activities play a significant role in developing students' critical thinking and problem-solving skills (Li et al., 2025). Extracurricular activities also serve as avenues for active student engagement (Pradhan et al., 2024) and support sustainable efforts to promote a more just future (Jornet et al., 2025).

In this context, ecopedagogy emerges as a critical educational approach that encourages students to deconstruct environmental issues (Misiaszek, 2014) and understand the interconnectedness of environmental and social problems (Misiaszek, 2015). Ecopedagogy is

believed to offer hope for addressing environmental crises (Misiaszek, 2014), yet its successful implementation depends on adequate teacher training and socio-environmental literacy (Misiaszek, 2015). Educational institutions must also optimise resources to monitor students' project progress and address challenges in implementing Pancasila as a moral foundation that supports mental health (Rachman et al., 2024). The application of Pancasila principles is central to character formation (Suryantari, 2022) and has the potential to position Indonesian education as a global model for character-based instruction (Rachman et al., 2024). Character education aims to nurture students' ethical, moral, and social development (Osman, 2024; Sarifah et al., 2025). Instilling ecological awareness from an early age is similarly essential in shaping environmentally responsible behaviour (Kongson, 2020).

Research by Rohsulina et al. (2024) reveals that although 84% of junior high schools in Sukoharjo Regency have implemented components of the Merdeka Curriculum through PJBL and ecopedagogy, several challenges remain. These include students' low ecological awareness, limited application of ecopedagogy, incomplete integration of Pancasila Student Profile values, insufficient contextualization of learning, and a lack of student-centred instructional models. These issues are evident among 7th-grade students at JHS 3 Nguter, JHS 5 Sukoharjo, JHS Muhammadiyah Kartasura, and other schools across the regency.

To address these gaps, the Project-Based Learning–Ecopedagogy (PJBL_EP) model is proposed as an alternative instructional strategy that can integrate curriculum goals, strengthen Pancasila Student Profile competencies, and support environment-based education. The PJBL_EP model systematically combines PJBL syntax with ecopedagogy principles by placing environmental issues at the centre of the learning process. Through six stages, formulating essential questions, designing the project, scheduling, monitoring, testing results, and reflection, the model fosters ecological awareness, critical reflection, collaboration, and real-world action. Thus, PJBL_EP not only enhances academic competence but also fosters a responsible ecological character and promotes a long-term commitment to sustainable living.

MATERIALS AND METHODS

1. Research Design

This study employs the Research and Development (R&D) method to develop the PJBL_EP model, aiming to strengthen the Pancasila Student Profile of 7th-grade students in Sukoharjo Regency. R&D supports the creation of new knowledge, technological insight, and innovation capacity (Sarpong et al., 2023), making it suitable for designing a learning model while testing its feasibility and effectiveness in classroom practice. This method is essential for producing advanced and sustainable educational innovations (Ganda, 2019; Holt et al., 2021).

This study used JHS Negeri 3 Nguter, representing a public school in a rural area on the outskirts of Sukoharjo Regency, JHS 5 Sukoharjo, representing a public school located in the central region of Sukoharjo Regency, and JHS Muhammadiyah Kartasura, representing a private school situated in an urban area bordering the city of Surakarta.

The large-scale trial involved 40 Social Studies teachers from 12 sub-districts in Sukoharjo Regency, representing both public and private junior high schools across Mojolaban, Baki, Polokarto, Nguter, Kartasura, Sukoharjo, Weru, Tawangsari, Bulu, Grogol, Bendosari, and Gatak.

2. Research Procedure

The R&D in this study follows the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), which provides a structured and systematic framework for developing learning models (see **Figure 1**). ADDIE is widely recognised for its effectiveness in supporting efficient teaching and learning (Saeidnia et al., 2022).

In the analysis stage, teachers identify learning needs, student characteristics, objectives, and contextual factors that influence learning. The design stage focuses on planning strategies, structuring learning, and selecting the most suitable media. The development stage produces modules, assessments, and limited trials to ensure model quality.

The implementation stage involves conducting learning activities, collecting feedback, and making necessary adjustments. The evaluation stage reviews both processes and outcomes to measure goal achievement. Across all stages, the ecopedagogy approach ensures that Social Studies learning not only delivers content but also fosters

environmental awareness and the key competencies outlined in the Pancasila Student Profile.

