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Analysis of Students' Science Process Skills Through Inquiry-Based Learning (IBL) in Elementary School

Nazroatul Ummah[1], Fitria Wulandari[2]*
[1]Elementary Education Study Program, Muhammadiyah University of Sidoarjo
[2]Teacher Professional Education Program, Muhammadiyah University of Sidoarjo
*Corresponding Author e-mail: fitriawulandari1@umsida.ac.id

Abstract: Science Process Skills (SPS) are fundamental competencies that form the foundation of scientific thinking; however, national achievement levels remain relatively low. This study aims to conduct an in-depth analysis of the achievement profiles of third-grade elementary school students' SPS indicators through the application of the Inquiry Based Learning (IBL) model to the topic of the five senses. The study employs a descriptive qualitative approach using a single-case study design. The research subjects involved 22 third-grade students at SD Muhammadiyah 1 & 2 Taman, selected through purposive sampling. Data collection was conducted through SPS tests, documentation of student worksheets, and structured interviews, which were then analyzed using the Miles and Huberman model and tested for validity through triangulation of techniques and sources. The results of the study indicate that the implementation of IBL is highly effective in facilitating the mastery of basic science process skills, particularly in the areas of observation and hypothesis formulation. However, achievements in integrated process skills, such as planning experiments, communicating results, and asking questions, are still considered moderate. This suggests that lower-grade students' mastery of science process skills remains at the guided inquiry level, where students are not yet able to conduct independent inquiry and are still heavily reliant on teacher guidance. The novelty of this study lies in the mapping of the hierarchy of mastery of basic science process skills in lower grades, which demonstrates that content rooted in concrete experiences (the five senses) can accelerate the ability to formulate hypotheses a skill that is theoretically often considered too complex for young children. Practically, this study implies the need for elementary school teachers to design more structured IBL scenarios by providing scaffolding and intensive stimuli to bridge students' transition toward more open inquiry.

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Introduction

Science Process Skills (SPS) are a crucial foundation in science education, encompassing abilities such as observing, classifying, interpreting, predicting, asking questions, formulating hypotheses, planning experiments, applying concepts, and communicating findings (Aktamiş et al., 2016). Developing SPS through authentic and meaningful learning experiences. SPS is a core competency that students must master to meet the challenges of the 21st century, including critical thinking, creativity, and problem-solving (Ismunayah et al., 2025). At the elementary school level, the development of SPS should ideally begin early on through authentic and meaningful learning experiences, in line with students' concrete operational stage of cognitive development (Rustaman, 2005).

Educational institutions are expected to provide a learning environment conducive to scientific exploration so that students can construct knowledge independently through hands-on and minds-on activities in line with constructivist theory. Thus, it is hoped that science education will produce students who possess a scientific mindset, a strong sense of curiosity, and problem-solving skills to prepare them for future challenges. This requires further investigation to provide insight into the current state of Indonesian students.

Many countries, including Indonesia, still face challenges in meeting science competency standards. This situation is due to the prevalence of teacher-centered instruction, which places greater emphasis on content mastery than on the development of science literacy. This is further supported by an analytical study that found students' science literacy scores to be 54, which is classified as insufficient (Astuti et al., 2025). This gap indicates that learning is still focused on concepts and has not yet been optimized in terms of students' scientific inquiry skills. The aspects rated as poor are communication (42) and experiment planning (50). Students' weak scientific inquiry skills are particularly evident at the elementary school level, where these skills should be developed. This problem is further exacerbated by the lack of systematic implementation of Inquiry-Based Learning (IBL), so that students are not accustomed to scientific inquiry as the core of science education (Furtak et al., 2012).

IBL has emerged as an innovative approach to counter the dominance of conventional methods. This approach encourages students to actively ask questions, design investigations, collect and analyze data, and construct knowledge through the process of scientific inquiry (Sutimah & Tyas, 2024). The strength of IBL lies in its integration with the SPS, where each stage of learning develops different skills from observing during the orientation phase, to predicting when formulating hypotheses, to drawing conclusions and communicating the results of the analysis (E. A. Mutiara, 2025). This is consistent with Vygotsky's constructivism, which emphasizes that knowledge is constructed through active interaction and a meaningful environment; therefore, IBL and SPS are expected to enhance students' understanding of science concepts.

