



Enhancing Scientific Reporting Skills and Learning Outcomes through SAVI-Based Practical Work

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abstract

Learning outcomes and scientific reporting skills are key components that need improvement in laboratory-based learning. This study aims to test the application of the SAVI approach in a laboratory-based learning context to students' scientific reporting skills. The method used is a quasi-experimental design for SAVI-based practicum activities. The assessment of scientific reporting skills uses an instrument to evaluate practicum reports. Learning outcomes are measured using multiple-choice questions. Data analysis uses N-Gain and t-test. The results show that the scientific reporting skills of experimental class students with an average of 81.81 are higher than the control class 73.61, but the difference is not significant ($p > 0.05$); the increase in student learning outcomes is significantly different ($p < 0.05$), with an N-gain of 0.57 (moderate) for the experimental class and 0.26 (low) for the control class. The SAVI approach has been proven effective in improving learning outcomes and scientific reporting activities, although students' physiological and psychological barriers still need to be further addressed in its application.

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1. Introduction

The ability to report scientific work is a very important competency in 21st-century learning, closely related to critical thinking and written communication skills. Mastery of these skills not only supports the achievement of subject matter mastery but also plays an important role in shaping students' scientific attitudes and academic integrity (Maknun et al., 2020; Rohman et al., 2024). Additionally, learning outcomes, which encompass knowledge, attitudes, and skills, are the primary indicators of the effectiveness of the educational process. In this context, mastery of concepts and the ability to communicate ideas or findings through scientific reports are two interrelated and equally essential aspects.

However, empirical evidence in the field shows that many students still struggle with writing scientific reports, especially laboratory reports. Preliminary research conducted on a sample of 57

students showed that although 82.5% of respondents reported understanding the structure of laboratory reports, only 35.1% were able to write coherent reports that complied with scientific principles. These findings indicate a mismatch between students' conceptual understanding and their ability to write scientific reports. This deficiency negatively impacts the quality of laboratory reports and the reinforcement of learning outcomes through laboratory activities.

In addition, the limitations of the applied learning approach are a major factor contributing to suboptimal student engagement. Initial observations indicate that educators still adopt a teacher-centered approach, failing to consider students' diverse learning styles. This approach has proven to be ineffective in achieving learning outcomes that require the development of complex skills, such as scientific report writing and higher-order thinking (Asif et al., 2021; Torrisi-Steele, 2020).

One approach believed to be capable of overcoming this challenge is the SAVI (Somatic, Auditory, Visual, Intellectual) approach. This approach integrates body movement, hearing, visualization, and intellectual processing into the learning process, making it more effective in addressing differences in students' learning styles (Sagita et al., 2019; Saifuddin et al., 2020). Research by Nengsih et al. (2022) also shows that applying the SAVI approach can result in significant improvements in student learning outcomes. In the context of biology education, the SAVI approach is particularly relevant when combined with concrete, practical, and experience-based laboratory activities (Oliveira et al., 2023).

Preliminary studies show that 98.2% of students reported a better understanding of the excretory system through participation in practical activities. However, this improved understanding does not directly correlate with their ability to write scientific reports. This discrepancy indicates that practical learning has not been optimized to the same extent in the development of scientific report writing skills. This study aims to determine how the implementation of the SAVI approach, grounded in practical work, influences students' scientific reporting skills and learning outcomes, and how students respond to it. The SAVI approach is expected to improve conceptual understanding and develop the scientific and written communication skills students need to face the challenges of the 21st century.

2. Method

This study used a quantitative experimental research method. The research design used was a pretest-posttest control-group design with a control and an experimental group. This research was conducted at a high school in Cirebon, West Java, during the even semester of the 2024/2025 academic year.

The learning process in this study used a problem-based learning model that combined practical sessions in both classes. The differences observed in the treatment can be attributed to the learning approaches used in each group. Specifically, the experimental class adopted the SAVI approach, while the control class used the scientific approach, a method commonly used by teaching staff at the research site. Therefore, this study focuses on testing the influence of various learning approaches within the same model on students' scientific reporting skills and learning outcomes.

