e-ISSN 3090-5354
Vol.2, No.2, August 2026

Implementation of Portfolio-Based Performance Assessment to Improve High School Students' Argumentation Skills in Physics Learning

Hatta Daeng Langga*, Abu Zainuddin

State University of Surabaya, Surabaya, Indonesia

DOI : https://doi.org/10.26740/jdpe.2.2.52776

Sections Info

Article history:
Submitted: April 14, 2026
Final Revised: July 30, 2026
Accepted: August 19, 2026
Published: August 27, 2026

Keywords:
Argumentation Skills;
Performance Assessment;
Physics Learning;
Portfolio;
Toulmin's Argument Pattern.

ABSTRACT

Objective: *To determine the implementation and effect of portfolio-based performance assessment in improving argumentation skills in physics learning, and to identify students' responses to its application.* ***Method:*** *This study used a quasi-experimental pretest-posttest control group design with 66 tenth-grade students at SMA Negeri 1 Bubulan, divided into an experimental class of 33 students receiving portfolio-based performance assessment and a control class of 33 students receiving conventional instruction. Data were collected through observation, TAP indicator-based essay tests, and portfolios, and analyzed using normality tests, paired and independent samples t-tests, and N-Gain calculations.* ***Results:*** *Portfolio assessment was implemented very well (93.75%). The experimental class's argumentation skills improved, with an average N-Gain score of 0.71 (high category), higher than the control class's 0.63 (medium category). However, the difference in post-test scores between the two classes was not statistically significant (p = 0.499).* ***Novelty:*** *The study integrates portfolio-based performance assessment with a Problem-Based Learning (PBL) model incorporating Toulmin's Argument Pattern (TAP) as an innovative approach to measuring and improving high school students' scientific argumentation skills in physics learning more comprehensively and authentically.*

INTRODUCTION

Physics learning today no longer focuses solely on conceptual mastery, but also requires students to think critically, communicate scientifically, and construct logical arguments based on evidence. Argumentation skills are one of the core competencies expected of students under the Regulation of the Minister of Education, Culture, Research, and Technology (Permendikbudristek) Number 5 of 2022 concerning Graduate Competency Standards, which positions critical thinking as a core dimension of the Pancasila Student Profile within the Kurikulum Merdeka framework. Through argumentation, students learn to propose claims, support them with scientific evidence, and build logical reasoning—abilities that are essential in both academic and everyday contexts (Irvan & Admoko, 2020).

Students' argumentation skills in Indonesia, including in physics learning, remain at a low to moderate level. A study by Hardini and Alberida (2022) revealed that students' argumentation abilities at SMAN 1 V Koto Kampung Dalam were classified as moderate to low. Research by Khumairoh (2022) at SMA Kesatrian 1 Semarang found that 51% of students were reluctant to express their opinions due to teacher-centered instruction. A similar condition was identified in a preliminary study at SMA Negeri 1 Bubulan, where only 32% of students could construct arguments with a complete structure comprising claims, evidence, and reasoning. This low level of argumentation skills is attributed to the dominance of conventional teaching methods, insufficient

training in scientific argumentation, and an assessment system oriented solely toward outcomes.

Therefore, the assessment system needs innovation—one that not only measures final learning outcomes but also continuously promotes the development of students' argumentation skills. One relevant approach is portfolio-based performance assessment. This approach evaluates students authentically through their thinking processes and the development of their abilities over time. Portfolios allow students to collect, reflect on, and revise their argumentative works, resulting in increasingly structured and evidence-based arguments (Nuril, 2020). Rosmiati et al. (2020) state that essay-based performance assessment in physics learning can significantly improve students' argumentation skills.

Existing studies on portfolio-based assessment have largely focused on subjects such as writing, biology, or general science, with comparatively limited attention to physics learning specifically (Force, 2020). Moreover, most prior portfolio-assessment studies have not explicitly linked the assessment structure to a formal argumentation framework such as TAP, leaving the connection between assessment design and the development of specific argumentation components (claims, data, warrants, backing, qualifiers, and rebuttals) underexplored (Driessen et al., 2005). This gap indicates the need for a study that examines portfolio-based performance assessment as a tool that is structurally aligned with an established argumentation framework, applied within an authentic physics learning context.

The urgency of this study lies in the gap between the demands of 21st-century physics learning and current assessment practices that remain dominated by summative, outcome-oriented tests (Biggs et al., 2021). Such tests cannot capture how students' argumentation develops over time, nor do they provide space for revision and reflection, both of which are essential to scientific reasoning (Dwivedi et al., 2019). Portfolio-based performance assessment addresses this gap by documenting the trajectory of students' argumentative thinking across multiple stages of learning, rather than measuring it at a single point in time (Blundo et al., 2021). This study differs from prior portfolio-assessment research by explicitly integrating Toulmin's Argument Pattern (TAP) as the structural framework for both instruction and assessment within a Problem-Based Learning (PBL) setting (Erduran et al., 2004). This integration allows the assessment not only to measure argumentation skills but also to actively scaffold their development, offering a more comprehensive and authentic alternative to conventional physics assessment (Beemt et al., 2020).