The IBL syntax consists of five stages: 1) orientation, in which the teacher presents a problem or phenomenon that sparks students' curiosity; 2) conceptualization, in which students formulate research questions or hypotheses with the teacher's guidance; 3) inquiry, which involves gathering information through experiments, interviews, observations, and other relevant sources; 4) conclusion, which involves analyzing data to answer the research questions, and 5) students presenting their findings in a report or during a discussion. In these stages, the teacher acts as a facilitator, emphasizing that students are at the center of the learning activity (Anderson, 2001) The integration of SPS into IBL warrants further investigation.

The implementation of IBL can be strengthened through the SPS, which includes activities that guide students in conducting structured observations, simple experiments,

Juli 2026 Vol. 11 No. 3
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P-ISSN: 2503-0602
pp. 388-398

measurements, classifications, and data analysis in accordance with the cognitive development stages of elementary school students (Kassaye et al., 2025). In addition, SPS also serves as a framework that helps teachers guide students to actively engage in the discovery process from formulating problems to communicating their findings in a focused manner. Thus, SPS not only supports more interactive learning but also ensures that every aspect of the process develops optimally (Angelia et al., 2022).

SPS can be developed comprehensively and sustainably through the implementation of IBL in the curriculum, particularly in science classes. The Merdeka Curriculum, which emphasizes competency-based and student-centered learning, strongly supports the implementation of IBL in developing the profile of Pancasila learners who are critical, creative, and possess critical thinking skills (Sutimah & Tyas, 2024). Through IBL, students not only gain scientific knowledge but also learn to think and act like scientists through meaningful, authentic investigative activities (Lubis & Siregar, 2024). Furthermore, IBL integrated with science process skills has the potential to serve as an effective tool for fostering 21st-century competencies, particularly higher-order thinking skills and scientific literacy, which support lifelong learning (Vinson, 2025). These skills are academic skills that students must master.

In addition to the academic aspects, the integration of SPS through IBL also supports the development of students' scientific attitudes, such as careful observation and honesty in reporting experimental results. The application of IBL in science education not only strengthens students' SPS but also serves as a means of reinforcing character education in line with national educational goals. The synergy between academic development and character values is expected to foster students who grow into intelligent, critical, creative individuals with strong character, capable of contributing to society and the advancement of science.

Several previous studies have demonstrated the effectiveness of IBL in developing SPS. Research by (Sa'adah et al., 2023). demonstrates that developing critical thinking skills through scientific inquiry can significantly enhance students' thinking skills and creativity. The study(Anderson et al., 2014) indicates that the IBL approach is effective in enhancing elementary school students' scientific literacy. Other studies have also concluded that inquiry-based learning methods influence learning outcomes, scientific literacy, and students' attitudes toward science.

Although there is strong evidence regarding the effectiveness of IBL, these studies still tend to be limited to a general analysis of the SPS. Research Gaps The identified research gap is the absence of in-depth investigations that specifically analyze each aspect of SPS in the implementation of IBL on sensory system content at the elementary school level. The novelty of this study lies in its detailed analysis of each SPS aspect within the context of sensory system content, distinguishing it from previous general studies.

This study aims to analyze students' SPS through the application of IBL in science curriculum on the five senses at the elementary school level. The research question posed is: What is the profile of students' Science Process Skills across each aspect of SPS through the application of Inquiry-Based Learning in science curriculum on the five senses at the elementary school level? This study adopts a framework developed in previous research but

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

with a more specific context focused on science curriculum regarding the five senses. It is hoped that this study will provide a comprehensive overview of the integration of IBL in describing students' SPS. Future research is expected to develop innovative models and methods for science education, particularly in elementary schools.

Research Method

This study employs a descriptive qualitative approach aimed at obtaining an in-depth, rich, and comprehensive understanding of the phenomenon under investigation, namely students' SPS achievements in the context of IBL learning (Sugiyono, 2019). Using a single-case study design to gather in-depth data on students' learning processes during actual classroom instruction on the topic of the five senses. The research subjects consisted of 22 third-grade students at SD Muhammadiyah 1 & 2 Taman, selected through purposive sampling based on variations in students' academic abilities (high, moderate, and low) in science, ensuring that the data obtained was representative of the class's heterogeneity.