Data collection was conducted using the following instruments: (1) learning observation sheets, laboratory activity observation sheets, and scientific report product assessments to measure scientific reporting skills; (2) multiple-choice tests to determine student learning outcomes; and (3) questionnaires to determine student responses during SAVI-based practical learning.

The instrument development process focused on indicators of scientific reporting skills as a reference for researchers to determine students' levels of these skills. These skill indicators are adopted from Levi's (2008) scientific communication indicators, which include: (1) Information retrieval; (2) Scientific reading; (3) Listening & observing; (4) Scientific writing; (5) Information representation; and (6) Knowledge presentation.

The instruments utilized in this study have undergone rigorous validation, namely content validity (yielding an average score of 89%; valid) and empirical validity (with a reliability value of $\alpha = 0.85$), thereby substantiating their suitability for research endeavors. After the data was successfully obtained, analysis was then performed on the results. The data analysis techniques used consisted of (1) Analysis of Observation Results and Assessment of Scientific Report Products; (2) Analysis of Scientific Report Product Values; (3) Analysis of Student Learning Test Scores; and (4) Normalized Gain (N-Gain) Analysis.

3. Result and Discussion

The SAVI approach, grounded in practical work, was implemented across four learning sessions. These four sessions covered the structure and function of excretory organs, the mechanism of urine formation, disorders and technologies related to the excretory system, and practical work analyzing urine content under various treatments.

The observation process in this study was divided into three types, namely learning observation, laboratory activity observation, and scientific report product assessment. The results of student learning activities during the first to third meetings are shown in Figure 1.

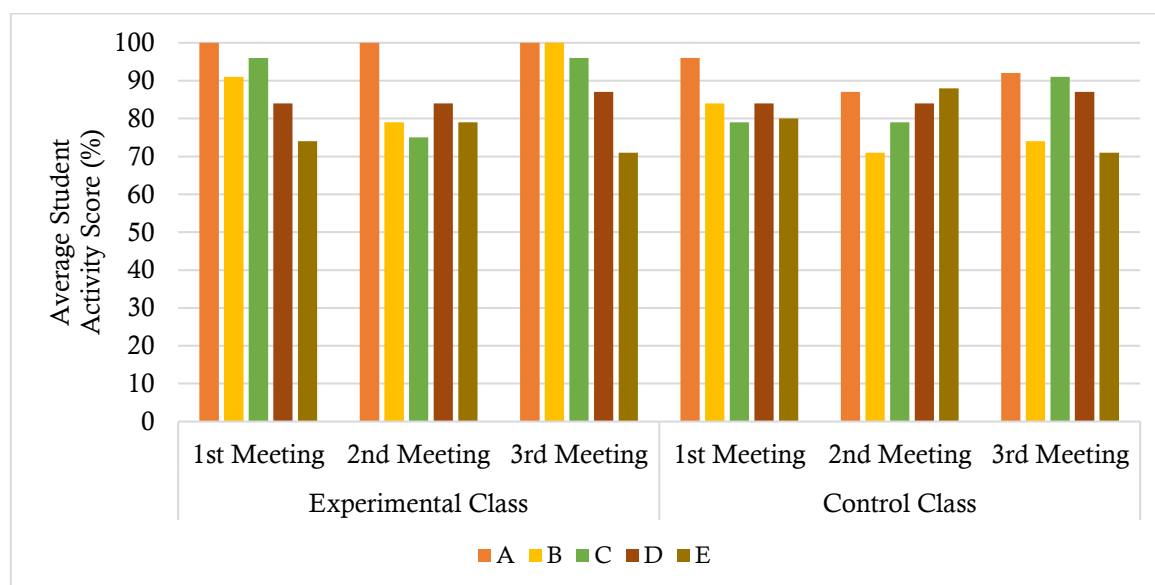


Figure 1. Diagram of average student learning activity scores for each indicator

Explanation:

A : Problem orientation

B : Organizing learning

C : Investigation guidance

D : Developing and presenting results

E : Analyzing and evaluating the problem-solving process

General observations of the experimental class indicate that students in that class achieved higher average scores than students in the control class. This is primarily due to the SAVI approach, which has been proven to maximize students' learning styles. This finding is supported

by the observation that students in the experimental class showed higher motivation and greater enjoyment of learning. Findings that align with Burke et al.'s (2024) argue that integrating internal and external factors can increase students' love of learning and learning outcomes.