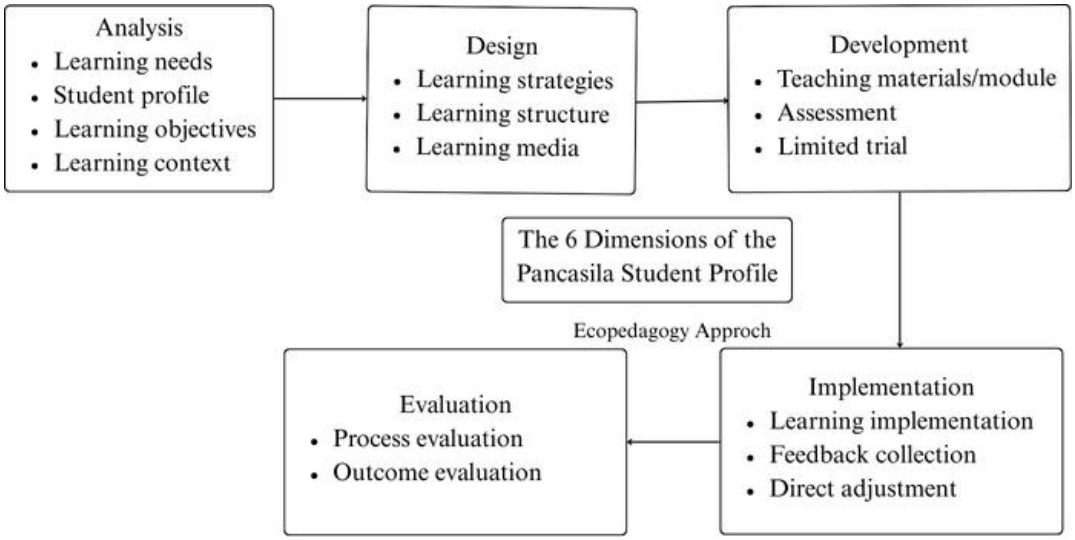

Figure 1. ADDIE Development Framework

Source: Analysis Data, 2024

3. Data Analysis

Data analysis employed qualitative and quantitative descriptive techniques. Qualitative feedback from experts and validators was categorised according to set criteria and converted into quantitative scores using a Likert scale. Quantitative data from the PJBL_EP Lesson Plan (RPP) validation questionnaires were analysed using descriptive statistics to determine quality and response categories. In general, quantitative research requires clear descriptions of experimental settings, data collection and analysis procedures, and statistical tests. In contrast, qualitative research must detail the research settings, sampling techniques, data collection, validation, coding, interpretation, and data presentation.

RESULTS AND DISCUSSION

1. Design

The design stage developed the PJBL_EP model by integrating ecopedagogy into the PJBL syntax, grounded in constructivist theory, the junior high school Social Studies curriculum, and project-based competencies. The model aims to strengthen the Pancasila Student Profile

within the Merdeka Curriculum, which promotes differentiated learning, potential development, reduced academic burden, and creativity. In this curriculum, the P5 project encourages students to investigate and address environmental issues through interdisciplinary learning, making PJBL-EP highly relevant. Meanwhile, ecopedagogy reinforces ecological awareness, sustainability, and social justice.

PJBL_EP is designed to develop students' creativity, critical thinking, independence, collaboration, and sustainable attitudes. Its objectives include enhancing critical and creative reasoning, strengthening collaboration and communication, building independence and responsibility, and fostering ecological awareness. The development process began with a literature review of theories, curriculum standards, ATP, CP, and TP, followed by the preparation of learning materials and teaching modules aligned with the Merdeka Curriculum as core components of the PJBL_EP model.

2. Development

The Development stage produced a prototype of the PJBL_EP model based on the framework of Bruce Joyce, Weil, and Calhoun (2016), which includes syntax, social system, principles of reaction, support system, and instructional–nurturant effects. The PJBL_EP syntax integrates PjBL with ecopedagogy principles grounded in sustainability and the 3R adapted from Gadotti and Supriatna. This integration encourages students to build knowledge, develop ecological awareness, and practice environmentally responsible behaviours. Teachers must teach the 3R principles interactively to strengthen students' understanding of Environmental Education (Kola-Olusanya et al., 2025).

