

## Effect of Praener in the Contextual Teaching and Learning Model on the Sciences Learning Outcomes of Elementary School Students

Mely Rohmawati\*, Yuni Ratnasari, Sekar Dwi Ardianti

Elementary School Teacher Education, Faculty of Teacher Training and Education, Muria Kudus University, Kudus, Indonesia

\*e-mail: [202233216@std.umk.ac.id](mailto:202233216@std.umk.ac.id)

Received: February 4, 2026. Accepted: March 9, 2026. Published: March 16, 2026

**Abstract:** Science education at the elementary school level requires a connection between students' direct experiences and scientific concepts in order to create meaningful understanding. Although the Contextual Teaching and Learning (CTL) model has been widely implemented to improve learning outcomes, most studies still focus on the core stage of learning and do not clearly emphasize strengthening the early phase as a systematic strategy to prepare students' cognition. This gap is the background for this study, which aims to evaluate the novelty of Praener (energy practices) as reinforcement of the early phase in the CTL model to build initial schemas and conceptual bridges before the implementation of core learning. This study aims to analyze the use of Praener in the CTL model on the science learning outcomes of third-grade students regarding the introduction to energy forms. The method used was a quantitative approach with a one-group pretest-posttest pre-experimental design involving 23 third-grade students at SD 4 Gondangmanis in the 2025/2026 academic year. Data were collected through tests, observations, interviews, and documentation, then analyzed using a paired sample t-test and N-Gain test. The results of the study showed a significant difference between the pretest and posttest scores, with an average increase from 48.95 to 83.65 and an N-Gain score of 0.6948, which is classified as moderate (quite effective). This improvement occurred evenly across cognitive levels C1 to C6 and was particularly high in process skills. These findings confirm that Praener is effective in strengthening cognitive readiness and have practical implications for teachers, who can systematically integrate early experiences into CTL learning to make it more contextual and meaningful.

**Keywords:** Contextual Teaching and Learning; Elementary School; Praener; Process Skills; Science Learning Outcomes.

### Introduction

Science and Social Studies (IPAS) learning at the elementary level serves as a means for children to recognize their environment through the relationship between science, experience, and social values that exist in everyday life [1]. At this stage, students are not only introduced to the basics of science and social studies but are also guided to develop a systematic mindset for observing, interpreting, and responding to the phenomena they encounter at home, school, and in society. This learning approach is in line with the principles of the Merdeka Curriculum, which emphasizes character building, independent learning skills, and strengthening the scientific thinking process from the elementary school level [2]. This is not only in line with the principles of the Merdeka Curriculum but also strengthens students' position as active participants in the learning process. Students are encouraged to make observations, ask questions, and connect their learning experiences with IPAS concepts, so that the learning process becomes more meaningful and reflective, helping develop students' independence and scientific character.

Within the framework of children's cognitive development in elementary school, meaningful learning processes require a connection between real experiences and more abstract concepts [3]. Successful learning that links these two things provides students with opportunities to build understanding gradually and reflectively. IPAS

learning in the Merdeka Curriculum is designed to facilitate the development of scientific thinking skills through a series of observing, questioning, trying, processing information, and drawing conclusions in a context- and problem-solving-oriented manner [4]. Therefore, IPAS is not only considered a tool for transferring knowledge, but also a method for shaping scientific thinking and learning attitudes that are responsive to change.

Success in IPAS learning is evident in the learning outcomes achieved by students, which serve as the main benchmark for assessing the effectiveness of the learning process. Learning achievements not only reflect theoretical understanding of IPAS but also students' ability to connect knowledge to real-life situations. Learning methods that focus on real activities can increase students' intrinsic motivation and deepen their understanding of IPAS through direct participation in the learning process [5]. In other words, the use of visualization and simulation in certain contexts can enrich students' learning experiences, thereby having a positive impact not only on cognitive aspects but also on the development of process skills and scientific attitudes [6]. The application of a contextual approach in IPAS learning creates a learning environment better suited to students' needs, as it provides opportunities to explore, reflect on, and gradually apply concepts, resulting in more meaningful and sustainable learning outcomes.