However, the complexity of the excretory system material poses significant challenges. As shown by Matovu (2024) Students' perceptions of task complexity can influence their active participation. It has been proven that tasks that are too simple tend not to spark discussion, while tasks that are too complex have been observed to cause a decline in engagement. In this study, this was reflected in several indicators of decreased learning activity, especially when abstract material was presented. In addition to classroom learning activities, this study also highlighted students' scientific skills through direct observation of laboratory practices during the fourth meeting (Figure 2).

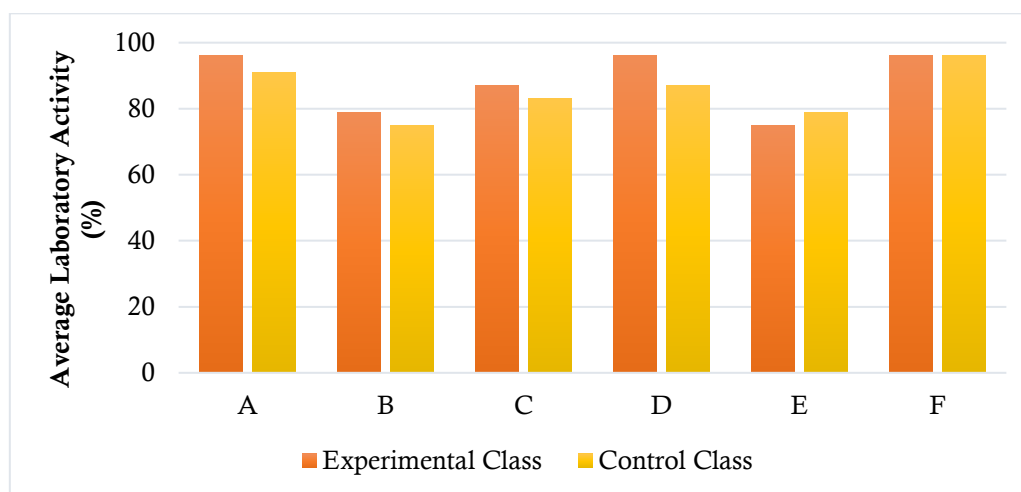


Figure 2. Diagram of average laboratory activities

Explanation:

A: Observe

B: Question and predict

C: Plan and conduct investigations

D: Process, analyze data and information

E: Evaluate and reflect

F: Communicate results

In the context of laboratory activities, most students demonstrated commendable skills; however, two indicators, namely questioning and predicting, as well as evaluating and reflecting, were still inadequate. It appears that difficulties are often encountered in forming hypotheses and experimental conclusions. These findings are in line with Hakyolu's (2016) statement that scientific argumentation skills depend on students' ability to understand phenomena and form conclusions based on evidence.

Laboratory activities have been proven to play a crucial role in developing scientific thinking skills, comprehensively understanding concepts, and fostering a positive attitude toward science through exploration and group collaboration (Shaby et al., 2024). The effectiveness of the SAVI approach in this context is further supported by Indriani's (2022) Findings show that integrating the SAVI model with practical methods optimally enhances students' sensory engagement.

The effectiveness of this collaborative approach in increasing student engagement and understanding has been proven in a study conducted by Pudjiarti et al. (2024), whose findings show that group work can foster collaboration and promote academic success. The results of the scientific report assessment, including several skill indicators, are shown in Figure 3.