The IBL learning implementation was conducted over one sessions (with a time allocation of 2 x 35 minutes per session) on the topic of the Five Senses. The learning was systematically designed following the five stages of IBL: 1) Orientation, the teacher showed a video about the five senses and provided stimuli in the form of objects (fruit, flowers, bells) to spark students' curiosity; 2) Conceptualization, students were guided to formulate problems and hypotheses, such as predicting what object is inside a closed box by touching it; 3) Inquiry: students conduct hands-on exploration through simple experiments testing the functions of the tongue (taste), skin (touch), and nose (smell); 4) Conclusion: students analyze the experimental data to verify their initial hypotheses; and 5) Discussion: students present their findings to the class. Throughout this process, the teacher acts as a facilitator who provides scaffolding to develop the SPS indicators.

The data for this study were collected using three main complementary instruments. First, the SPS test, which consists of essay questions designed to measure nine SPS indicators adapted from (Rustaman, 2005) Namely: observing, classifying, interpreting, predicting, asking questions, formulating hypotheses, planning experiments, applying concepts, and communicating. Before use, the SPS test instrument was validated for content validity through expert judgment (validated by two experts in science education). For example, for the "formulating hypotheses" indicator, students were given the problem: "Can you guess the object inside the box if your eyes are tightly closed?" They were then asked to provide a logical reason as a tentative guess. Additionally, for the "observing" indicator, students were asked to identify the face of the classmate sitting next to them, point to the facial features representing the five senses, and then name and describe their functions. This instrument is accompanied by clear visual stimuli of the five senses to guide students in accurately identifying the five sensory organs (eyes, ears, nose, tongue, and skin) along with their respective functions. The second form of learning documentation consists of photos of practical activities and Student Worksheets (LKPD) used to obtain authentic data regarding the students' learning process during the implementation of IBL. Third, structured and semi-structured interviews were conducted with students and teachers to explore their experiences, perceptions, and challenges faced during the IBL learning process, so that quantitative data from tests could be enriched and confirmed with qualitative data from participant narratives.

This study employed both quantitative and qualitative data analysis. Quantitatively, the test data were processed using Microsoft Excel with a scoring system of 1–4 for each student's

Jurnal Teknologi Pendidikan:
Jurnal Penelitian dan Pengembangan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jtp/index

Juli 2026 Vol. 11 No. 3
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P-ISSN: 2503-0602
pp. 388-398

response: Score 4: Very complete and logical answer; Score 3: Correct but incomplete answer; Score 2: Brief answer; Score 1: Incorrect or irrelevant answer.

After all answers were scored, the researcher calculated the percentages using the formula:

$$NP = R/SM \times 100$$

Notes:
NP : Target or expected value
SM : Ideal maximum score
R : Raw score obtained
The SPS indicator categories are as follows:

Table 1. Student Process Skills Category

Score	Category
80-100	High
60-79	Medium
0-59	Low

These findings were then analyzed in greater qualitative depth using the Miles and Huberman model (Mawarnis et al., 2023). Through the first three stages of data reduction: sorting the SPS test answers, worksheets, and interview transcripts relevant to the nine SPS indicators; second, presenting the data in the form of a SPS frequency matrix; and third, verification and conclusions by ensuring data consistency throughout the analysis process. To ensure data validity, the researcher applied technical triangulation and source triangulation procedures on the students. The technical triangulation procedure involved comparing or cross-referencing students' SPS test scores (quantitative) with their authentic performance records in the LKPD (documentary evidence), and reconfirming these through interview results (verbal accounts). If a student scored high on the "formulating hypotheses" indicator in the written test, the researcher verified whether this was consistent with what the student wrote in the LKPD and how the student explained it during the interview.

Result and Discussion

This study describes the SPS administered to 22 third-grade students at SD Muhammadiyah 1 & 2 Taman through the implementation of Inquiry-Based Learning (IBL) for the topic of the five senses. Data from the SPS test results and observations indicate varying levels of achievement across indicators, but overall show positive results. A summary of the percentages and categories for each indikator is presented in.