However, field conditions indicate that IPAS learning objectives have not been fully met. At SD 4 Gondangmanis,

### How to Cite:

M. Rohmawati, Y. Ratnasari, and S. D. Ardianti, "Effect of Praener in the Contextual Teaching and Learning Model on the Sciences Learning Outcomes of Elementary School Students", *J. Pijar. MIPA*, vol. 21, no. 2, pp. 225–231, Mar. 2026.. <https://doi.org/10.29303/jpm.v21i2.11544>

particularly in grade III, IPAS learning outcomes are still low. Data from the Mid-Semester 1 Summative Assessment shows that of 23 students, only 7 are in the high category, while most are in the low and very low categories. The level of mastery, based on the Learning Objective Achievement Criteria (KKTP), is only about 30%, while 70% of students have not achieved mastery. The results of preliminary research conducted through interviews with classroom teachers show that learning still relies heavily on lectures and textbooks as the main sources, with practices limited to simple observations. Conventional learning makes it difficult for students to connect IPAS concepts with their daily experiences [7]. This condition shows that the learning process does not provide enough space for students to actively construct knowledge, leading to a resulting understanding that tends to be verbal and less meaningful in everyday life.

Classroom observations also showed that the presentation of learning objectives and the apperception connecting previous material with new material were not well done. The learning process was mostly conducted in a one-way manner, without support from diverse media and strategies, so student participation in questioning and discussion remained limited. Interviews with students showed that they were more interested in learning that involved direct activities and real classroom interaction. Student involvement in contextual learning experiences greatly influences their motivation and understanding of IPAS [8]. From the researcher's point of view, low student participation in one-way learning not only affects their motivation to learn but also hinders the development of critical thinking skills and their ability to relate IPAS concepts to real-life situations, thereby limiting students' learning outcomes to their full potential.

Conceptually, learning outcomes in IPAS learning not only reflect knowledge mastery but also include the development of process skills and scientific attitudes. Learning outcomes are abilities acquired by students through a systematically designed learning process [9]. This shows that the quality of learning outcomes depends greatly on how the learning process provides students with space to think, explore, and actively build understanding. Learning outcomes include verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills [10]. These aspects need to be developed in a balanced manner so that IPAS learning is not only oriented toward cognitive achievement but also toward the development of students' scientific attitudes and skills. In the context of IPAS, understanding IPAS and process skills are key elements, especially in applied subjects such as energy, which require students to observe, analyze, and draw conclusions from direct experience [11].

In response to these conditions, the Contextual Teaching and Learning (CTL) model is relevant because it links learning materials to students' real-life contexts. CTL encourages students to build knowledge through activities such as discovery, questioning, discussion, and reflection [12]. The CTL approach strengthens students' roles as active subjects in learning, enabling the development of critical thinking and problem-solving processes. Johnson mentions seven components of CTL, namely constructivism, inquiry, questioning, learning communities, modeling, reflection, and authentic assessment. The integration of these

components can create more meaningful and participatory science learning [13].

In teaching material on recognizing forms of energy, the CTL model can be reinforced through an initial learning phase that focuses on student experiences to build a basic understanding before conducting the main activities [14]. This approach, referred to in this study as Praener, aims to link the concept of energy to simple phenomena that are relevant to students' daily lives. The researchers argue that providing this initial experience serves as a cognitive bridge, helping students activate their existing knowledge so that the concept-formation process in the next stage becomes more focused and meaningful. Praener is an abbreviation for energy practice, one of the approaches in contextual learning. This activity integrates practical activities to conduct an experiment. Through simple practical activities, students are invited to observe, analyze, and connect concepts with reality, which in turn strengthens their understanding of science and science process skills [15].

Several previous studies support the application of the Praener-based CTL model in improving learning outcomes in science. The application of CTL in the context of the environment improves students' understanding of science and their engagement with science material [16]. Another study found that contextual learning through simple experimental activities can significantly improve students' learning outcomes and scientific attitudes [17]. Furthermore, a quantitative approach found that CTL had a positive impact on student learning outcomes in energy material at the lower level [18]. However, these three studies emphasized the efficiency of CTL or the experimental method in the main part of learning, without specifically considering the significance of reinforcement in the early phase as an organized approach to prepare students' cognitive readiness before entering the core activities. Therefore, there is still a lack of research on how the preparation of planned initial experiences can strengthen the overall application of CTL, especially in energy material in lower grades of elementary school.

