



# The Development of Inquiry-Based LKPD to Enhance Critical Thinking Skills in Science learning at Elementary Schools

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**Abstract:** This research is motivated by the development of LKPD (Student Worksheet) for enhancing critical thinking skills of elementary school students. The LKPD used has not yet captured the students' attention. The LKPD has not been able to improve students' learning motivation because it does not align with their learning styles. LKPD serves as teaching material used by teachers to facilitate the delivery of content and achieve learning objectives. This study aims to develop LKPD and assess its validity using the Inquiry model to improve critical thinking skills in Science education about the conservation of natural resources in the 4th-grade class. The type of research used is research and development (R&D), employing the 4-D model. This model consists of four development stages: define, design, development, and dissemination. Based on the results of the validation of LKPD using the Inquiry model to enhance critical thinking skills, the LKPD is deemed feasible for use. The material aspect validation result was 85.41% (valid), the design aspect validation result was 86.53% (valid), and the language aspect validation result was 94.44% (very valid). Therefore, the LKPD using the Inquiry model to improve critical thinking skills is valid.

**Keywords** Critical thinking; Inquiry; LKPD; Science learning

## Introduction

Education plays a vital role in enhancing human resources and serves as a key factor in driving national development in Indonesia (Pramitasari et al., 2024). The learning process is an educational activity that involves both teachers and students (Akbariah, 2023). The "Merdeka Curriculum" is a curriculum that's designed to build students who have the 21st century skills, such as creativity, collaboration, communication, and critical thinking, and uphold the freedom of learning through an approach that is more flexible, contextual, and in accordance with student needs (Kemendikbudristek, 2022). The implementation of Merdeka Curriculum is expected to lead students to be ready to face global

challenges that are full of uncertainty and rapid change (Mulyasa, 2023).

According to Ahyar (2021) one of the models applied to develop learning is the Inquiry model, which focuses on inquiry-based learning, where students are given the opportunity to explore problems, ask questions, and seek answers through the research process.

Natural Science Education (IPA) in the Merdeka Curriculum requires the application of an approach that emphasizes science skills and scientific thinking skills. Through the Inquiry learning model, students are encouraged to develop investigative, critical thinking, and problem-solving skills that are useful in everyday life. By using this model, science learning not only teaches scientific concepts, but also how students can use

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scientific processes to understand the world around them more deeply. Learning is essentially a process of interaction between students and their environment, leading to positive behavioral changes (Maritasari et al., 2025).

The author found problems in learning in elementary schools. Students' learning styles tend to be visual where the Learner Worksheets (LKPD) used by students are less interesting and students lack understanding of science learning in the teaching and learning process students are still teacher-centered. The conventional approach to teaching, with its limited use of flexible learning materials, contributed to a lack of interest and focus among the students, ultimately leading to a decline in their academic performance (Kulsum & Isdaryanti, 2024). Learning is not limited to teaching materials from a single source, such as books (Alika & Radia, 2021).

The author finds the problems of existing student teaching materials or LKPDs, namely the images are less attractive and not colorful, the space for students to fill in the answers is too narrow and it seems that the questions have not improved students' critical thinking skills, the steps of inquiry have not been included in the student's LKPD, using newsprint and tearing easily.

Based on the description above, the author concludes that one of the ways that can be done to increase student motivation in learning is to provide relevant Learner Worksheets (LKPD) applied by the teacher and provide opportunities for students to take an active role in classroom learning. Students are able to work on problems with critical thinking. Critical thinking is crucial for 21st-century learning as it helps students analyze information from different perspectives, understand problems effectively, develop solutions, and consider alternative approaches to problem-solving (Setiyaningsih et al., 2024). As a crucial 21st-century competency, critical thinking is an essential skill that must be taught to students. Therefore, teachers and instructors are expected to utilize their full capabilities in fostering this skill (Asrowi et al., 2025).

According to Sundari et al. (2021), critical thinking is the ability to analyze and evaluate information logically and deeply, which involves the use of evidence-based reasoning in decision making. Critical thinking skills are very important in the learning process because they encourage students to be more reflective of what they learn and do. Students must be trained in critical thinking skills, as these skills enable them to evaluate their thoughts, make informed decisions, and draw logical conclusions (Miftakhurrohman et al., 2023). The enhancement of critical thinking skills is essential in shaping individuals who are both competent and competitive in the future (Alpindo, 2024).