Social Studies is an appropriate subject for this approach because it develops social skills, fosters responsibility, promotes democratic values, and cultivates environmental awareness. Through projects, students are guided to think critically, creatively, and collaboratively in addressing real environmental problems. The PJBL_EP model aligns with the Pancasila Student Profile dimensions, including critical reasoning, independence, creativity, collaboration, and noble character rooted in faith in God Almighty. Overall, PJBL_EP offers comprehensive

cognitive, affective, and psychomotor learning experiences, fostering ecological awareness and responsibility in accordance with Pancasila values within the Merdeka Curriculum.

3. Implementation

In the initial implementation stage, expert validation was conducted to assess all products developed in this study. Each validation phase generated constructive feedback that informed product revision. The researcher prepared validation instruments covering the model, material, and readability, followed by a trial of the PJBL_EP model. Three experts served as validators: Prof. Dr Farida Nugrahani, M.Hum (model), Dr R. Muh. Amin Sunarhadi, S.Si, M.P. (material), and Siswanto, S.Pd, M.Pd. (readability). Validation was carried out using structured assessment forms. The model validation by Prof. Dr Farida Nugrahani yielded a score of 92 (very good), with suggestions such as adding time allocations and including a material summary (see **Table 1**). Overall, the PJBL_EP model draft was declared feasible for trial implementation.

Table 1. First Model Validation

No	Objectives of model development	Score
1	Philosophical foundations and learning theories	4
2	Sequentially structured model syntax	4
3	Dimensions of the Pancasila Student Profile	5
4	Stages of ecopedagogy	5
5	Principles of reaction	4
6	Social system	4
7	Instructional impacts and accompanying impacts	5
8	Support system	5
9	Complementary instruments for the learning process	5
10	Objectives of model development	5
	Total	46
		92

$$Score : \frac{Obtained\ Score}{Maximum\ Score} x\ 100 = \frac{46}{50}\ x\ 100$$

Source: Data Processing, 2024

Material validation was conducted by Dr Muh Amin Sunarhadi, M.Si, an environmental expert from Universitas Sebelas Maret, who gave the PJBL_EP materials a score of 88.75 (very good) (see **Table 2**). He suggested adding maps, strengthening digital literacy, and improving writing consistency. Based on this validation, the PJBL_EP model draft was deemed feasible for field trials.

Table 2. Second Model Validation

No	Completeness of material	Score
1	Breadth of material	3
2	Depth of material	4
3	Accuracy of concepts and definitions	4
4	Accuracy of principles	3
5	Accuracy of facts	3
6	Accuracy of examples	4
7	Accuracy of images and illustrations	4
8	Accuracy of notations, symbols, and icons	4
9	Accuracy of references	3
10	Reasoning	3
11	Relevance/connectedness	4
12	Communication	4
13	Application	4
14	Attractiveness of material	3
15	Encourages further information-seeking	4
16	Alignment of material with scientific developments	4
17	Use of actual diagrams and illustrations	4
18	Use of case examples	3
19	Currency of references	3
20	Completeness of material	3
Total		71
	$Score : \frac{Obtained\ Score}{Maximum\ Score} x\ 100 = \frac{71}{80}\ x\ 100$	88,75

Source: Processed Data, 2025

Table 3. Third Model Validation

Assessment Indicators	Assessment Items	Score
Language Aspect	Use of proper language based on Indonesian grammar rules	4
	Use of effective language	4
	Use of unambiguous language	4
Visual/Display Aspect	The text or writing in this module is easy to read	4
	Images or tables presented are clear and not blurry	3
	The proportion of images presented is appropriate (not too many and not too few)	3
	Captions provided for each image in this module are clear and useful	4
	Images presented are visually appealing	3
	The images presented help in better understanding the material	3
Material Presentation Aspect	The module explains concepts needed in daily life as a teacher	3
	The module uses case examples related to daily life, especially in schools	3
	The presentation of material in the module encourages discussion	4
	The presentation of material in the module encourages further exploration of the topic	4
	The presentation of material in the module is easy to understand	4
	The material presented is well-structured	4
	Total	55
	$Score : \frac{Obtained\ Score}{Maximum\ Score} x\ 100 = \frac{55}{60}\ x\ 100$	91,67

Source: Processed Data, 2025

The validation process generated several inputs that guided revisions to the PJBL_EP model. Material, model, and readability validations were conducted to

ensure the product's clarity and feasibility. Readability was assessed by Siswanto, S.Pd, M.Pd, Head of the JHS Social Studies MGMP of Sukoharjo Regency, who confirmed that the syntax was sequential and aligned with the Pancasila Student Profile. The readability validation received a score of 91.67 and was declared feasible for trial implementation (see **Table 3**).