Based on these differences, the research question in this study is: Can early-stage reinforcement through Praener (energy practices) in the CTL model significantly improve IPAS learning outcomes for third-grade students, both in conceptual understanding and process skills? The novelty of this study lies in applying Praener as a planned strategy in the early stages of CTL learning, serving as a cognitive bridge to strengthen students' foundational knowledge before they enter the core phase. Unlike previous studies that focused more on the general application of CTL, this study clearly includes early practical experience as a structured part of the learning design to strengthen students' readiness to learn, thereby contributing theoretically to the development of a CTL model based on early experience and practically to elementary school teachers in designing more focused and meaningful IPAS learning.

Based on this review, this study aims to analyze the application of Praener in the Contextual Teaching and Learning model on the IPAS learning outcomes of third-grade students on the topic of Understanding Energy at SD 4 Gondangmanis, Bae District, Kudus Regency. This study is expected to provide theoretical contributions to the development of contextual learning based on early experiences as well as practical contributions for elementary

school teachers in designing more interactive, meaningful, and student-centered IPAS learning.

### Research Methods

This study uses quantitative research. Quantitative research is used to study specific populations and samples, collect data using research instruments, analyze data statistically, and test predetermined hypotheses [19]. This research method uses experiments. The research method used in this study is a pre-experimental design with a one-group pretest-posttest. This study was conducted at SD 4 Gondangmanis on third-grade students in the 2025/2026 academic year, located in Gondangmanis Village, Bae District, Kudus Regency, Central Java Province. In this design, the pretest was conducted before the experimental treatment. After the treatment, a final test (posttest) was conducted to evaluate performance. The treatment consisted of applying the Contextual Teaching and Learning model based on praener.

The test instruments in this study first underwent content validity testing through expert judgment by two science education lecturers and one third-grade elementary school teacher to assess the suitability of the items with the learning outcome indicators, material on recognizing forms of energy, and cognitive levels (C1–C6). The validation results showed that all items were declared valid, with minor revisions to wording and the clarity of the question context. The implementation of Praener in the Contextual Teaching and Learning (CTL) model was carried out over three meetings (each lasting 2 × 35 minutes) with systematic stages, namely administering a pretest to measure students' initial abilities, implementing the treatment through the initial phase of Praener in the form of practice and observation of energy phenomena to activate prior knowledge, followed by the core CTL stage, which included inquiry activities, group discussions, modeling, reflection, and authentic assessment, and concluded with a posttest to measure learning improvement. The details of this procedure were structured to clarify the treatment steps and increase the replicability of the research in similar elementary school contexts.

This study involved all 23 third-grade students at SD 4 Gondangmanis as the population. The sampling procedure in this study was saturated sampling. Data collection techniques included observation, interviews, tests, and documentation. The test instrument in this study used 10 multiple-choice questions and 5 essay questions to determine students' understanding of the IPAS content on recognizing forms of energy.

### Results and Discussion

The study's results indicate a significant increase in student learning outcomes following the implementation of Praener within the Contextual Teaching and Learning Model for IPAS. IPAS learning outcomes were measured across two elements: IPAS understanding and process skills. The IPAS comprehension element was measured using the average pretest and posttest scores. Meanwhile, the element of process skills was measured using an observation sheet. This instrument was developed based on science process skill indicators, which include the ability to observe,

question and predict, plan and conduct investigations, process data, evaluate and reflect, and communicate results [20]. The improvement in learning outcomes can be explained by the characteristics of the experimental method, which actively involves students in the process of observation, experimentation, and drawing conclusions. This aligns with constructivist theory, which views learning as an active process of constructing knowledge from direct experience [21]. Learning with this method encourages students to build understanding independently and contextually. These results are shown in Table 1.