Critical thinking is not only a skill for solving academic problems but also helps develop students' habitual ways of thinking in addressing various challenges they encounter (Widiatmo, 2019). Critical thinking allows students to broaden their viewpoints and make more informed decisions in both their personal and professional lives (Shirmard & Howe, 2024). Essentially, critical thinking and learning are mutually connected. When someone thinks critically about an issue, they naturally gain new knowledge, and conversely, effective learning requires critical thinking (Heidari, 2020). Critical thinking skills enable educators to gain a deeper understanding of their students' performance, which may vary depending on the situation (Sireerat et al., 2025). At its core, critical thinking encompasses skills such as analysis, comparison, reasoning, evaluation, and decision-making (Wilson & Defianty, 2024).

As for overcoming the problem of students' learning styles that tend to be visual while the Learner Worksheets (LKPD) used by students are less interesting and the questions are not able to improve students' critical thinking skills by overcoming them, teachers need to improve students' critical thinking skills in learning and be able to make interesting LKPDs. A key realization is that critical thinking skills do not naturally develop through conventional teaching and learning methods within a subject (Leibovitch & M., 2025). Teachers must choose a learning model that is in accordance with the material to be taught, so as to motivate students to be able to think critically in solving problems. One of them is by applying the *Inquiry* model.

According to Widianjani & Patimah (2023), the *Inquiry* learning strategy is a learning approach that involves students actively in the exploration process to find answers to problems. This strategy prioritizes student involvement in asking questions, analyzing data, and drawing conclusions, so as to improve critical thinking and independent problem-solving skills. *Inquiry* learning necessitates active student participation in discovering new concepts through their own creativity (Herlina et al., 2022). *Inquiry* learning encourages students to actively engage both physically and mentally in the process of exploration and elaboration (Rusdiyana, 2024). The *inquiry*-based learning model can be applied to various subjects according to learning objectives (Wulandari, 2025). The *Inquiry Model* is a learning approach that can be implemented in both real-life and future experiences (Rubio & Conesa, 2022).

The *inquiry* learning model has the advantages described by Prasetyo (2021) are The *inquiry* learning strategy is a learning strategy that emphasizes the development of cognitive, affective, and psychomotor

aspects in a balanced manner, so that learning through this strategy is considered more meaningful, the inquiry learning strategy can provide space for students to learn according to their learning style, the inquiry learning strategy is a strategy that is considered in accordance with the development of modern learning psychology which considers learning to be a process of changing behavior due to experience and another advantage is that this learning strategy can serve the needs of students who have above-average abilities. Inquiry learning can be used to train students' critical thinking skills (Hikmawati et al., 2020).

The development of Learner Worksheets (LKPD) is an important key in supporting the successful implementation of the Inquiry learning model. LKPD as teaching material can design various activities that trigger students' curiosity, support them in formulating hypotheses, collecting data, and analyzing and drawing conclusions. By using LKPD, teachers can more easily direct students to collaborate and work independently in exploring science topics, so that learning becomes more meaningful and applicable, students not only learn about scientific facts, but also understand how these facts are obtained through planned experiments and observations (Ulya & Rusmini, 2022). In accordance with developments in education, research by Yuliana et al. (2025) shows that the use of LKPD in inquiry-based science learning can improve students' critical thinking skills.

Based on the above background, the authors are interested in conducting research with the title "Development of Inquiry-Based LKPD to Improve Critical Thinking Skills in Natural Science Learning in Elementary Schools".

## Method

The type of research used is R&D (Research and Development) research with the 4D model. The Four-D development model stands for Define, Design, Development and Dissemination. Phase Define (Needs Analysis) Activities at this stage are carried out to determine and define the requirements for the development of teaching materials to be made. The requirements for the development of teaching materials in the analysis stage carried out by the author are 3 ways carried out, namely: curriculum analysis, analysis of learner characteristics, and LKPD analysis.

Defining Learning Objectives Learning objectives are determined based on the applicable curriculum and the competencies to be achieved, referring to the Merdeka Curriculum or the 2013 Curriculum, particularly in the aspects of critical thinking skills. next Stage Design (Design) In this design there are several

steps taken that are used, namely: initially making modules, designing LKPD displays, designing LKPD content, then the development stage in this development stage aims to produce the final product after going through the validation and revision process and the dissemination stage is the last stage in the development of the 4-D model. Process of Developing LKPD Content: Based on the Curriculum. The content of LKPD (Student Worksheets) must be aligned with the basic competencies stated in the curriculum. The emphasized competencies include critical thinking skills, problem-solving abilities, and experiment-based learning.

