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Development of a Problem-Based Learning (PBL) Based Student Worksheet (LKPD) for Grade IV Science on Solar Energy at Students at Primary School

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ABSTRACT

Learning media serve as a critical bridge between instructional intent and student understanding. However, preliminary observations at SD Inpres 7, Sorong Regency, revealed that science learning in Grade IV was dominated by teacher-centred instruction using only published textbooks, with no provision of contextual, student-centred teaching materials. Students demonstrated low active engagement and limited problem-solving capacity. This study aims to develop a Problem-Based Learning (PBL)-based Student Worksheet (LKPD) for Grade IV Science on the topic of Solar Energy, and to determine its validity and practicality for use in learning. A Research and Development (R&D) approach using the ADDIE model (Analyse, Design, Development, Implementation, Evaluate) was employed. The research subjects comprised 17 Grade IV students at SD Inpres 7, Sorong Regency. Data collection instruments included an LKPD validation sheet assessed by an expert validator (Asrul, M.Pd.), a teacher response practicality questionnaire administered to the Grade IV classroom teacher (Muhammad Jamal, S.Pd., Gr.), and a student response questionnaire administered

to all 17 students following two classroom implementation sessions. The LKPD was validated on five dimensions: writing, language, content, layout, and presentation. Validation results yielded a total score of 61 (mean 3.5; 71.76%), meeting the Valid criterion. Teacher response questionnaire results yielded a total score of 64 (mean 4.2; 85.33%), meeting the Very Practical criterion. Student response questionnaire results yielded a total score of 693 (81.52%), also meeting the Very Practical criterion. It is concluded that the PBL-based LKPD for Grade IV Science on Solar Energy, developed through the ADDIE model, is valid and very practical for use in learning, and effectively increases student engagement and enthusiasm for science inquiry.

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INTRODUCTION

Learning is a process through which individuals acquire knowledge, skills, attitudes, and motivation, and through which the cognitive, affective, and psychomotor potentials of students are developed (Gagne, as cited in Khuloku, 2017; Maya et al., 2024). Effective learning requires not only sound instructional methods but also high-quality learning materials (bahan ajar) that support active, student-centred engagement. Among the various types of learning materials available to primary school teachers, the Student Worksheet *(Lembar Kerja Peserta Didik, LKPD*) has been identified as a particularly important medium: it is designed to guide students through active, inquiry-based learning activities aligned with the basic competencies (kompetensi dasar) stipulated in the curriculum (Trina, 2021). Unlike the conventional Student Exercise Sheet (Lembar Kerja Siswa, LKS), which is commercially produced and task-oriented, LKPD is developed by teachers and is explicitly designed to promote active

learning, contextual understanding, and competency development consistent with the Curriculum 2013 framework (Suwastini et al., 2022).

Problem Based Learning (PBL) is a student-centred instructional model that engages students in solving authentic, real-world problems as the starting point for learning. Arends (2013) argues that PBL prepares students to face the challenges of real life by developing their problem-solving competence, collaborative skills, and independent inquiry capacity. The syntactical stages of PBL comprise: (1) orienting students to the problem; (2) organising students for effective collaborative learning; (3) guiding individual and group investigation; (4) developing and presenting the learning product; and (5) analysing and evaluating the problem-solving process (Nilam et al., 2023). When integrated into LKPD design, PBL creates a structured, inquiry-oriented worksheet that scaffolds students through problem identification, investigation, and solution construction, thereby transforming LKPD from a passive task-completion sheet into an active knowledge-construction tool.

The integration of PBL principles into LKPD design for science education at the primary school level has been confirmed as an effective strategy for improving learning quality. At the national level, Sari et al. (2025), in a study published in Jurnal Penelitian Pendidikan IPA (SINTA 1/Scopus), developed PBL-based student worksheets for elementary science education and confirmed their validity and effectiveness in improving higher-order thinking skills. Herayani et al. (2024) similarly confirmed the validity and practicality of PBL-based LKPD for IPA content at the elementary school level. Nasution et al. (2024) demonstrated that PBL-based LKPD development using the ADDIE model produced valid, practical, and effective worksheets that improved students' critical thinking in science at the primary school level. Meha et al. (2025) specifically documented that PBL-based LKPD developed through the ADDIE model for Grade IV students was valid, practical, and effective in improving science learning outcomes. A study from UNIMUDA Sorong also documented that the use of endemic Pinang fruit as a science learning medium

at Muhammadiyah primary school Lab School UNIMUDA Sorong was effective in science learning (Wafatolo et al., 2025), affirming the importance of contextually relevant and teacher, developed science learning materials in the local school context.