Table 2. Percentage and Categories of SPS

No.	SPS Indicators	Persentase (%)	Category
1	Observing	99%	High
2	Classifying	97%	High
3	Interpreting	93%	High
4	Predicting	89%	High
5	Asking Questions	78%	Medium
6	Formulating Hypotheses	98%	High
7	Planning Experiments	73%	Medium
8	Applying Concepts	86%	High

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

9	Communicating	74%	Medium

Of the nine SPS indicators measured, six indicators achieved the high category (80–100%) and three indicators fell into the moderate category (60–79%). Indikator indicators fell into the low category, indicating that the implementation of IBL on sensory perception material has, overall, successfully developed students' SPS above the minimum acceptable threshold. The highest percentage was achieved in the "observing" indikator at 99%, while the lowest percentage was in the "planning experiments" indikator at 73%. A complete summary of the achievements of all SPS indicators is presented.

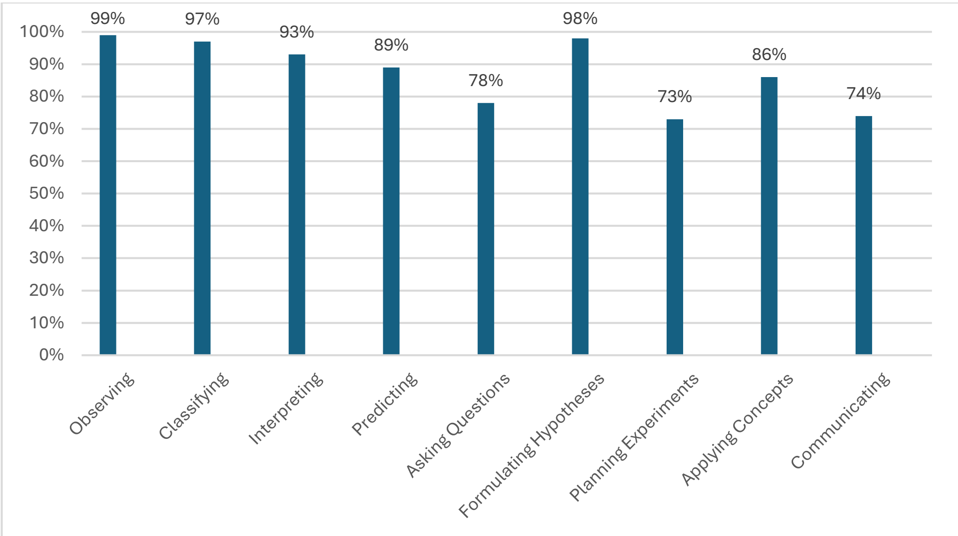

Figure 1. The Graphic of SPS Results

The results of data triangulation from tests, interviews, and Student Worksheets (LKPD) reveal a consistent pattern: students tend to demonstrate greater mastery of basic science process skills, consistently achieving higher scores compared to indicators classified as integrated science process skills. This pattern aligns with the hierarchy of science process skills proposed by experts, which states that basic process skills such as observation and classification develop earlier and are easier to master compared to integrated skills such as planning experiments, which require more complex cognitive coordination. An exception occurs with the indicator of formulating hypotheses; although classified as an integrated skill, it achieved a very high percentage (98%).

Discussion

Based on the findings above, the implementation of Inquiry-Based Learning (IBL) in the five senses curriculum has been shown to effectively foster students' science process skills (SPS) to a level well above the minimum threshold. The data patterns indicate that basic science process skills achieved higher scores than integrated science process skills. well students can engage with various objects such as graphs, images, and diagrams as well as events by applying the five basic principles in daily life.

The high achievement rates on the indicators of observing (99%), classifying (97%), interpreting (93%), predicting (89%), and applying concepts (86%) align with the SPS cognitive hierarchy. These basic skills develop earlier because they correspond to the concrete operational stage of third-grade elementary school students (Idris et al., 2022). This outstanding

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

achievement is closely linked to the effectiveness of the IBL strategies implemented by the teachers. During the IBL orientation phase, teachers consistently used a variety of media, ranging from direct observation in the school garden, the use of images and videos, to real objects that students could hold and experience firsthand. This created a learning experience that was both hands-on and minds-on simultaneously. Basic process skills serve as the primary gateway to the entire scientific process, as they are acquired through careful and systematic observation (Agustiani et al., 2022)

The grouping or classification indicator reached a percentage of 97%, which falls into the high category. This is because the material on the five senses has a clear structure and is easy to categorize. Students can group objects based on function, type of stimulus, and the sensory organ used. In IBL learning, students are given the opportunity to construct classification concepts through active discussion and exploration. These findings support previous research stating that active science-based learning can improve the classification skills of elementary school students (Rizal & Ridwan, 2019)

Under the "interpretation" indicator, students are able to explain phenomena related to the functions of the five senses based on their observations and learning experiences. This interpretive ability demonstrates that IBL not only encourages the memorization of concepts but also helps students build a more meaningful conceptual understanding (Matsna et al., 2023).