Based on Student Needs, Prior student characteristic analysis is conducted to understand their learning styles and levels of comprehension, The content should be adapted to students' thinking abilities (neither too difficult nor too easy). Next Oriented Towards Inquiry Stages, LKPD should follow the stages of inquiry-based learning, such as: Trigger questions to spark students' curiosity, Experiments or explorations to discover answers through hands-on experiences, discussions and reflections to develop critical thinking skills.

## Result and Discussion

Results and discussion contain the results of research findings and their scientific discussion. Write scientific findings obtained from the results of the research that has been carried out and supported by data.

The product in this study is in the form of LKPD using the *Inquiry* model to improve students' critical thinking skills in science learning about the Preservation of Natural Resources in grade IV SD. Students can use this learning media during learning. This development product is prepared so that it can be a guide for educators and students in carrying out learning. LKPD products using the Inquiry model to improve students' critical thinking skills in science learning about Natural Resources Conservation are expected to be able to be used as learning resources, sources of practice and become alternative media for students in the learning process. This product is also expected to be a medium to assist educators in carrying out the teaching and learning process. The research stage consists of several stages described

### *Define*

The defining stage is the stage for determining and defining development requirements such as determining and analyzing needs in the learning process. The analysis of the definition stage in this study includes: a). curriculum analysis, namely This analysis

aims to determine the scope of indicators and learning objectives that are suitable for developing LKPD. Before making LKPD learning objectives must be formulated first. This is to limit the author so as not to deviate from the material to be taught. b). learner analysis and LKPD analysis. learner analysis is carried out to determine the ability of students to work on LKPD. Nuryati & Darsinah (2021) grade IV elementary school students enter into the concrete operational stage (age 7-11 years), at this stage students have begun to understand the cumulative aspects of material, such as volume and quantity; have the ability to combine several classes of objects that vary in level. In addition, students are able to think systematically about concrete objects and events. LKPD in circulation is not in accordance with the learning style of students, namely the image is less attractive and not colorful, the space for students to fill in the answers is too narrow and it can be seen that the questions have not improved students' critical thinking skills, the inquiry steps have not been included in the student's LKPD, using newsprint and tearing easily. Therefore, the researcher designed the LKPD to.

#### *Design*

Based on the analysis at the defining stage, the design of LKPD using the Inquiry model to improve critical thinking skills for grade IV elementary schools was carried out. The products that have been designed include: Teaching modules and teaching materials and Learner Worksheets (LKPD). LKPD is adjusted to the provisions of the curriculum, then arranged with critical thinking skills and the Inquiry learning model. The teaching materials designed can encourage students to work and be active in learning. LKPD is equipped with colorful pictures that are attractive to students. Thus, the design of this LKPD will be more favored by students and can support the learning process later.

#### *Preface*

The preface contains the gratitude of researchers for developing LKPD and the hope of students, so that this LKPD can be useful for students. The preface is written in Comic Sans MS font size 12.

#### *Table of contents*

The table of contents is made to make it easier for students to find the desired book page. Fill in the table of contents with Comic Sans MS font size 12, for an example of its presentation can be seen in the Figure 1a.

#### *Author guidelines*

These instructions for use provide direction to students in using this LKPD. Instructions are made using Comic Sans MS font size 12, for an example of its presentation can be seen in the Figure 1b.

#### *Inquiry steps*

This LKPD contains the steps of the inquiry learning model.

#### *Natural Science Basic Competencies*

In the Basic Competencies of Natural Science, it shows that the LKPD studies the material in these competencies.

#### *Critical Thinking Indicators*

This LKPD is to improve critical thinking skills. In this LKPD, the indicators of critical thinking are described which are limited (analyzing arguments, considering whether the source is reliable, and educating and considering deduction) on the questions in the LKPD. The following is an example of the presentation of activities on LKPD.

#### *LKPD Activity*

The LKPD activities follow the Inquiry steps in the LKPD for Inquiry learning. The following is an example of presenting activities on LKPD.