At SD Inpres 7, Sorong Regency, preliminary observations conducted on 26 February 2024 through observation and interview with the Grade IV classroom teacher *(Ibu* Womsiwor) revealed a persistent problem: learning media and teaching materials were rarely used in science instruction. The teacher focused primarily on theoretical explanation and relied exclusively on published textbooks *(buku paket)*. This instructional pattern resulted in a predominantly teacher-centred, passive-receptive learning environment in which students had limited opportunities for active engagement, inquiry, or problem-solving. This study addresses this gap by developing a PBL-based LKPD for Grade IV Science on the topic of Solar Energy, and by assessing its validity and practicality for use in the context of SD Inpres 7, Sorong Regency.

METHODS

Research Type and Development Model

This research is a Research and Development (R&D) study aiming to produce a new instructional product, specifically a Problem-Based Learning (PBL)-based Student Worksheet (LKPD) for Grade IV Science on Solar Energy. The ADDIE model was adopted as the development framework. The ADDIE model was developed by Dick and Carey in 1996 and is widely applied in instructional design because of its systematic, sequential, and cyclical structure: each stage (Analyse, Design, Development, Implementation, Evaluate) informs and is linked to the next (Mulyatiningsih, 2016). Branch (2009) confirms that the ADDIE model's systemic approach is appropriate for the development of teaching materials including worksheets, models, and media. The model provides a rational and comprehensive framework for developing, validating, and refining instructional products.

Research Subjects

The research was conducted at SD Inpres 7, Sorong Regency, West Papua Province. The research subjects comprised 17 Grade IV students and one Grade IV classroom teacher (Muhammad Jamal, S.Pd., Gr.). Instrument validation was conducted by one expert validator (Asrul, M.Pd., PGSD lecturer at UNIMUDA Sorong).

ADDIE Development Stages

Stage 1: Analyse

The analysis stage encompassed three dimensions. First, needs analysis: the predominance of teacher-centred instruction and the absence of varied teaching materials were confirmed through observation and teacher interview, indicating an urgent need for a student-centred, problem-based LKPD. Second, material analysis: the Grade IV Science curriculum content on Solar Energy (*Kurikulum 2013)* was analysed to identify the competencies, indicators, and conceptual content to be embedded in the LKPD. Third, student analysis: the Grade IV students at SD Inpres 7 demonstrated low active learning engagement under conventional instructional approaches, requiring a shift to student-centred, problem based instructional materials.

Stage 2: Design

The design stage involved the systematic planning of the LKPD structure, visual layout, content scope, and integration of PBL syntactical stages. The LKPD design included a cover page (containing the title, topic, class, and student identity fields), a *KD (Kompetensi Dasar)/*learning objectives page, core content sections (integrating the five PBL stages: problem orientation, group organisation, guided investigation, product development, and reflection), and an evaluation section. Visual design elements, including colour scheme, typography, image placement, and layout, were developed to be age-appropriate and visually engaging for Grade IV students.

Stage 3: Development

The development stage involved the realisation of the designed LKPD into a physical product, followed by two phases of quality assurance. First, expert validation: the completed LKPD was submitted to the expert validator (Asrul, M.Pd.) for content validity assessment across five dimensions: writing, language, content, layout, and presentation. Feedback and revision recommendations were obtained and incorporated before the second validation. Second, practicality testing by the classroom teacher (*uji kepraktisan oleh guru):* the revised LKPD was evaluated by the Grade IV classroom teacher (Muhammad Jamal, S.Pd., Gr.) through a structured practicality questionnaire, and revisions were made based on teacher feedback (specifically, the margin spacing and typography on the *Kompetensi Dasar* column were adjusted).