The indicator is predicted to achieve a high rating because teachers consistently use prediction games before conducting experiments. This strategy helps students activate prior knowledge and develop anticipatory thinking skills. When predictions are tested through experiments, students gain a more meaningful learning experience than if they were simply given theoretical explanations (Kirnanda & Besar, 2025).

The indicator for asking questions scored 78% and falls into the moderate category. Some students are already able to formulate simple scientific questions, but still require teacher prompts and guidance. This indicates that the ability to ask scientific questions is a metacognitive skill that has not yet developed optimally among students. The indicator for formulating hypotheses achieved a very high percentage, namely 98%. This finding is noteworthy because, theoretically, formulating hypotheses is considered a more complex integrated process skill (Widyaningsih et al., 2020). These high achievements were influenced by the context of the material on the five senses, which is closely tied to students' daily experiences, thereby making it easier for them to formulate tentative hypotheses based on simple cause-and-effect relationships (Kurniawati, 2021). This finding reinforces the argument that selecting a context for the material that is relevant to students' lives is a key variable in the successful implementation of IBL (Safira Eka Indrayani et al., 2025).

Meanwhile, the indicator for planning experiments received the lowest percentage, at 73%. Most students still require teacher assistance in systematically outlining the experimental procedures. This finding indicates that the implementation of IBL in this study remains at the guided inquiry level because students are not yet fully independent in designing investigations. This condition aligns with Piaget's theory, which states that elementary school students still require concrete guidance in solving complex thinking tasks (J. Piaget, 1950). Planning experiments demands relatively higher levels of sequential and anticipatory thinking skills abstract, as students must imagine a series of actions they have not performed before. In this study, the teacher acted as a facilitator who provided intensive scaffolding to bridge these cognitive limitations, which is an implementation of real-world learning practices.

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

Nevertheless, the 73% achievement still holds positive significance and deserves recognition. This figure indicates that even under guided conditions, third-grade elementary school students have begun to construct their own investigative steps.

The communication indicator also falls into the moderate category with a percentage of 74%. Students are already able to record observation results in tables, but still struggle to present experimental results coherently, both orally and in writing. Scientific communication skills indeed require verbal skills, the organization of ideas, and self-confidence all of which are still developing in third-grade elementary school students (Maison et al., 2019).

Overall, the study's findings confirm that basic process skills develop more rapidly than integrated process skills among elementary school students (Misfa et al., 2025). However, this study found that the indicator of formulating hypotheses actually achieved very high scores despite being classified as an integrated skill. This finding suggests that the success of a process skill is influenced not only by the level of cognitive complexity but also by the relevance of the material's context to students' experiences.

The contribution of this study lies in the finding that contextual material closely related to daily life can help elementary school students develop more complex scientific thinking skills through the IBL approach.

Future research could gradually advance the implementation of IBL toward the open inquiry stage to foster greater student autonomy in conducting scientific investigations. Additionally, subsequent studies could incorporate visual media, scientific communication exercises, and other learning contexts to strengthen students' integrated process skills (Putri et al., 2022). These findings also imply that selecting materials closely related to students' daily experiences can be an effective strategy for developing science process skills at the elementary school level (Yaqin, 2025).

Conclusion

This study concludes that the implementation of Inquiry-Based Learning (IBL) is effective in developing the science process skills (SPS) of third-grade elementary school students in the context of the five senses. Basic process skills, such as observation and hypothesis formulation, developed very well. However, integrated skills (planning experiments, communicating, and asking questions) still require reinforcement because students are still at the guided inquiry stage.