Based on feedback from the MGMP team and Social Studies teachers, two key inputs were given: (1) the learning steps should be simplified, and (2) the module and teaching materials need to be published promptly for teacher use—these inputs, along with expert validations, guided revisions to the initial PJBL_EP syntax.

The PJBL_EP model was tested through limited and large-scale trials by Social Studies teachers in Sukoharjo Regency, generating feedback for further refinement.

Table 4. Trial Results at JHS 3 Nguter

Syntax	Ecopedagogy Indicators	Indicators of the Pancasila Student Profile Strengthening Project	Process Findings	
			Teacher	Student
Formulation of Fundamental Questions	Environmental Knowledge and Awareness	The Dimension of Critical Thinking	Inaccurate information.	Reading issues.
Designing a Project (3R Project)		Dimension of Faith, Devotion to God Almighty, and Noble Character	Weak IPS alignment.	Uneven creativity.
Developing a schedule (creating a relief map using plastic/paper waste)	Environmental Awareness	Dimension of Cooperation, Creative Dimension, Independent Dimension	No schedule discussion.	Reading issues.
Monitoring the progress of the project		Dimension of Cooperation, Independent Dimension	Weak class management.	Stage-1 overload.
Testing the results		Independent Dimension, Critical Reasoning Dimension	Low last-period effectiveness.	Low focus last period.
Experience Evaluation	Application of Environmental Care	Dimension of Faith, Devotion to God Almighty, and Noble Character	Weak environmental reflection.	Low app awareness.

Source: Processed Data, 2025

During implementation, the first syntax involved asking essential questions about environmental issues and natural resource potential, followed by a video on pollution. In the second syntax, students worked in heterogeneous groups on a Sustainable Living with 3R project, creating maps from plastic waste while collaborating, analysing ideas, and designing schedules. The teacher

monitored progress and recorded student activities using a rubric. Each group then presented their work, received peer feedback, and was evaluated on skills and attitudes. The trial concluded with a class reflection on the overall project experience.

Table 4 presents the trial of the PJBL_EP model at JHS 3 Nguter, which revealed several challenges faced by both teachers and students. On the teacher's side, there were limitations in mastering social studies content, managing the class and time effectively, and conducting reflections that emphasised environmental awareness. On the students' side, issues included some who still struggled with reading, uneven levels of creativity, lack of focus due to classroom conditions and scheduling, and limited knowledge about environmental care applications. The lack of self-confidence among educators and students, due to limited knowledge, awareness, resources, and time, has been identified as a major inhibiting factor (Ago et al., 2025).

Table 5. Trial Results at JHS 5 Sukoharjo

Syntax	Ecopedagogy Indicators	Indicators of the Pancasila Student Profile Strengthening Project	Process Findings	
			Teacher	Student
Formulation of Fundamental Questions	Environmental Knowledge and Awareness	The Dimension of Critical Thinking	Voice unclear.	Low focus.
Designing a Project (3R Project)	Environmental Awareness	Dimension of Faith, Devotion to God Almighty, and Noble Character	No student involvement.	Low eco-knowledge.
Developing a schedule (creating a relief map using plastic/paper waste)		Dimension of Cooperation, Creative Dimension, Independent Dimension	No schedule discussion.	Project confusion.
Monitoring the progress of the project		Dimension of Cooperation, Independent Dimension	Poor time management.	Low understanding.
Testing the results		Independent Dimension, Critical Reasoning Dimension	Limited presentation time.	Presentation shyness.
Experience Evaluation	Application of Environmental Care	Dimension of Faith, Devotion to God Almighty, and Noble Character	Module attention is lacking.	Low independence.