**Table 1.** Average learning outcomes of third-grade students

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	48.956	23	15.03777	3.1355
	Posttest	83.652	23	8.68964	1.8119

Based on Table 1, there was a significant increase in student learning outcomes following treatment. The average score increased from 48.95 on the pretest to 83.65 on the posttest. This increase shows that strengthening the initial phase through Praener helps activate students' prior knowledge, making them better prepared to follow the core learning. Connecting students' first experiences in contextual learning can significantly improve their cognitive readiness and understanding of IPAS [22]. These findings are in line with the principles of contextual learning, which emphasize the connection between initial experiences and meaningful concept formation. Linking students' initial experiences in contextual learning can significantly improve cognitive readiness and understanding in IPAS [23]. Thus, initial activities based on real experiences have a positive impact on student participation, learning motivation, and learning achievement at the elementary school level.

Along with increases in the average score and distribution of learning outcomes, the statistical test results for IPAS comprehension scores using test instruments were based on pretest-posttest paired t-test data, as shown in Table 2 below.

In Table 2, the statistical test results indicate a significance level below 0.05. Therefore, it can be concluded that there is a significant difference between learning outcomes before and after the application of Praener in the CTL model. These results confirm that the treatment given has a real impact on improving students' understanding of IPAS. From the researcher's point of view, this significant difference shows that learning that begins by linking students' initial experiences can support a more organized and meaningful knowledge construction process, in accordance with the CTL learning principle that emphasizes active student involvement in constructing knowledge through experiences and interactions with real situations [24].

The application of contextual learning methods in teaching energy forms significantly improved learning outcomes in elementary school students [25]. According to researchers, these results indicate that strengthening the early stages of learning through Praener improves students' cognitive readiness and concentration, thereby making the core learning process more efficient and leading to higher learning outcomes. Activating existing knowledge through

experiences in specific contexts can increase participation in learning and improve students' conceptual understanding [26]. In addition, learning methods that connect theory with real events encourage students to analyze information more deeply, thereby not only improving their cognitive

achievements but also strengthening their reflective abilities and scientific attitudes [27]. Thus, Praener can be seen as an effective approach in connecting students' experiences with energy concepts in a structured and meaningful way.

**Table 2.** IPAS Learning Outcome Test Criteria Data

Paired Samples Test					Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-34.69565	9.67863	2.01813	-38.88101	-30.51030	-17.192	22	.000

The second statistical test result uses the N-Gain test. This test is used to determine the increase in pretest and posttest learning outcomes after the treatment tested, namely the application of the Praener-based Contextual Teaching and Learning model in IPAS for third-grade students. This test is taken from the pretest and posttest data on IPAS learning outcomes.

**Table 3.** Results of the N-Gain Statistical Test of IPAS Learning Outcomes

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
N_Gain	23	.53	1.00	.6948	.11749
Valid N (listwise)	23				

Furthermore, the N-Gain test showed a score of 0.6948, which falls in the moderate category and indicates a level of effectiveness of "quite effective." This indicates that integrating Praener into the CTL model consistently improves learning outcomes, although it has not yet reached the high category. This improvement indicates that structured initial experiences help prepare students' cognitive readiness before entering the core learning stage. Contextual learning based on real experiences shows stable improvement in learning outcomes but still needs reinforcement during the reflection stage to achieve high effectiveness [28]. The success of contextual learning also depends heavily on teachers' consistency in connecting students' initial experiences with core concepts at each stage of the learning process [29]. As a follow-up to these findings, results in the "moderately effective" category also indicate that Praener's success in the CTL model is influenced not only by the initial stage of learning but also by the quality of interactions during the core and closing stages of the process.

Active student participation in group discussions, presentation of observation results, and joint reflection activities are important factors that strengthen the understanding of energy IPAS in a sustainable manner. The effectiveness of contextual learning increases when students are given the opportunity to communicate their learning outcomes and reflect on the relationship between their experiences and scientific concepts [30]. Therefore, it is necessary to strengthen aspects of interaction and pedagogical reflection so that the impact of Praener in CTL not only focuses on improving learning outcomes

quantitatively but also deepens students' understanding of science and their scientific attitudes.

The IPAS learning outcome scores for the elements of IPAS understanding and process skills for each indicator are shown in Table 4.