The main contribution of this study is the demonstration that the relevance of the subject matter context, which is closely tied to students' daily experiences, can accelerate the mastery of integrated skills particularly the ability to formulate hypotheses, which is theoretically complex for lower-grade students. These findings confirm that the success of IBL depends not only on the model's syntax but also on the relevance of the subject matter context to students' concrete world.

Theoretically, this study reinforces the view that the development of scientific communication skills proceeds in stages corresponding to cognitive age, but can be accelerated through contextual learning. Practically, these findings imply that teachers should design a gradual transition in inquiry-based learning (IBL) from guided to open inquiry through the provision of targeted scaffolding. For elementary schools, the implication is the need for curriculum policy support at the school level that facilitates the continuous integration of scientific communication practice starting from the lower grades. Further research is recommended to test the implementation of IBL on more abstract science topics and to develop specific learning strategies focused on improving elementary students' scientific communication skills and experimental planning.

References

Agustiani, E., Aminah, N. S., & Suryana, R. (2022). Analysis of science process skills based on programme for international student assessment test and observation instruments of senior high schools. *Jurnal Pendidikan Fisika Indonesia*, *18*(1), 45–54. https://doi.org/:10.15294/jpfi.v18i1.29434

Aktamiş, H., Hiğde, E., & Özden, B. (2016). Effects of the inquiry-based learning method on students' achievement, science process skills and attitudes towards science: A meta-analysis science. *Journal of Turkish Science Education*, *13*(4), 248–261. https://doi.org/.10.12973/tused.10183

Anderson, Ellis, J. P., & Jones, A. M. (2014). Understanding early elementary children's conceptual knowledge of plant structure and function through drawings. *CBE Life Sciences Education*, *13*(3), 375–386. https://doi.org/10.1187/cbe.13-12-0230

Anderson, L. W. and K. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* Longman.

Angelia, Y., Supeno, S., & Suparti, S. (2022). Keterampilan Proses sains siswa sekolah dasar dalam pembelajaran IPA menggunakan model pembelajaran inkuiri. *Jurnal Basicedu*, *6*(5), 8296–8303. https://doi.org/10.31004/basicedu.v6i5.3692

Astuti, I. A., Suhandi, A., Sopandi, W., Sujana, A., & Nurnaningrum, G. (2025). Analysis of Elementary School Students' Science Process Skills in the Merdeka Curriculum. *Jurnal Penelitian Pendidikan IPA*, *11*(2), 837–844. https://doi.org/10.29303/jppipa.v11i2.10147

Widyaningsih, D.A. Gunarhadi, Muzzazinah (2020). Analysis of science process skills on science learning in primary school. *Proceedings of the 3rd International Conference on Learning Innovation and Quality Education* (ICLIQE 2019). 10.2991/assehr.k.200129.085

Mutiara, E. S. (2025). *Pengaruh model inquiry based learning berbantuan media solar system scope terhadap keterampilan proses*. https://repository.upi.edu/129932/

Furtak, E. M., Seidel, T., Iverson, H., & Briggs, D. C. (2012). Experimental and quasi-experimental studies of inquiry-based science teaching: a meta-analysis. *Review of Educational Research*, *82*(3), 300–329. https://doi.org/10.3102/0034654312457206

Idris, N., Talib, O., & Razali, F. (2022). Strategies in mastering science process skills in science experiments: a systematic literature review. *Jurnal Pendidikan IPA Indonesia*, *11*(1), 155–170. https://doi.org/10.15294/jpii.v11i1.32969

Ismunayah, R., Nurasiah, I., Sutisnawati, A. (2025). Peningkatan keterampilan proses IPA melalui pendekatan science, environment, technology, and society (SETS) di sekolah

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

dasar. *ELSE (Elementary School Education Journal)* https://doi.org/https://eprints.ummi.ac.id/4126/1/Ismunayah%2B85-96.pdf

J. Piaget. (1950). *The Psychology of Intelligence*.

Kassaye, M. T., Damtie, D., Melesse, S., & Yemata, G. (2025). Effect of using science process skills-integrated inquiry-based approach on grade nine students' cell biology academic achievement. *Discover Education*, *4*(1). https://doi.org/10.1007/s44217-025-00699-w

Kirnanda, N., & Besar, A. (2025). Penerapan model pembelajaran inkuiri untuk meningkatkan pemahaman konsep IPAS pada siswa kelas VI 1 MIN 25 Aceh Besar. In *Jurnal Studi Tindakan Edukatif: I*. https://ojs.jurnalstuditindakan.id/jste/