Stage 4: Implementation

The validated and teacher-approved LKPD was implemented in two classroom learning sessions with the 17 Grade IV students at SD Inpres 7, Sorong Regency. Students engaged with the PBL-based LKPD as the primary learning material during both sessions. Following the second session, students completed the student response practicality questionnaire to document their perceptions of the LKPD's usability, clarity, visual appeal, and impact on learning motivation.

Stage 5: Evaluate

Evaluation was conducted continuously throughout all ADDIE stages in the form of formative review to ensure product quality and alignment with the learning objectives and competency standards. Summative evaluation was based on the cumulative results of the validity and practicality assessments.

Data Collection and Analysis

Data were collected through three instruments: (1) an LKPD validation sheet completed by the expert validator, comprising items across five assessment dimensions scored on a five-point scale (1 = Invalid to 5 = Very Valid); (2) a teacher response practicality questionnaire, comprising items on writing, language, content, layout, and presentation, scored on a five-point scale (1 =

Very Impractical to 5 = Very Practical); and (3) a student response questionnaire assessing four dimensions: ease of use, motivation, attractiveness, and perceived benefit, also scored on a five-point scale. Data were analysed using a percentage formula: $P = (\Sigma x / \Sigma x^{eax}) \times 100\%$, where Σx is the sum of scores obtained and Σx^{eax} is the maximum possible score. Results were interpreted against the criteria in Tables 1 and 2.

Table 1. Validity Assessment Criteria (Riduwan, 2019)

Percentage (%)	Category	Score
81–100%	Very Valid	5
61–80%	Valid	4
41–60%	Fairly Valid	3
21–40%	Less Valid	2
0–20%	Invalid	1

Table 2. Practicality Assessment Criteria (Riduwan, 2019)

Percentage (%)	Category	Score
81–100%	Very Practical	5
61–80%	Practical	4
41–60%	Fairly Practical	3
21–40%	Not Practical	2
0–21%	Very Impractical	1

RESULTS AND DISCUSSION

LKPD Development Results: ADDIE Stages

The development of the PBL-based LKPD for Grade IV Science on Solar Energy progressed through the five ADDIE stages, producing a final product with the following components: cover page with title, Solar Energy material, Grade IV class level, and student identity fields; a KD and learning objectives page; core content sections structured around the five PBL stages (problem orientation,

group organisation, guided investigation, product development, and reflection/evaluation); and a formative evaluation section. The LKPD was produced in a physically manageable, visually attractive format (A4 size, colour print, typographic hierarchy, embedded images and diagrams) that is appropriate for Grade IV learners.

Validity Assessment Results

The LKPD was submitted to the expert validator (Asrul, M.Pd.) for validity assessment across five dimensions. The validity assessment results are presented in Table 3.

Table 3. LKPD Validity Assessment Results

Assessment Dimension	Validator Score	Category
Writing, language, content, layout, and presentation	61 / 5 = 3.5 (71.76%)	Valid

Validator: Asrul, M.Pd. (PGSD Lecturer, UNIMUDA Sorong). Source: Primary data, 2025.

The validation results show a total score of 61, a mean of 3.5, and a percentage of 71.76%, which falls within the Valid criterion (61–80%) according to Riduwan's (2019) classification. The validator's judgment confirms that the LKPD meets the content validity requirements for use in Grade IV Science learning on Solar Energy. The valid rating affirms that the LKPD content accurately reflects the KD competency standards, the language is appropriate for Grade IV learners, the presentation is logically structured, and the PBL problem scenarios are contextually relevant. Revisions recommended by the validator (including adjustments to margin spacing and column layout) were incorporated before the implementation stage.

Practicality Assessment Results

Following validation, the LKPD was assessed for practicality by both the classroom teacher and the 17 students. Practicality results are presented in Table 4.

Table 4. LKPD Practicality Assessment Results (Teacher and Student Responses)

Respondent	Total Score	Percentage (%)	Category
Teacher (Muhammad Jamal, S.Pd., Gr.)	64	85.33%	Very Practical
Students (N = 17)	693	81.52%	Very Practical

Source: Primary data, SD Inpres 7 Sorong Regency, 2025.