#### *Tes Items*

Test items on the teacher's LKPD to determine the extent to which students understand the learning material that has been studied,

#### *Bibliography*

The bibliography on this LKPD is made to find out the sources of material and images in the LKPD.

#### *Development Step*

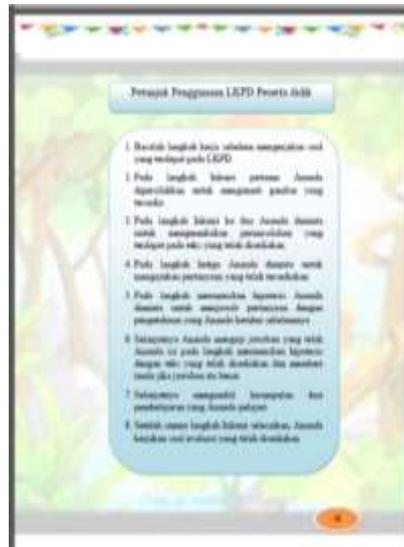
This stage aims to produce LKPD using the Inquiry model to improve valid critical thinking skills so that it is feasible to use in the learning process. This development stage consists of one stage, namely: design validation.

#### *LKPD Validation*

The LKPD that has been designed is then validated by validators using validated instruments. Validation must first be carried out to determine the feasibility of the Critical Thinking Skills questions used in this study (Rizki et al., 2021). Validation was carried out by three validators.



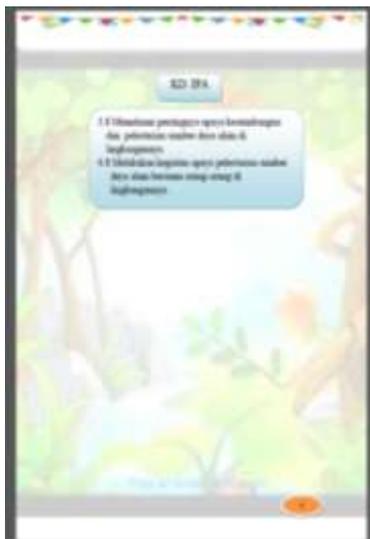
(a)



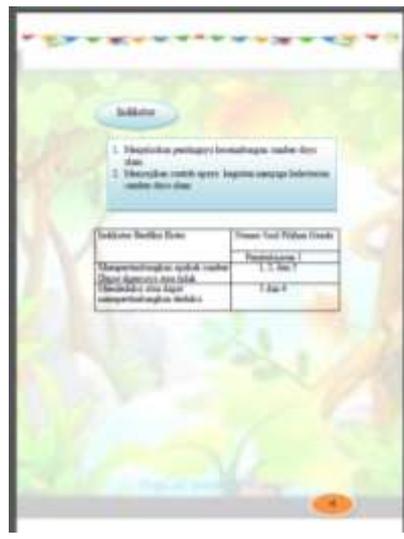
(b)



(c)



(d)



(e)



(f)



(g)

Figure 1. Display of LKPD: (a) table of content; (b) author guidelines; (c) inquiry steps; (d) natural science basic competencies; (e) critical thinking indicators; (f) lkpd activities; and (g) test items.

The revised LKPD was handed back to the validator. The validator is asked to provide an assessment and opinion on the LKPD that has been designed. Validation has been completed if the validator has stated that the designed LKPD is valid and revised. The results of the validation of the LKPD that has been produced are described in the following description.

**Table 1.** Validation

Aspects observed	Percentage (%)	Category
The Results of LKPD Validation on Material Aspects	85.41	Valid
Results of LKPD Validation on Design Aspects	86.53	Valid
Results of LKPD Validation on Language Aspects	94.44	Very Valid
Average	88.79	Valid

**Conclusion**

The process of developing LKPD using the Inquiry model to improve students' critical thinking skills is carried out with the stages of Define, Design, Development, and Dissemination. It can be explained as follows: Defining is to analyze the needs and objectives, at the design stage is done with the design of lesson plans and LKPD products, the development stage validates by expert experts, and then the widespread stage is not carried out due to the current pandemic. LKPD products using the Inquiry Model to improve students' critical thinking skills in science learning about the preservation of natural resources in grade IV SD are very valid. This can be seen based on the results of material validation, inquiry-based LKPD by material expert validators, Disegn experts and linguists carried out.