**Table 4.** Analysis of Scores for Each IPAS Learning Outcome Indicator: IPAS Comprehension Element

Indicator	Pre	Post	N-Gain	Description
Remembering (C1)	56	85	0.66	Moderate
Understanding (C2)	51	81	0.61	Moderate
Applying (C3)	53	82	0.62	Moderate
Analysing (C4)	55	83	0.62	Moderate
Evaluating (C5)	52	81	0.6	Moderate
Creating (C6)	52	82	0.63	Moderate
Average	53	82	0.62	Moderate

Based on Table 4, the results of the N-Gain test per indicator of IPAS learning outcomes in the IPAS comprehension element described above show that a value of 0.62 was obtained, which is in the range of  $0.3 \leq g \leq 0.7$ , categorized as moderate improvement. The results of this study indicate a relatively even increase in learning outcomes across all cognitive levels, from remembering (C1) to creating (C6), with an average N-Gain of 0.62 in the moderate category. The improvement at lower cognitive levels (C1–C2) indicates that students find it easier to remember and understand energy concepts when the material is taught by relating it to their daily experiences, making new information more easily integrated with existing knowledge. This aligns with the opinion [31], which states that the relationship between learning experiences and real-world contexts can strengthen students' memory and understanding of IPAS. At higher cognitive levels (C4–C6), improvements in analysis, evaluation, and creation skills indicate that students are beginning to develop scientific thinking and independent thinking skills through regular discussion, observation, and reflection. Contextual learning that integrates reflective activities can more effectively encourage the development of higher-order thinking skills (HOTS) [32]. According to researchers, achievements at this level indicate that Praener not only serves as an introduction to understanding IPAS but also triggers metacognitive processes that help students plan, assess, and reconstruct their ideas based on the real phenomena they observe.

Based on Table 5, the results for the process skills elements described above show an average score of 0.75, which falls in the  $\geq 0.7$  category of great improvement. This indicates that from the beginning of the learning process,

students became more involved in observing phenomena, asking questions, and planning investigation steps. On the other hand, the indicators in data processing, evaluation and reflection, and communication of results obtained an N-Gain of 0.5, which is in the moderate category. These results reflect the development of students' reflective and scientific communication skills, but still need to be strengthened through more systematic discussion and presentation of results. Overall, the results of this study support the constructivist theory, which states that knowledge is actively constructed through direct experience and interaction with the learning environment [33]. In addition, these findings reinforce the view that student participation in contextual learning experiences increases motivation and understanding of IPAS [34]. Praener, as part of the CTL model, serves to activate students' prior knowledge and build cognitive connections between everyday experiences and the scientific concepts being studied, thereby better preparing students to follow the main learning stages in a reflective and focused manner.

**Table 5.** N-Gain Test for Each IPAS Process Skill Element Learning Outcome Indicator

Indicator	Meeting			N-Gain	Description
	I	II	III		
Observation	2	3	4	1.0	High
Questioning and predicting	2	3	4	1.0	High
Planning and conducting investigations	2	3	4	1.0	High
Processing and analyzing data	2	3	3	0.5	Moderate
Evaluating and reflecting	2	2	3	0.5	Moderate
Communicating results	2	2	3	0.5	Moderate

Furthermore, improvements in process skills, as indicated by observing, questioning, and planning investigations, suggest that the initial experiences provided can increase students' curiosity and active engagement from the start of learning. Context-based practical activities strengthen science process skills and promote concept retention [35]. However, moderate achievement in the indicators of evaluation, reflection, and scientific communication indicates the need to strengthen structured discussion strategies and presentation of results so that students' reflective thinking skills can develop more optimally.

Although the study's results show significant improvement, several limitations need to be considered. This study used a pre-experimental design without a control group, so the improvement in learning outcomes cannot be directly compared with classes that did not receive the treatment. In addition, the relatively small sample size (23 students) limits the generalization of the findings to a broader elementary school context. The implementation period, which lasted only three meetings, also did not fully describe the long-term impact of applying Praener in the CTL model. Therefore, further research is recommended using an experimental design with a control group, a larger sample

size, and a longer implementation period to obtain stronger external validity.