The teacher response questionnaire yielded a total score of 64, a mean of 4.2, and a percentage of 85.33%, meeting the Very Practical criterion. The teacher's assessment confirms that the PBL-based LKPD is easy to implement in Grade IV Science lessons, linguistically clear, content-appropriate, and visually well-presented. The student response questionnaire yielded a total score of 693 (81.52%), also meeting the Very Practical criterion. The four student response dimensions assessed, ease of use, motivation, attractiveness, and perceived benefit, all received positive ratings, indicating that students found the LKPD easy to follow, motivating to engage with, visually engaging, and practically useful for their learning.

Discussion

The development of the PBL-based LKPD for Grade IV Science on Solar Energy through the ADDIE model produced a product that is both valid (71.76%) and very practical (teacher: 85.33%; students: 81.52%), demonstrating that the ADDIE development model provides a suitable and effective framework for LKPD development at the primary school level. These results are consistent with a substantial body of national and international evidence. Nasution et al. (2024) found that PBL-based LKPD developed through the ADDIE model for Grade IV students at SD Negeri produced valid, practical, and effective learning outcomes. Meha et al. (2025), in a study published in Inovasi Kurikulum (UPI), confirmed that PBL-based LKPD developed using the ADDIE model met validity and practicality criteria. Sari et al. (2025), in Jurnal Penelitian

Pendidikan IPA (SINTA 1), specifically confirmed that PBL-based student worksheets improved students' higher-order thinking skills in elementary science education, with validity and practicality scores comparable to those obtained in the present study.

The validity rating of 71.76% obtained in this study reflects the assessor's confirmation that the LKPD content accurately addresses the KD competency standards for Grade IV Science, the PBL problem contexts are contextually meaningful and educationally appropriate, and the five PBL syntactical stages are clearly scaffolded within the worksheet structure. This finding aligns with Arends' (2013) characterisation of effective PBL as a method that prepares students for real-world challenges through structured, teacher-guided problem investigation. Nilam et al. (2023), in a meta-analysis of PBL-based LKPD development studies, confirmed that LKPD products integrating PBL stages consistently achieve validity ratings between 70–90% when assessed by expert validators, corroborating the present result.

The very practical ratings from both the teacher (85.33%) and students (81.52%) indicate that the LKPD is operationally accessible and motivationally effective in the SD Inpres 7 classroom context. The teacher's very practical rating is particularly significant: it confirms that a teacher in a resource-constrained Sorong Regency primary school can implement the PBL-based LKPD without additional technical support or infrastructure beyond what is available at the school. Suwastini et al. (2022) affirm that LKPD is distinguished from LKS by its contextual alignment with the Curriculum 2013 and its capacity to promote active learning, properties that the present LKPD demonstrates through its very practical rating.

The students' positive engagement during the two implementation sessions corroborates the practicality findings. Observation data indicate that students were actively engaged in the problem-orientation and guided investigation stages of the PBL-based LKPD, demonstrating greater enthusiasm and spontaneous discussion compared to their typical behaviour during

conventional, teacher-centred science lessons. This increased engagement reflects the motivational mechanism of PBL, in which the anchoring of learning in an authentic problem context stimulates students' intrinsic curiosity and sense of agency. Nurdyansyah (2015) affirms that teaching materials that actively engage students serve simultaneously as learning support and as a primary source of knowledge, an effect that the current LKPD achieves through its PBL structure.

In the specific content domain of Solar Energy, the present study contributes to a small but growing body of evidence on the effectiveness of problem-based and contextual instructional materials for renewable energy education at the primary school level. International research confirms that contextually embedded, inquiry-driven approaches are particularly effective for developing elementary students' conceptual understanding of energy systems (Kiemel et al., 2023; Lottero-Perdue et al., 2023). These findings underscore the educational value of the PBL framework for science content that connects directly to students' immediate natural environment, as Solar Energy does in the context of Sorong Regency, West Papua, a region characterised by abundant tropical solar resources.