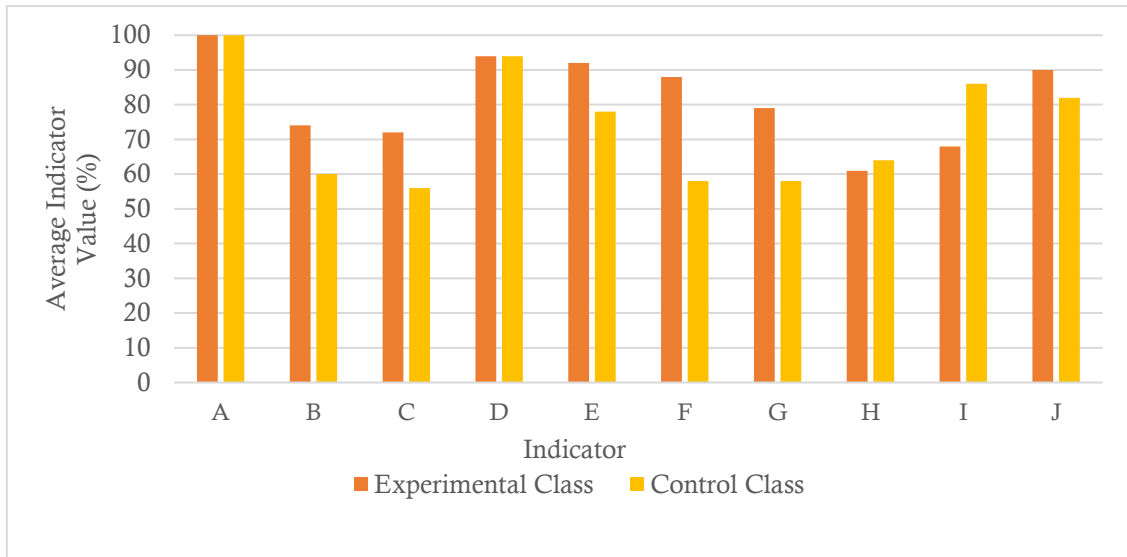


Figure 3. Average product value diagram for scientific work reports for each indicator

Explanation:

A: Scientific Writing - Practical objectives

B: Information Retrieval - Theoretical basis

C: Scientific Writing - Hypothesis

D: Listening & Observing - Methodology

E: Information Representation - Observation Results

F: Knowledge Presentation - Discussion

G: Knowledge Presentation - Conclusion

H: Scientific Writing - Bibliography

I: Information Representation - Appendix

J: Information Representation - Discussion Questions

The evaluation of students' scientific reports found that the experimental group demonstrated proficiency in compiling observation results but experienced difficulties in compiling the bibliography. Conversely, the control group experienced difficulties with the observation results. The indicator with the lowest proficiency level was scientific hypothesis writing in both classes. These findings are in line with Anwar's (2019) observation, which states that the ability to formulate hypotheses is a key component in biological investigation and must be carefully developed in the education curriculum.

A notable finding is the significant challenges encountered in compiling a bibliography. According to Hernawan et al. (2023) The main obstacles to effective writing in this context are a lack of understanding of the writing system, inadequate references, and limited source literacy. Therefore, improving academic literacy and providing training in scientific writing techniques are essential to enhancing the quality of student reports.

Finally, students' ability to interpret data in laboratory reports still needs improvement. An incorrect interpretation indicates weak critical thinking skills, especially in the conclusion of experiments. Urip et al. (2019) shows that applying the SAVI model can significantly improve students' cognitive, affective, and psychomotor skills, including their ability to conclude. To determine whether this difference was statistically significant, an Independent Samples T-Test was conducted, as shown in Table 1.

Table 1. Results of the Independent Samples T-Test for Scientific Paper Report Scores

Variance Assumption Conditions	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.031	.863	1.364	10	.202	8.3333	6.1083	-5.2768	21.9434
Equal variances not assumed			1.364	9.981	.202	8.3333	6.1083	-5.2803	21.9469

The results of the hypothesis test indicate that the p-value is greater than 0.05. These findings indicate that there is no statistically significant difference in the scientific report-writing skills of students in the experimental and control classes. The absence of significant variation is thought to be due to the limited number of practical sessions, which were conducted only once, thereby not allowing for the optimization of students' scientific abilities. This finding aligns with research conducted by Suherman (2023), which shows that the initial implementation of the SAVI learning model does not significantly influence students' understanding and requires repeated application across multiple learning cycles. Therefore, to achieve optimal results, the SAVI approach must be applied continuously, rather than being limited to a single session. In addition to measuring students' scientific reporting skills, this study also evaluated differences in student learning outcomes based on test scores. The average pretest and posttest scores are shown in Table 2.