Source: Processed Data, 2025

Table 5 shows that the trial of the PJBL_EP model at JHS Sukoharjo revealed several challenges for both teachers and students. On the teacher's side, issues included speaking too softly with unclear intonation, not involving students in project design, preparing schedules without discussion, weak time management, and giving limited opportunities for presentations, as well as insufficient attention to the teaching module. On the students' side, problems included a lack of focus when receiving information, low environmental awareness, confusion in organising projects, needing more time to understand, low confidence during presentations, and a lack of independence.

Table 6. Trial Results at JHS Muhammadiyah Kartosura

Syntax	Ecopedagogy Indicators	Indicators of the Pancasila Student Profile Strengthening Project	Process Findings	
			Teacher	Student
Formulation of Fundamental Questions	Environmental Knowledge and Awareness	The Dimension of Critical Thinking	The teacher needs better IPS mastery.	Students must build thinking and collaboration.
Designing a Project (3R Project)		Dimension of Faith, Devotion to God Almighty, and Noble Character	The teacher must tighten the schedule.	Students must focus on planning.
Developing a schedule (creating a relief map using plastic/paper waste)	Environmental Awareness	Dimension of Cooperation, Creative Dimension, Independent Dimension	The teacher forms heterogeneous groups.	Students must voice challenges.
Monitoring the progress of the project		Dimension of Cooperation, Independent Dimension	The teacher needs better IPS mastery.	Students must build thinking and collaboration.
Testing the results		Independent Dimension, Critical Reasoning Dimension	All groups must present.	Students must share experiences.
Experience Evaluation	Application of Environmental Care	Dimension of Faith, Devotion to God Almighty, and Noble Character	Teachers must ensure real and theoretical app use.	Students must improve app skills.

Source: Processed Data, 2025

Table 6 shows the trial of the PJBL_EP model at JHS Muhammadiyah Kartasura, which indicates that teachers need to strengthen their mastery of social studies content, design tighter schedules, form heterogeneous groups, and provide equal opportunities for reflection. It was also important to ensure that students

understood the function of the environmental awareness application not only as a theoretical concept but also as a practical implementation. On the students' side, improvements were still needed in critical thinking skills, confidence in expressing opinions, independence in group collaboration, as well as knowledge and skills in using the environmental awareness application, so that the learning objectives could be achieved more optimally. Research conducted by Benzer et al. (2025) suggests that unrestricted machine learning can integrate large-scale data in environmental education.

Across the three schools, teachers showed similar weaknesses in Social Studies mastery, classroom management, and reflection on environmental awareness. Students likewise faced challenges in environmental knowledge, independence, confidence, and use of environmental applications. However, distinct patterns emerged: SMPN 3 Nguter struggled with basic literacy, concentration, and poor classroom conditions; JHS 5 Sukoharjo faced unclear teacher communication and project organisation issues, while JHS Muhammadiyah Kartasura dealt with more advanced needs, such as application-use skills and confidence in sharing experiences.

The extended trial refined the PJBL_EP syntax to better match classroom conditions in Sukoharjo. Key improvements included merging stages 2 and 3 to simplify activities and adding an ecopedagogy component to strengthen teacher understanding. Keeping educators updated is essential for promoting awareness of human impacts on the environment and sustainable behaviour (Li et al., 2025). Although teachers initially perceived PJBL_EP as difficult, simulations showed that Social Studies can be more engaging and critical through projects. Teachers from both public and private schools participated actively, consistent with findings that training enhances knowledge, skills, and professional growth (Huseyin et al., 2025). Questionnaire results from 22 schools showed that 8 of 10 PJBL_EP implementation indicators were rated highly appropriate, confirming that the model is feasible and effective for Social Studies instruction. Findings from the Extended Trial are shown in **Table 7**.