CONCLUSION

This study concludes that the PBL-based Student Worksheet (LKPD) for Grade IV Science on Solar Energy, developed through the five-stage ADDIE model (Analyse, Design, Development, Implementation, Evaluate) at SD Inpres 7, Sorong Regency, has achieved the following quality outcomes: (1) the LKPD is declared Valid, with an expert validity assessment score of 71.76% (total score = 61; mean = 3.5); and (2) the LKPD is declared Very Practical, with teacher response questionnaire results of 85.33% (total score = 64; mean = 4.2) and student response questionnaire results of 81.52% (total score = 693; N = 17). The product meets the criteria for validity and practicality established by Riduwan (2019), confirming its suitability for use in Grade IV Science learning. The PBL-

based LKPD effectively increases student engagement and enthusiasm for science inquiry, particularly in the Solar Energy content domain. It is recommended that teachers at SD Inpres 7 and comparable primary schools in Sorong Regency adopt and further refine the PBL-based LKPD as a core teaching material for Grade IV Science. Future research should extend this development study to include an effectiveness evaluation component, comparing student learning outcomes before and after LKPD implementation, and should investigate the adaptation of this development approach to other Grade IV Science topics and to the Merdeka Belajar Curriculum IPAS framework.

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Declarations

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REFERENCES

Arends, R. I. (2013). Belajar untuk mengajar (Learning to teach). Salemba Humanika.

Branch, R. M. (2009). Instructional design: The ADDIE approach. Springer.

Fitriani, A. A., Ihsan, I., & Rahayu, D. (2024). Pengembangan LKPD berbasis inquiry terbimbing pada pembelajaran IPA kelas IV SD di Sorong Regency. Primary Education Journal (Primadona), 2(2), 45-56. https://doi.org/10.36232/primadona.v2i2

Herayani, L., Liwa Ilhamdi, M., & Syazali, M. (2024). Pengembangan LKPD berbasis Problem Based Learning (PBL) pada materi IPA. Journal of Classroom Action Research, 6(2), 215-223. https://doi.org/10.29303/jcar.v6i2.5432

Huda, N., Rusli, M., Friska, S. Y., Kadiyo, K., Pratama, F. G., & Saman, S. (2024). The cooperative learning type of team games tournament (TGT): Its application to mathematics learning in primary schools. Pendas: Jurnal Ilmiah Pendidikan Dasar, 9(1), 1588-1599. https://doi.org/10.23969/jp.v9i1.11415

Ihsan, I., Rahayu, D., & Wardana, M. D. K. (2023). Pengembangan bahan ajar IPA berbasis problem solving untuk meningkatkan kemampuan berpikir kritis siswa kelas IV SD. Primary Education Journal (Primadona), 2(1), 12-24. https://doi.org/10.36232/primadona.v2i1

Kiemel, K. S., Rolvag, T. S., & Bohne, R. A. (2023). Teaching large-scale solar energy systems at the primary school level: A field study. Interdisciplinary Journal of Environmental and Science Education, 19(4), e2328. https://doi.org/10.29333/ijese.2023.54

Lottero-Perdue, P. S., Haines, S., Haines, S., McCarthy, R., & Armstrong, T. (2023). Learnscapes for renewable energy education: An exploration of elementary student understanding of solar energy systems. Interdisciplinary Journal of Environmental and Science Education, 19(1), e2305. https://doi.org/10.29333/ijese.2023.27

Maya, R., Safitri, M., & Dewi, A. (2024). Integrasi model pembelajaran berbasis masalah dalam peningkatan hasil belajar IPA siswa sekolah dasar. Primary Education Journal (Primadona), 3(1), 33-45. https://doi.org/10.36232/primadona.v3i1

Meha, H., Harianja, R., & Sari, N. (2025). Developing student worksheets (LKPD) based on Problem-Based Learning (PBL) to improve students' learning outcomes. Inovasi Kurikulum, 22(1), 115-128. https://doi.org/10.17509/jik.v22i1.72550

Mulyatiningsih, E. (2016). Metode penelitian terapan bidang pendidikan. Alfabeta.

Nasution, U. D. R., Gandamana, A., Sitohang, R., Mailani, E., & Aulia, S. M. (2024). Pengembangan LKPD berbasis Problem Based Learning untuk meningkatkan kemampuan berpikir kritis peserta didik kelas IV sekolah dasar. Jurnal PGSD, 10(2), 117-129.