Table 2. Average student learning test scores

Class	Pre-test (M ± SD)	Post-test (M ± SD)	Percentage	Improvement (%)
Experiment	46.77 ± 15.52	73.61 ± 16.27	26.84	57.37%
Control	52.57 ± 15.03	66.17 ± 16.54	13.60	25.88%

Table 2 shows that both groups had relatively equal initial abilities. However, after treatment, post-test scores increased more significantly in the experimental group than in the control group. These findings indicate that the SAVI approach, grounded in practical work, has a greater impact on learning outcomes. After collecting the results, statistical tests were carried out, as shown in Table 3.

Table 3. Mann-Whitney U test results on student learning test results

Test Type	Student Learning Test Results
Mann-Whitney U	344.500
Wilcoxon W	974.500
Z	-3.162
Asymp. Sig. (2-tailed)	.002

Statistical analysis was performed using the Mann-Whitney U test, which yielded a significance value (Asymp. Sig. 2-tailed) of 0.002, which did not reach the threshold of 0.05 for statistical significance. These findings indicate a significant difference in scientific reporting ability between the experimental and control groups, as evidenced by the test results.

The findings of this study are supported by Wahyuni et al. (2022), who found that the SAVI approach improves students' cognitive abilities, including critical thinking skills. Students with

critical thinking skills exhibit a range of traits, including self-confidence, open-mindedness, a commitment to honesty, and a focus on clarity and accuracy (Mudaningrat et al., 2022). The selection of appropriate teaching methods has been shown to be effective in achieving learning objectives and creating a pleasant learning environment (Wallace et al., 2021). The next test in this study was to perform a Normalized Gain (N-Gain) analysis. Table 4 below shows the results of the N-Gain analysis.

Table 4. N-Gain value

Class	N-Gain Score	Category
Experiment	0.57	Medium
Control	0.26	Low

As shown in Table 4, the N-Gain value in the experimental class was higher than that in the control class, with an average difference of 0.31. Although the observed difference was not statistically significant, it still indicates that the practice-based SAVI approach has contributed to improved student learning outcomes. Hypothesis testing to determine the difference in improvement was conducted by analyzing each student's N-Gain scores. Hypothesis testing used the Independent Samples T-Test, with the results shown in Table 5.

Table 5. Results of the independent samples t-test N-Gain values

Variance Assumption Conditions	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.577	.214	4.667	68	.000	30.94286	6.63078	17.71133	44.17438
Equal variances not assumed			4.66766	601	.000	30.94286	6.63078	17.70630	44.17942

Statistical analysis of the test results yielded a p-value of 0.000 (< 0.05), indicating a significant difference in the observed improvement between the two classes. Consequently, the lab-based SAVI approach proved more effective in improving students' scientific reporting skills. These results align with Victorina's (2019) findings that the SAVI approach has a significant impact on learning outcomes compared to conventional methods. These findings are supported by research conducted by Indriani et al. (2022), which shows that the SAVI approach, when supported by basic laboratory work, can lead to positive changes in science education.

Statistical analysis of the test results yielded a p-value of 0.000 (< 0.05), indicating a significant difference in the observed improvement between the two classes. As a result, the SAVI approach, based on practical work, proved more effective at improving students' scientific reporting skills. These results align with Victorina's (2019) findings that the SAVI approach has a significant impact on learning outcomes compared to conventional methods. These findings are supported by Indriani et al. (2022), who found that the use of the SAVI approach, supported by basic laboratory work, can lead to positive changes in science education.

The significant improvement in the experimental group suggests that the practice-based SAVI approach effectively supports students' understanding of the excretory system. This is evident not only from cognitive outcomes but also from student feedback, indicating that practical activities

aid comprehension and increase learning interest. These responses reflect active student engagement (physically, emotionally, visually, and intellectually) (Dewi et al., 2023; Nimah et al., 2023). This aligns with Permana's view in Shodiq et al. (2025), emphasizing that direct experience and a supportive environment enhance motivation and learning outcomes.

4. Conclusion

Practice-based learning using the SAVI approach has been shown to positively impact student learning outcomes and scientific reporting skills. The research findings indicate that student learning outcomes in the experimental class improved significantly. However, in evaluating scientific reporting proficiency, the experimental class scored higher than the control class, but the difference was not statistically significant. These findings suggest that the SAVI approach is worth adopting as a laboratory learning strategy, particularly for abstract material or topics that require concrete experience. In light of these findings, it is recommended that further research be conducted to investigate the efficacy of the SAVI approach across other domains of scientific skills, assess its long-term impact, and adapt it to diverse subjects and educational levels, thereby facilitating a more comprehensive understanding.