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**Author Contributions**

Conceptualization; SW. YN. F. Y. HH. YA.; methodology.; F. Y. HH; validation; F. Y.; formal analysis; SW. YN; investigation.; SW. YN.; resources; SW. YN.; data curation: SW. YN.; original draft writing; SW. YN.; review and editing; YN.; visualization: F. Y. HH. YA. All authors have read and approved the published version of the manuscript.

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**Conflicts of Interest**

The researchers in this study were assigned by each institution with the aim of improving the lecturers' resources and students from Doctoral Programs Department of Natural Science Education, Universitas Negeri Padang, Indonesia.

**References**

Ahyar, D. B. (2021). *Model-Model Pembelajaran*. Pradina Pustaka.

Akbariah, N. (2023). STEM-Based Learning Process Analysis of Students' Science Process Skills. *Jurnal Penelitian Pendidikan IPA*, 9(2), 943-951. <https://doi.org/10.29303/jppipa.v9i2.2912>

Alika, O., & Radia, E. H. (2021). Development of Learning Media Based on Cross Puzzle Game in Science Learning to Improve Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 7(2), 173-177. <https://doi.org/10.29303/jppipa.v7i2.667>

Alpindo, O. (2024). Can Critical-thinking Skills be Measured by Analyzing Metacognition? *Journal of Teaching and Learning*, 18(2), 194-211. <https://doi.org/10.22329/jtl.v18i2.8813>

Asrowi, M., I., B., K., M., & Qodr, T. S. (2025). Assessing critical thinking skills in vocational school students during hybrid learning. *Journal of Education and Learning*, 19(1), 232-240. <https://doi.org/10.11591/edulearn.v19i1.21754>

Heidari, K. (2020). Critical thinking and EFL learners' performance on textually-explicit, textually-implicit, and script-based reading items. *Thinking Skills and Creativity*, 37. <https://doi.org/10.1016/j.tsc.2020.100703>

Herlina, W., Hidayat, T., & Rahman, T. (2022). The Effect of Green School-Based Inquiry Learning Model on Students' Ability of Scientific Literacy. *Jurnal Penelitian Pendidikan IPA*, 8(5), 2513-2517. <https://doi.org/10.29303/jppipa.v8i5.1847>

Hikmawati, H., Kusmiyati, K., & Sutrio, S. (2020). Inquiry Learning Model to Improve Student Cognitive Learning Outcomes in Temperature and Heat. *Jurnal Penelitian Pendidikan IPA*, 6(1), 97-100. <https://doi.org/10.29303/jppipa.v6i1.330>

Kemendikbudristek. (2022). *Pedoman Implementasi Kurikulum Merdeka*. Jakarta: Kementerian Pendidikan, Kebudayaan.

Kulsum, M., & Isdaryanti, B. (2024). Canva-based E-comic on the Dangers of Plastic Waste Environment as Learning Media for IPAS Effectively Improve Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(10), 7199-7208. <https://doi.org/10.29303/jppipa.v10i10.8269>

Leibovitch, Y., & M. (2025). Teachers' (evolving) beliefs about critical thinking education during professional learning: A multi- case study. *Thinking*