Table 7. Findings from the Extended Trial

PJBL_EP Stage	Pancasila Student Profile	Learning Steps
Stage 1 – Determining the Fundamental Questions	Critical Reasoning Dimension, Global Diversity Dimension	- The teacher asks questions about "the potential of Indonesia's natural resources, ways to conserve natural resources, and methods to process waste without harming natural resources." - Students actively watch a video about pollution and environmental changes. Examples of products made from plastic/paper waste are the 3R.
Stage 2 – Designing the Project (3R Project)	Dimension of Faith, Devotion to God Almighty, and Noble Character; Dimension of Cooperation; Creative Dimension	- Students, together with their groups, begin to develop the project concept by collaborating, reasoning, analysing, and then presenting ideas to design the project plan. - Students divide tasks within their groups and list the materials and tools needed. - The teacher monitors the students.
Stage 3 – Developing the Schedule (Creating a Relief Map Using Plastic/Paper Waste)	Dimension of Cooperation, Creative Dimension, Independent Dimension	- Students, together with their groups, prepare the schedule and divide tasks. - The teacher monitors students' activities.
Stage 4 – Monitoring Project Progress	Dimension of Cooperation, Independent Dimension	- The teacher inquires about the project's progress and any difficulties that may arise. - Students actively ask questions regarding potential challenges. - The teacher fills out a rubric to record students' activities as they complete the project.
Stage 5 – Testing the Results	Independent Dimension, Critical Reasoning Dimension	- Students present the products they have created. - Other students provide feedback. - The teacher assesses both the skills and attitude aspects.
Stage – Experience Evaluation	Dimension of Faith, Devotion to God Almighty, and Noble Character	- Students are allowed to share their experiences while completing the project tasks. - The teacher provides feedback on both the process and the products produced. - The teacher and students reflect on the activities and outcomes of the project tasks.

Source: Processed Data, 2025

Initially, Social Studies teachers viewed the PJBL_EP model as challenging and preferred conventional teaching methods. However, after simulating the syntax, their perception shifted—they realised that Social Studies can be taught more engagingly through projects that stimulate creativity and critical reasoning. Model refinement included improving classroom and time management, forming more heterogeneous groups, introducing

intergroup assessments earlier, and deepening teachers' understanding of the module through discussions. These steps align with competencies needed for future sustainability, such as systems thinking and strategic action (Sá et al., 2022).

Large-scale trials revealed several challenges: group compositions were not fully heterogeneous due to school policies that separated boys and girls, time management remained ineffective, and student participation was uneven—partly due to limited teacher guidance and some students' low reading abilities. To improve implementation, teachers must strengthen classroom control, time allocation, and group heterogeneity, clearly communicate intergroup assessments from the start, and receive academic support from researchers to enhance their mastery of the material.

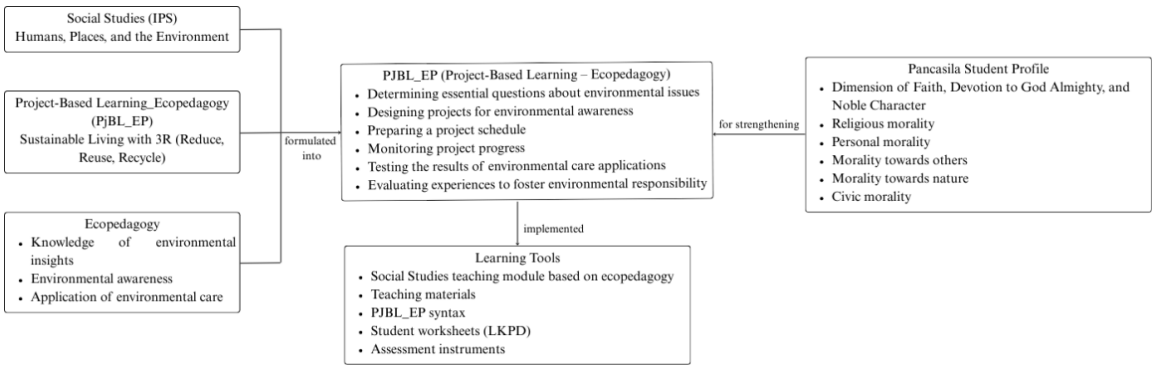

Figure 2. PjBL_EP Model

Source: Analysis Data, 2024

The diagram outlines the development flow of the PJBL_EP model in Social Studies learning (**Figure 2**), covering stages from formulating essential environmental questions to project design, scheduling, monitoring, testing, and reflection. Ecopedagogy-based modules, teaching materials, PJBL_EP syntax, worksheets, and assessment tools support the model. Interactive materials and classroom trials strengthen student engagement (Chauhan et al., 2025). PJBL_EP enhances environmental literacy and reinforces key dimensions of the Pancasila Student Profile: faith and piety, personal and social morality, ecological awareness, and national character. Education, both formal and informal, also plays a crucial role in building sustainability-oriented behaviour (Perea et al., 2025).