References

- Anwar, Y., & Susanti, R. (2019). Analyzing Scientific Argumentation Skills of Biology Education Students in General Biology Courses. *In Journal of Physics: Conference Series*, 1166(1). <https://doi.org/10.1088/1742-6596/1166/1/012001>
- Asif, M., Thomas, G., Awan, M. U., & Din, A. M. (2021). Enhancing Student Engagement Through Heterogeneous Pedagogical Approaches: Action Research in a University Level Course in Saudi Arabia. *International Journal of Educational Management*, 35(1), 1–28. <https://doi.org/10.1108/IJEM-10-2019-0375>
- Burke, C. M., Montross, L. P., & Dianova, V. G. (2024). Beyond the Classroom: An Analysis of Internal and External Factors Related to Students' Love of Learning and Educational Outcomes. *Data*, 9(6), 88. <https://doi.org/10.3390/data9060081>
- Dewi, N. P. S. S., & Riastini, P. N. (2023). SAVI Approach to Students' Creative Thinking Abilities in Class VI Elementary School Science Content. *MIMBAR PGSD Undiksha*, 11(3), 498–504. <https://doi.org/10.23887/jjpsd.v11i3.63940>
- Hakyolu, H., & Ogan-Bekiroglu, F. (2016). Interplay between Content Knowledge and Scientific Argumentation. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(12). <https://doi.org/http://doi.org/10.12973/eurasia.2016.02319a>
- Hernawan, Anshari, D., Syihabuddin, & Mulyati, Y. (2023). Exploring the Profile of Scientific Article Writing Ability Among Tertiary Students: Insights From Five Institutions in Indonesia. *International Journal of Education*, 16(2), 157–166. <https://doi.org/10.17509/ije.v16i2.57357>
- Indriani, S. P., Giri, I. M. A., & Ardiawan, I. K. N. (2022). Pengaruh Model Pembelajaran SAVI Berbantuan Media Praktikum Sederhana Terhadap Hasil Belajar IPA. *Indonesian Journal of Learning Education and Counseling*, 5(1), 44–52. <https://doi.org/10.31960/ijolec.v5i1.1746>
- Maknun, D., Gloria, R. Y., & Muzakki, J. A. (2020). Keterampilan Meneliti yang Dimiliki Mahasiswa Prodi Pendidikan Biologi Se-Wilayah III Cirebon. *Jurnal Inovasi Pendidikan IPA*, 6(1), 39–47. <https://doi.org/10.21831/jipi.v6i1.28251>
- Matovu, H., Won, M., Ungu, R. B. H.-A. D. A. K., Treagust, D. F., Tsai, C.-C., Mocerino, M., & Tasker, R. (2024). The Perceived Complexity of Learning Tasks Influences Students'