## Conclusion

Based on the results of research and analysis, it can be stated that the use of Praener in the Contextual Teaching and Learning (CTL) model has been proven effective in improving the science learning outcomes of third-grade students at SD 4 Gondangmanis, both in terms of science comprehension and process skills. The average score increased from 48.95 on the pretest to 83.65 on the posttest, and the paired t-test results, which showed a significant difference, confirmed that learning that began with initial experiences could strengthen students' cognitive readiness to follow the core of the learning process. The N-Gain score of 0.6948, which falls into the "quite effective" category, indicates that there was a steady increase at all cognitive levels (C1–C6), from memory to creativity. In addition, significant improvements in process skill indicators, particularly in observation, questioning, and investigation planning, indicate that Praener can optimize students' active engagement and curiosity from the beginning of learning. Therefore, the use of Praener in the CTL model is recommended as a contextual, meaningful IPAS learning approach that focuses on developing students' understanding of IPAS and scientific process skills at the elementary level.

## Author's Contribution

M. Rohmawati, as the first author, played a role in formulating the research concept and design, developing instruments, collecting and analyzing data, and writing the main draft of the article. Y. Ratnasari and S.D. Ardianti, as the second and third authors, contributed to supervising the research methodology, validating instruments, reviewing scientific substance, and editing and refining the manuscript. All authors were involved in discussing the results, drawing conclusions, and approving the manuscript for publication.

## Acknowledgements

The author would like to express sincere gratitude to Mrs. Yuni Ratnasari and Mrs. Sekar Dwi Ardianti for their invaluable guidance, constructive feedback, and continuous support during the research and development process of this study. Their expertise and encouragement greatly contributed to the successful completion of this work. Thanks are also extended to the classroom teachers and third-grade students of SD 4 Gondangmanis who participated for their cooperation during the data collection process.

## References

- [1] J. Alimuddin, "Implementasi Kurikulum Merdeka di Sekolah Dasar," *J. Ilm. Kontekst.*, vol. 4, no. 02, pp. 67–75, 2023, doi: 10.46772/kontekstual.v4i02.995.
- [2] D. W. F. Izzati, D. Setyowati, and R. A. Fatmawati, "Deskripsi Pembelajaran Ipas Dalam Kurikulum Merdeka Kelas IV di SD Negeri 01 Anjongan," *Indo-MathEdu Intellectuals J.*, vol. 5 (5), no. 5, pp. 5618–5626, 2024.
- [3] S. M. Nabila, M. Septiani, Fitriani, and Asrin, "Pendekatan Deep Learning untuk Pembelajaran IPA yang Bermakna di Sekolah Dasar," *Prim. Educ.*