Kurniawati, K. (2021). Penerapan model pembelajaran inkuiri terbimbing untuk meningkatkan keterampilan proses sains siswa. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, *10*(2). https://doi.org/10.33578/jpfkip.v10i2.8250

Lubis & Siregar. (2024). Penggunaan pendekatan steam dalam meningkatkan kemampuan literasi sains siswa sekolah dasar. *Social, Humanities, and Educational Studies SHEs: Conference Series 7 (3) (2024) 2599-2608*. https://jurnal.uns.ac.id/shes

Maison, M., Darmaji, D., Kurniawan, D. A., Astalini, A., Dewi, U. P., & Kartina, L. (2019). Analysis of science process skills in physics education students. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *23*(2), 197–205. https://doi.org/10.21831/pep.v23i2.28123

Matsna, F. U., Rokhimawan, M. A., & Rahmawan, S. (2023). Analisis keterampilan proses sains siswa melalui pembelajaran berbasis praktikum pada materi titrasi asam-basa kelas xi sma/ma. *Dalton : Jurnal Pendidikan Kimia Dan Ilmu Kimia*, *6*(1), 21. https://doi.org/10.31602/dl.v6i1.9187

Mawarnis, E. R., Akbar, I., & Herman, M. (2023). The analysis of science process skills (SPS) of 11th grade science students. *Hydrogen: Jurnal Kependidikan Kimia*, *11*(5), 632. https://doi.org/10.33394/hjkk.v11i5.8923

Misfa, W. A., Sari, L., Hermita[3], N., Gusmida, R., & Barokah[4], S. (2025). Penerapan model pembelajaran inquiry based learning berbasis kearifan lokal untuk meningkatkan hasil belajar siswa sekolah dasar pada materi pewarna alami. *Didaktik : Jurnal Ilmiah Pgsd fkip universitas mandiri 11*.

Putri, W. A., Astalini, A., & Darmaji, D. (2022). Analisis kegiatan praktikum untuk dapat meningkatkan keterampilan proses sains dan kemampuan berpikir kritis. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(3), 3361–3368. https://doi.org/10.31004/edukatif.v4i3.2638

Rizal, R., & Ridwan, I. M. (2019). Implementasi discovery learning untuk meningkatkan keterampilan dasar proses sains siswa SMA. *JoTaLP: Journal of Teaching and Learning Physics*, *4*, 1–10.

Rustaman, A. 2005. *Buku strategi belajar mengajar biologi*. Bandung.

Juli 2026 Vol. 11 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 388-398

Sa'adah, S., Andini, F. S., & Yusup, I. R. (2023). Improving students' science process skills through level of inquiry learning assisted by liveworksheet on the concept of environment change. *Jurnal Penelitian Pendidikan IPA*, *10*(7), 3983–3991. https://doi.org/10.29303/jppipa.v10i7.8120

Safira Eka Indrayani, Dwi Sulistyaningsih, & Abdul Aziz. (2025). A sistematic literature review: Model inquiry based learning terhadap pengingkatan kemampuan berpikir kritis. *Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *8*(1), 408–420. https://doi.org/10.30605/proximal.v8i1.5310

Sugiyono. (2019). *Metode penelitian kuantitatif kualitatif dan r&d*. Alfabeta.

Sutimah, S., & Tyas, D. N. (2024). Implementasi model pembelajaran inquiry based learning pada mata pelajaran IPAS dalam konteks kurikulum merdeka di sekolah dasar. *Jurnal Basicedu*, *8*(4), 2941–2952. https://doi.org/10.31004/basicedu.v8i4.8307

Vinson, T. M. A. (2025). Inquiry-base learning to enhance scientific literacy and process skills of students: Private secondary school teachers in focus. *International Journal of Innovative Science and Research Technology*, 1156–1159. https://doi.org/10.38124/ijisrt/25jul756

Yaqin, A. H. (2025). Efektivitas inquiry based learning dalam meningkatkan kemampuan literasi dan numerisasi di sekolah tingkat dasar. *Jurnal Pendidikan Guru Madrasah Ibtidaiyah*. https://ejournal.iaingawi.ac.id/index.php/pgmi/index