Compared with previous approaches, this study offers a novel integration of PjBL and ecopedagogy within a unified

syntax, unlike earlier models that used environmental themes merely as context. PJBL_EP embeds ecopedagogy, ecological awareness, sustainability practices, critical reflection, and environmental action into every stage of PjBL. The model also operationalises P5 dimensions (critical thinking, creativity, independence, collaboration, and moral-spiritual character) as measurable indicators. Thus, PJBL_EP serves as a comprehensive pedagogical strategy that simultaneously builds ecological competence and Pancasila character.

CONCLUSIONS

The development of the PJBL_EP model in Social Studies learning has proven feasible, practical, and effective in integrating the Merdeka Curriculum with the strengthening of the Pancasila Student Profile. The final model consists of a clear and systematic syntax, essential questioning, project design, scheduling, monitoring, testing, and reflection integrated with key ecopedagogy principles such as ecological awareness, critical reflection, and sustainability. The model establishes clear teacher–student roles and includes achievement indicators aligned with critical thinking, creativity, collaboration, independence, and ecological literacy. Future development may involve more exhaustive effectiveness testing, digital module development, and application to other subjects. Unlike previous studies that only use environmental themes as context, this research offers a model that systematically integrates PjBL and ecopedagogy to strengthen P5 dimensions directly, combining ecological awareness with character and competency development coherently and measurably.

REFERENCES

Ago, J. L., Kilgour, A., Chau, M., Ohene-Botwe, B., Ofori-Manteaw, B., Smith, C. L., Acquah, G., & Akudjedu, T. N. (2025). Advancing environmental sustainability concepts in medical radiation science education: A document analysis. *Radiography*, *31*(5). https://doi.org/10.1016/j.radi.2025.103090

Benzer, S., Garabaghi, F. H., Benzer, R., & Güni, H. Ç. (2025). Sustainable environmental education: Some machine learning algorithms in the classification of sustainable environmental attitudes. *Evaluation and Program Planning*, *112*. https://doi.org/10.1016/j.evalprogplan.2025.102652

Bruce Joyce, Marsha Weil, & Calhoun, E. (2016). Models Of Teaching:

Model-Model Pembelajaran (9th ed.). Yogyakarta: Pustaka Pelajar.

Chauhan, R., Dangi, M. B., Rijal, K., & Cohen, R. R. H. (2025). Environmental science education in Nepal: Historical development, current status, and prospects. *Social Sciences and Humanities Open*, *12*. https://doi.org/10.1016/j.ssaho.2025.101853

Ganda, F. (2019). The impact of innovation and technology investments on carbon emissions in selected organisation for economic Cooperation and development countries. *Journal of Cleaner Production*, *217*, 469–483. https://doi.org/10.1016/j.jclepro.2019.01.235

Huseyin, M. Y., Dershewi, A., Marais, D., & Albuhtori, M. (2025). Evaluating the effectiveness of a health and environmental education training program for Syrian teachers in Northern Syria. *International Journal of Educational Research Open*, *8*. https://doi.org/10.1016/j.ijedro.2025.100448

Holt, J., Skali, A., & Thomson, R. (2021). The additionality of R&D tax policy: Quasi-experimental evidence. *Technovation*, *107*. https://doi.org/10.1016/j.technovation.2021.102293

Jornet, A., Penuel, W. R., Esteban-Guitart, M., & Akkermann, S. (2025). Socio-educational ecologies for learning, social change, and future thinking: Expanding educational psychology's boundaries. *Acta Psychologica*, *258*. https://doi.org/10.1016/j.actpsy.2025.105156

Kola-Olusanya, A., Adewale, P. S., Yusuf, F., & Odekeye, O. T. (2025). Environmental education for nurturing nature: Assessment of environmental education in nature protection in Nigeria. *Social Sciences and Humanities Open*, *12*. https://doi.org/10.1016/j.ssaho.2025.101755

Kongson, R. (n.d.). Using STSE-Model Learning to Examine Students' Environmental Awareness of the Risk of Environmental Disaster. In *International Journal of Innovation, Creativity and Change. www.ijicc.net* (Vol. 13, Issue 6). www.ijicc.net

Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System. State Gazette of the Republic of Indonesia Year 2003 Number 78.