- Collaborative Interactions in Immersive Virtual Reality. *Journal of Science Education and Technology*, 33(4), 542–555. <https://doi.org/10.1007/s10956-024-10103-1>
- Mudaningrat, A., Maryuningsih, Y., & Anugrah, I. R. (2022). Conformity Analysis of HOTS (Higher-order Thinking Skills) Based on Critical Thinking in the Evaluation of High School Biology Learning in The East Cirebon Region. *Biosfer: Jurnal Tadris Biologi*, 13(1), 37–47. <https://doi.org/10.24042/biosfer.v13i1.11701>
- Nengsih, S., Ependi, I., & Meutiawati, I. (2022). Efektivitas Pendekatan SAVI Terhadap Hasil Belajar Peserta Didik di SMPN 2 Longkib Subulussalam. *Phi: Jurnal Pendidikan Fisika Dan Terapan*, 3(2), 33–40. Retrieved from <https://jurnal.ar-raniry.ac.id/index.php/jurnalphi>
- Nimah, M., & Wahyuni, A. (2023). Unleashing the SAVI Learning Model: Enhancing Grade IV Science Outcomes. *Academia Open*, 8(1), 10–21070. <https://doi.org/10.21070/acopen.8.2023.5274>
- Oliveira, H., & Bonito, J. (2023). Practical Work in Science Education: A Systematic Literature Review. *Frontiers in Education*, 8, 1151641. <https://doi.org/10.3389/educ.2023.1151641>
- Pudjiarti, E. S., Rusdarti, L., M. M., & Mamu, F. J. (2024). The Power of Project-Based Learning: A Catalyst for Student Engagement, Collaboration, and Academic Excellence. *International Journal of Education and Practice*, 12(3), 606–621. <https://doi.org/10.18488/61.v12i3.3735>
- Rohman, F., Dharmawan, A., & Sari, M. S. (2024). Development of a 4C Skills Evaluation Instrument for Biology: A Validity and Reliability Study on Indonesian High School Students Learning. *International Journal of Innovative Research and Scientific Studies*, 7(2), 701–717. <https://doi.org/10.53894/ijirss.v7i2.2873>
- Sagita, S. G. N., & Aminatun, T. (2019). Combination of CPS and SAVI on Biology Learning Media to Improve Student's Understanding and Creativity on Environmental Change Topic. *Journal of Physics: Conference Series*, 1397(1). <https://doi.org/10.1088/1742-6596/1397/1/012057>
- Saifuddin, M., Khoiri, A., & Mulyani, P. S. (2020). Treatment Model Pembelajaran Somatic, Auditory, Visual, Intellectual (SAVI) Terhadap Gaya Belajar Dan Prestasi Belajar. In *Prosiding Seminar Pendidikan Fisika FITK UNSIQ*, 2(1), 61–69. Retrieved from <https://ojs.unsiq.ac.id/index.php/semnaspf/article/view/1376>
- Shaby, N., Assaraf, O. B. Z., & Koch, N. P. (2024). Students' Interactions During Laboratory Group Activity in a Science Museum. *International Journal of Science and Mathematics Education*, 22(4), 703–720. <https://doi.org/10.1007/s10763-023-10404-8>
- Shodiq, M. F., & Darmawan, D. (2025). Pengaruh Lingkungan Sekolah terhadap Hasil Belajar Siswa Sekolah Menengah Pertama. *Ihsanika: Jurnal Pendidikan Agama Islam*, 3(1), 292–307. <https://doi.org/10.59841/ihsanika.v3i1.2209>
- Suherman, A. (2023). Penerapan Model Pembelajaran (SAVI) Somatic Auditory Visual Intellectual dalam Meningkatkan Pemahaman Puisi (Penelitian Tindakan Kelas). *Jiip - Jurnal Ilmiah Ilmu Pendidikan*, 6(7), 5055–5064. <https://doi.org/10.54371/jiip.v6i7.2375>
- Torrissi-Steele, G. (2020). Facilitating the Shift From Teacher Centred to Student Centred University Teaching: Design Thinking and The Power of Empathy. *International Journal of Adult Education and Technology (IJAET)*, 11(3), 22–35.
- Urip, U., Supriyadi, S., & Mulyono, S. E. (2019). Implementation of SAVI Learning Model Through Practicum Activities Towards Students Science Learning Outcomes. *Journal of Primary Education*, 8(5), 181–187.

- Victorina, A., & Ramadhan, S. (2019). The Effects of Using Somatic, Auditory, Visual, Intellectual as Learning Model Towards Students Competency Skill in SMPN 1 Koto Baru Dharmasraya. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, 15(2), 176–179. Retrieved from <http://ijpsat.ijsh-t-journals.org/>
- Wahyuni, F. R. E., Wiransah, W., Syafruddin, D., & Bustami, Y. (2022). The Meta-analysis Study of SAVI Learning Model on Student's Cognitive Aspects in Biology Learning. *JPBIO (Jurnal Pendidikan Biologi)*, 7(1), 93–105. <https://doi.org/10.31932/jpbio.v7i1.1550>
- Wallace, C. S., Prather, E. E., Milsom, J. A., Johns, K., & Manne, S. (2021). Students Taught by a First-Time Instructor Using Active-Learning Teaching Strategies Outperform Students Taught by a Highly-Regarded Traditional Instructor. *Journal of College Science Teaching*, 50(4), 48–57. <https://doi.org/10.48550/arXiv.2004.09684>