- Mandalika*, vol. 2, no. 1, pp. 9–20, 2025.
- [4] R. Fajra, A. Syachruroji, and S. Rokmanah, “Metode Pembelajaran Aktif Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Sekolah Dasar,” *J. Dunia Pendidik.*, vol. 4, no. 1, pp. 122–129, 2023, doi: 10.54373/imeij.v5i5.1784.
- [5] M. M. P. N. Kusumawati and D. U. Halmahera, “Pembelajaran Kontekstual ( Contextual Teaching Learning) dalam Kurikulum Merdeka di Sekolah Dasar.” pp. 35–38, 2024.
- [6] R. Aen and U. Kuswendi, “Meningkatkan Pemahaman Konsep IPA Siswa SD Menggunakan Media Visual Berupa Media Gambar dalam Pembelajaran IPA,” *J. Elem. Educ.*, vol. 03, no. 03, p. 3, 2020.
- [7] R. Hayati, “Meningkatkan Kemampuan Kognitif Siswa melalui Model Contextual Teaching and Learning (CTL) Di Kelas VIII MTs Swasta Baharuddin,” *Logaritma J. Ilmu-ilmu Pendidik. dan Sains*, vol. 9, no. 01, pp. 111–124, 2021, doi: 10.24952/logaritma.v9i01.3475.
- [8] D. M. Frida Silitonga and E. D. Putra, “Peran Guru Dalam Menggunakan Model Contextual Teaching and Learning (CTL) di Sekolah Dasar,” *QALAMUNA J. Pendidikan, Sos. dan Agama*, vol. 13, no. 2, pp. 577–590, 2021, doi: 10.37680/qalamuna.v13i2.1038.
- [9] S. D. Ardianti, S. Wanabuliandari, and S. Rahardjo, “The Implementation Of E-Jas Science Edutainment To Improve Elementary School Student’s Conceptual Understanding,” *Unnes Sci. Educ. J.*, vol. 8, no. 1, pp. 1–6, 2019.
- [10] S. Surachmi and Y. Ratnasari, “Analisis Pembelajaran Konstruktivisme dalam Proyek Pembuatan Pupuk Kompos dan Pemanfaatannya di kelas VI Sekolah Dasar,” *Pendas J. Ilm. Pendidik. Dasar*, vol. 10, no. 03, pp. 225–234, 2025.
- [11] M. Y. Falaah, S. D. Ardianti, and Y. Ratnasari, “Increasing Student Learning Interest using The Problem Based Learning Model Assited by Puzzle Mediaa in Science Learning for Grade IV of Kayuapu Elementary School,” *PIONIR J. Pendidik.*, vol. 14, no. 1, pp. 182–190, 2025.
- [12] D. Nababan and C. A. Sipayung, “Pemahaman Model Pembelajaran Kontekstual dalam Model Pembelajaran CTL,” *J. Pendidik. Sos. dan Hum.*, vol. 2, no. 2, pp. 825–837, 2023.
- [13] Y. Wasti, “Meningkatkan Hasil Belajar Ips Dengan Mengoptimalkan Langkah-Langkah Model Pembelajaran Contextual Teaching and Learning(Ctl) Siswa Kelas Vii.3 Smp Negeri 16 Batam Tahun Pelajaran 2019/2020,” *SENTRI J. Ris. Ilm.*, vol. 2, no. 5, pp. 1775–1794, 2023, doi: 10.55681/sentri.v2i5.903.
- [14] S. A. Rohmah, F. Fakhriyah, S. D. Ardianti, and S. Artikel, “Peningkatan Pemahaman Konsep Melalui Model CTL Berbantuan Media Kotak Lingkungan Hewan Pada Tema 6 Kelas IV,” *J. Prakarsa Paedagog.*, vol. 2, no. 2, pp. 185–191, 2019.
- [15] N. Huda and S. Fatolah, “Pembelajaran IPA Berbasis Praktikum di MI Ngadirejo 1,” *Al-Madrasah J. Pendidik. Madrasah Ibtidaiyah*, vol. 7, no. 4, p. 1923, 2023, doi: 10.35931/am.v7i4.2582.
- [16] A. P. N. Indah, I. Nuraeni, N. S. Azima, S. Novitasari, and Komariah, “Penerapan Model CTL untuk Melatih Aktivitas dan Hasil Belajar Bangun Ruang di SD Kelas I,” *J. Pendidik. Tambusai*, vol. 7, no. 2, pp. 5440–5446, 2023.
- [17] D. Kurniasih, “Implementasi Model Pembelajaran Contextual Teaching and Learning (CTL) dalam Pelajaran IPA di Sekolah Dasar,” *Soc. Humanit. Educ. Stud. Conf. Ser.*, vol. 3, no. 4, pp. 285–293, 2021.
- [18] S. P. Collins *et al.*, “Efektifitas Model Pembelajaran Contextual Teaching and Learning (CTL)Berbantuan Media Audiovisual Terhadap Hasil Belajar IPAS Kelas V di SD Papingan,” *Pendas J. Ilm. Pendidik. Dasar*, vol. 10, no. September, pp. 167–186, 2025.
- [19] M. I. Syahrone, “Prosedur Penelitian Kuantitatif,” *J. Al-Musthafa STIT Al-Aziziyah Lomb. Barat*, vol. 2, no. 3, pp. 43–56, 2022.
- [20] Y. Fitria, F. N. Hasanah, and N. Gistituati, “Critical Thinking Skills of Prospective Elementary School Teachers in Integrated Science-Mathematics Lectures,” *J. Educ. Learn.*, vol. 12, no. 4, pp. 597–603, 2018, doi: 10.11591/edulearn.v12i4.9633.
- [21] I. Machali, *Teori-Teori Pendidikan*. Yogyakarta: Fakultas Ilmu Tarbiyah dan Keguruan UIN Sunan Kalijaga, 2021.
- [22] L. Taroreh, “Efektivitas Media Pembelajaran Interaktif Berbasis Teknologi dalam Meningkatkan Pemahaman Konsep IPA,” *EdudeenaPEDASUD J. Ilmu Pendidik. Guru Sekol. Dasar dan Usia Dini*, vol. 1, no. 01, pp. 26–31, 2024.
- [23] H. Mufidah *et al.*, “Pengembangan E-Modul Pembelajaran Berbantuan Flip PDF pada Mata Pelajaran IPAS Materi Bagaimana Wujud Benda Berubah di Kelas IV SDN 03 Pontianak Selatan,” *J. Educ.*, vol. 06, no. 02, pp. 14956–14966, 2024.
- [24] D. Pepilina *et al.*, “Implementasi Model Pembelajaran Kontekstual untuk Meningkatkan Hasil Belajar IPA di Kelas Rendah Sekolah Dasar,” *J. Pengabd. Masy. dan Ris. Pendidik.*, vol. 3, no. 4, pp. 3091–3099, 2025, doi: 10.31004/jerkin.v3i4.1028.
- [25] M. Berliana and S. D. Ardianti, “Penerapan Pembelajaran Kontekstual Berbantuan Media Audio Visual untuk Meningkatkan Hasil Belajar Kognitif Siswa Kelas III,” *DEIKTIS J. Pendidik. Bhs. dan Sastra*, vol. 5, no. 3, pp. 1617–1627, 2025.
- [26] A. Fauzi and A. Al-zainuri, “Penerapan Assessment For Learning dalam Meningkatkan Keterampilan Reflektif Siswa,” *PENDIRI J. Ris. Pendidik.*, vol. 1, no. 2, pp. 42–49, 2024.
- [27] S. M. Tanango, M. Kudrat, and R. I. Husain, “Pengembangan Modul Ajar Pembelajaran IPA Menggunakan Pendekatan Kurikulum Merdeka Kelas IV Sekolah Dasar,” *Innov. J. Soc. Sci. Res.*, vol. 3, no. 2, pp. 8907–8919, 2023.
- [28] S. Lestari, Y. Ratnasari, and E. Zuliana, “Efektivitas Penerapan Metode Eksperimen Terhadap Hasil Belajar IPAS Materi Wujud Zat dan Perubahannya,” *Pendas J. Ilm. Pendidik. Dasar*, vol. 10, no. September, pp. 350–361, 2025.
- [29] D. A. Noviantoro, L. Rosdiana, D. A. Permatasari,