Li, B., Nie, W., Zuo, X., & Zuo, H. (2025). How does education affect knowledge and intergenerational social class mobility in China? *Journal of Innovation and Knowledge*, *10*(3). https://doi.org/10.1016/j.jik.2025.100678

Li, S., Liu, Z., Tripathi, V. C., & Mohamed Hashim, M. A. (2025). An investigation of landscape of environmental education (EE): A bibliometric and systematic literature review. *International Journal of Management Education*, *23*(3). https://doi.org/10.1016/j.ijme.2025.101229

Misiaszek, G. W. (2014). *Learning from Southern environmental education models: Borrowing ecopedagogy*

through processes of globalization from below. https://www.researchgate.net/publication/342716030

Misiaszek, G. W. (2015). Ecopedagogy and Citizenship in the Age of Globalisation: Connections between environmental and global citizenship education to save the planet. *European Journal of Education*, *50*(3), 280–292. https://doi.org/10.1111/ejed.12138

Osman, Y. (2024). Understanding how to develop an effective role-modelling character education programme in Saudi Arabia. *Globalisation, Societies and Education*. https://doi.org/10.1080/14767724.2024.2330363

Perea, H. R., Piedrahita, A. R., & Alzate, Ó. E. T. (2025). Models of environmental awareness: exploring their nature and role in environmental education – a systematic review. *Heliyon*, *11*(13). https://doi.org/10.1016/j.heliyon.2025.e43679

Pradhan, I., Shea, M. V., & Jurow, A. S. (2024). What is at risk in campus activism?: Learning as part of progressive social change in U.S. and Indian higher education. *Acta Psychologica*, *250*. https://doi.org/10.1016/j.actpsy.2024.104537

Rachman, A., Putro, H. Y. S., Rusandi, M. A., & Situmorang, D. D. B. (2024). The development and validation of the "Kuesioner Tema Proyek Penguatan Profil Pelajar Pancasila" (KT P5): A new tool for strengthening the Pancasila Student Profile in Indonesian pioneer schools. *Heliyon*, *10*(16). https://doi.org/10.1016/j.heliyon.2024.e35912

Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia Number 12 of 2024 concerning the Curriculum in Early Childhood Education, Primary Education, and Secondary Education.

Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.53/MENLHK/SETJEN/KUM.1/9/2019 concerning the Movement for Caring and Cultured Environment in Schools.

Regulation of the Minister of Primary and Secondary Education of the Republic of Indonesia Number 13 of 2025 concerning the Curriculum Structure of Junior High Schools.

Rohsulina, P., Setyowati, D. L., Priyanto, A. S., & Utomo, C. B. (2024). Project based learning model-Eco pedagogy on environmental health material in public junior high schools in Sukoharjo regency. *Edelweiss Applied Science and Technology*, *8*(5), 2436–2446. https://doi.org/10.55214/25768484.v8i5.2014

Sá, P., Lourenço, M., & Carlos, V. (2022). Sustainability Competencies in Higher Education Research: An Analysis of Doctoral Theses in Portugal. *European Journal of Investigation in Health, Psychology and Education*, *12*(4), 387–399. https://doi.org/10.3390/ejihpe12040028

Saeidnia, H. R., Kozak, M., Ausloos, M., Herteliu, C., Mohammadzadeh, Z., Ghorbi, A., Karajizadeh, M., & Hassanzadeh, M. (2022).

Development of a Mobile App for Self-Care Against COVID-19 Using the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) Model: Methodological Study. *JMIR Formative Research*, *6*(9). https://doi.org/10.2196/39718

Sarifah, I., Nurhasanah, N., Hasanah, U., Marini, A., & Muawanah, U. (2025). How can educational policy support the application of the Rasch Model for character E-assessment in elementary schools during Indonesia's new normal era? *Social Sciences and Humanities Open*, *12*. https://doi.org/10.1016/j.ssaho.2025.101752

Sarpong, D., Boakye, D., Ofosu, G., & Botchie, D. (2023). The three pointers of research and development (R&D) for growth-boosting sustainable innovation system. *Technovation*, *122*. https://doi.org/10.1016/j.technovation.2022.102581

Suryantari, H. (2022). Exploring Character of Pancasila Students in the English Textbook for the Tenth Grade Senior High School Students. *Journal of English Language Learning (JELL)*, *6*(2), 229–243. https://doi.org/10.31949/jell.v6i2.3772