- Skills and Creativity*, Volume, 56. <https://doi.org/10.1016/j.tsc.2024.101725>
- Maritasari, D. B., Aswasulasikin, L., & A. (2025). Development of Tests Based on Proprofs Digital Media to Measure Higher Order Thinking Skills (HOTS) of Students in Science Learning. *Jurnal Penelitian Pendidikan IPA*, 11(1), 71-77. <https://doi.org/10.29303/jppipa.v11i1.9383>
- Miftakhurrohmah, N. L., Masykuri, M., & Ariyani, S. R. D. A. (2023). The Effect of Guided Inquiry-Based Excretion System E-Module to Improve Critical Thinking and ICT Literacy Skills for Students. *Jurnal Penelitian Pendidikan IPA*, 9(2), 681-689. <https://doi.org/10.29303/jppipa.v9i2.2036>
- Mulyasa, H. E. (2023). *Implementasi Kurikulum Merdeka*. Jakarta: Bumi Aksara.
- Nuryati, N., & Darsinah, D. (2021). Implementasi teori perkembangan kognitif jean piaget dalam pembelajaran matematika di sekolah dasar. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*, 3(2), 153-162. Retrieved from <https://e-journal.unimudasorong.ac.id/index.php/jurnalpe ndidikdasar/article/view/1793>
- Pramitasari, N., Hastuti, P. W., Tyas, R. A., Anjarsari, P., & Roektingroem, E. (2024). The Influence of Inquiry Learning Models Containing STEAM to Improve the Science Process Skills. *Jurnal Penelitian Pendidikan*, 10(12), 11109-11120. <https://doi.org/10.29303/jppipa.v10i12.8985>
- Prasetyo, B. M. (2021). Model Pembelajaran Inquiry sebagai Strategi Mengembangkan Kemampuan Berpikir Kritis Siswa. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, 9(1). <https://doi.org/10.26740/jpap.v9n1.p109-120>
- Rizki, A., Khaldun, L., & Pada, A. U. T. (2021). Development of discovery learning student worksheets to improve students' critical thinking skills in chemical balance materials. *Jurnal Penelitian Pendidikan IPA*, 7(4), 707 - 711. <https://doi.org/10.29303/jppipa.v7i4.829>
- Rubio, A. D. J., & Conesa, I. M. G. (2022). Inquiry-Based Learning in Primary Education. *Journal of Language and Linguistic Studies, Ankara*, 18(2), 623-647. Retrieved from <https://hdl.handle.net/10481/88662>
- Rusdiyana. (2024). The application of on-line science-based inquiry learning in primary schools. *Journal of Turkish Science Education*, 21(2), 293-303. <https://doi.org/10.36681/tused.2024.016>
- Setiyaningsih, L. B., Riandi, R., Amprasto, A., & Mardiyah, M. (2024). Application of the Inquiry-Based Learning Model with Education for Sustainable Development to Enhance Critical Thinking Skills and Sustainable Awareness. *Jurnal Penelitian Pendidikan IPA*, 10(10), 7790-7802. <https://doi.org/10.29303/jppipa.v10i10.8943>
- Shirmard, F. O., & Howe, E. R. (2024). What Does Critical Thinking Mean to You?" A Narrative Inquiry of Graduate Students' Perceptions. *Journal of Comparative & International Higher Education*, 16(4), 32-44. <https://doi.org/10.32674/jcihe.v16i4.5459>
- Sireerat, K., N., S., & Foxton, R. (2025). A study of critical thinking skills among Thai dental students: From disposition to skills assessment. *Journal of Dental Sciences*. <https://doi.org/10.1016/j.jds.2025.02.005>
- Sundari, P. D., Dewi, W. S., Saputra, D., Hidayat, R., & others. (2021). The Improvement of Physics Teachers' Competence in Developing an Interactive Recitation Programs to Remediate Students' Misconception. *Indonesian Journal of Science and Mathematics Education*, 4(3), 242-252. <https://doi.org/10.24042/ijsme.v4i3.10053>
- Ulya, U., & Rusmini. (2022). Pengembangan Lembar Kerja Peserta Didik (LKPD) untuk Meningkatkan Keterampilan Literasi Sains Peserta Didik pada Materi Laju Reaksi. *Jurnal of Science Education*, 6(3), 695-703,. <https://doi.org/10.33369/pendipa.6.3.695-703>
- Widianjani, W., & Patimah, L. (2023). Penerapan Model Pembelajaran Inkuiri untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Didactical Mathematics*, 5(1), 81-86. <https://doi.org/10.31949/dm.v5i1.4938>
- Widiatmo, T. (2019). Analysis of Validation of Instruments to Measure Student's Critical Thinking Ability and Science Literation. *Jurnal Penelitian Pendidikan IPA*, 5(2), 212-218. <https://doi.org/10.29303/jppipa.v5i2.272>
- Wilson, K., & Defianty, M. (2024). The critical challenge for ELT in Indonesia: Overcoming barriers in fostering critical thinking in testing-oriented countries. *TESOL in Context (Australia)*, 33(1). <https://doi.org/10.3316/informit.T2025012400005900449126560>
- Wulandari, A. (2025). A bibliometric analysis of inquiry learning in primary education. *Journal of Education and Learning (EduLearn)*, 19(1), 340-349. <https://doi.org/10.11591/edulearn.v19i1.21245>
- Yuliana, R., Wasino, W., & Widiarti, N. (2025). The effectiveness of experiential learning on students' understanding of science and technology. *Inovasi Kurikulum*, 22(1), 249-262. <https://doi.org/10.17509/jik.v22i1.77888>