- and E. V. Aulia, "the Effect of Contextual Teaching and Learning Model Through Energy in Living Systems Video on Students' Achievement," *J. Penelit. Pendidik. IPA*, vol. 7, no. 1, pp. 30–39, 2022, doi: 10.26740/jppipa.v7n1.p30-39.
- [30] S. B. Masus and Fadhilaturrehmi, "Peningkatan Keterampilan Proses Sains IPA Dengan Menggunakan Metode Eksperimen di Sekolah Dasar," *J. Pendidik. dan Konseling*, vol. 2, no. 2, 2020.
- [31] Ulfah, O. Arifudin, and I. Kartika, "Pengaruh aspek kognitif, afektif, dan psikomotor terhadap hasil belajar peserta didik," *J. Al-Amar*, vol. 2, no. 1, pp. 1–9, 2021.
- [32] N. Shofiyah and S. B. Sartika, *Buku Ajar Asesmen Pembelajaran*, vol. 5, no. 2. 2018.
- [33] T. F. C. Sidabutar, E. Djulia, and M. Sinaga, "The Effect of Project-Based Learning with a STEM Approach on Students Creative Thinking Ability and Science Process Skills," *J. Pijar MIPA*, vol. 20, no. 7, pp. 1283–1288, 2025.
- [34] Amanda and U. Darwis, "Analisis Faktor Penyebab Rendahnya Hasil Belajar Siswa pada Pembelajaran IPA Kelas IV SD Negeri 105358 Sekip Lubuk Pakam," *JISMA J. Ilmu Sos. Manajemen, dan Akunt.*, vol. 2, no. 4, pp. 1141–1148, 2023, doi: 10.59004/jisma.v2i4.453.
- [35] H. Firman, "Mengapa Praktikum Penting Dalam Pembelajaran Sains," *Acad. Edu*, vol. 1, no. 2, pp. 1–8, 2019.