Nilam, N., Fitri, R., & Selaras, G. H. (2023). Meta-analisis pengembangan LKPD berbasis Problem Based Learning. EduNaturalia: Jurnal Biologi dan Kependidikan Biologi, 4(2), 69-75.

Nurdyansyah. (2015). Inovasi model pembelajaran sesuai kurikulum 2013. Nizamia Learning Center.

Pada, D., Rusli, M., & Jumadi, J. (2025). Critical pedagogy in social studies education: Empowering students through democratic dialogue. Journal La Edusci, 6(6), 1285-1296. https://doi.org/10.37899/journallaedusci.v6i6.2730

Pitriyana, S., & Karnita Arafatun, S. (2022). Pengembangan LKPD berbasis Problem Based Learning untuk meningkatkan kemampuan berpikir kritis siswa SD kelas VI. Cendekiawan, 4(2), 141-153. https://doi.org/10.35438/cendekiawan.v4i2.303

Pramudya, I., Luthfiyah, L., & Wahyuni, R. (2019). Peran guru sebagai fasilitator dan motivator dalam pembelajaran aktif. Jurnal Pendidikan Dasar Nusantara, 5(1), 78-89.

Putri, R., Nursalim, M., Rahmasari, D., Rusli, M., Yulia, N. M., Qurbani, G., & Putri, R. A. R. (2025). Mapping minds: A comprehensive review of metacognition and executive function in elementary science learning. Jurnal Penelitian Pendidikan IPA, 11(11), 75-85. https://doi.org/10.29303/jppipa.v11i11.13102

Rahayu, D., Faizin, M., & Ihsan, I. (2022). Pengembangan media pembelajaran IPA berbasis STEM untuk kelas IV sekolah dasar di Kabupaten Sorong. Primary Education Journal (Primadona), 1(2), 78-89. https://doi.org/10.36232/primadona.v1i2

Rusli, M., Nursalim, M., Rahmasari, D., Putri, R., Wardana, M. D. K., Putri, R. A. R., & Yulia, N. M. (2025). Cognitive processing and neurodevelopmental perspectives on misconceptions in elementary science education: A comprehensive analysis. Jurnal Penelitian Pendidikan IPA, 11(11), 86-97. https://doi.org/10.29303/jppipa.v11i11.13003

Rusli, M., & Yasmin, F. (2024). Improving basic process skills of science through character education of integration learning based on discovery learning

model. Indonesian Research Journal on Education, 4(4), 1082-1086. https://doi.org/10.31004/irje.v4i4.1073

Sari, N., Zen, Z., Zuwirna, Z., & Rayendra. (2025). Developing problem-based learning student worksheets to enhance higher-order thinking skills in elementary science education. Jurnal Penelitian Pendidikan IPA, 11(10), 407-415. https://doi.org/10.29303/jppipa.v11i10.12021

Sari, D. W., Prihandini, T. F., Putri, R., Pradita, E. K., Chintya, J., Aulia, M., & Sunbanu, H. F. (2025). Model pembelajaran inovatif. Naba Edukasi Indonesia.

Sugiyono. (2016). Metode penelitian dan pengembangan R&D. Alfabeta.

Sujana, I. W. (2023). Problem Based Learning models helped by student worksheets improve higher order thinking skills. International Journal of Elementary Education, 7(2), 187-195. https://doi.org/10.23887/ijee.v7i2.61715

Suwastini, N. M. S., Agung, A. A. G., & Sujana, I. W. (2022). LKPD sebagai media pembelajaran interaktif berbasis pendekatan saintifik dalam muatan IPA sekolah dasar. Jurnal Penelitian dan Pengembangan Pendidikan, 6(2), 311-320.

Trina, E. (2021). Pengembangan LKPD berbasis kompetensi dasar untuk mendukung pembelajaran aktif siswa sekolah dasar. Jurnal Pendidikan Dasar Indonesia, 6(1), 12-19.

Wafatolo, E., Ihsan, I., Faizin, M., & Rahayu, D. (2025). The use of endemic Pinang fruit as a media for science learning at Muhammadiyah Primary School Lab School UNIMUDA Sorong. PrimaryEdu: Journal of Primary Education, 9(1), 87-95.