This study aims to: (1) determine the implementation of portfolio-based performance assessment in measuring students' argumentation skills; (2) examine the effect of such assessment on the improvement of students' argumentation skills in physics learning; and (3) identify student responses to the application of the assessment.

RESEARCH METHOD

This study used a quantitative, quasi-experimental pretest-posttest control group design (Creswell & Creswell, 2023). The study involved two groups: an experimental class that received physics instruction with portfolio-based performance assessment, and a control class that received conventional instruction. The research sample consisted of 66 tenth-grade students at SMA Negeri 1 Bubulan, selected using purposive sampling based on considerations of readiness, active participation in discussions, and completeness of learning documentation, with each group consisting of 33 students.

Instruments and procedure

The learning material used was Global Warming, delivered through a Problem-Based Learning (PBL) model integrated with Toulmin's Argument Pattern (TAP). The research instruments consisted of: (1) an observation sheet for the implementation of portfolio assessment with a rating scale of 0–4; (2) an argumentation skills test in the form of essay questions based on TAP indicators comprising claims, data, warrants, backing, qualifiers, and rebuttals, administered as a pre-test and post-test; (3) a student response questionnaire using a four-point Likert scale (SA/A/D/SD) with 12 statement items across three indicators; and (4) portfolio sheets containing students' argumentative assignments collected progressively. The portfolio assessment instrument consisted of a rubric with four indicators, namely planning, implementation, argumentation skills, and reflection and feedback, each scored on a 0–4 rating scale with descriptive criteria for every score level. The observer used this rubric at each of the three meetings to document students' progress, supported by photographic documentation of student worksheets , argumentative posters, and portfolio sheets collected at each meeting as evidence of implementation.

The portfolio assessment was implemented over three meetings. The first meeting focused on formulating essential questions and designing initial arguments through mind mapping. The second meeting focused on constructing and monitoring arguments through student worksheets, including evidence collection and warrant formulation. The third meeting covered the evaluation and presentation phase, in which students presented their final arguments as argumentative posters incorporating three core TAP elements: claims, data, and warrants.

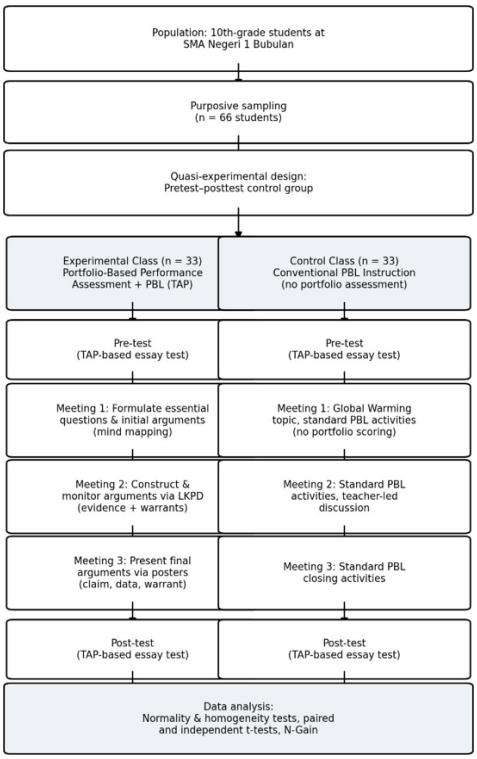

Figure 1. Research flowchart showing sampling, group assignment, and the three-meeting procedure for the experimental and control classes.

Data analysis

Data analysis was conducted quantitatively using SPSS and Microsoft Excel. The implementation of learning was analyzed using score percentages with categorical criteria based on Zakariah et al. (2020), using the formula $P = (\Sigma x / \Sigma xi) \times 100\%$, where P is the implementation percentage, Σx is the total score obtained, and Σxi is the maximum possible score; the resulting percentage was classified into five criteria ranging from Very Poor to Very Good, following Zakariah et al. (2020). The improvement in argumentation skills was analyzed through: (a) the Shapiro-Wilk normality test; (b) Levene's Test for homogeneity; (c) a paired t-test to determine significant differences between the pre-test and post-test scores within each group; (d) an independent samples t-test to compare post-test scores between groups; and (e) N-Gain calculations to determine the degree of improvement in students' argumentation skills.

RESULTS AND DISCUSSION

Results

This study's results are presented in two parts. The first part recapitulates the portfolio assessment implementation across the planning, implementation, argumentation skills, and reflection and feedback indicators observed at each of the three meetings, as summarized in Table 1. The second part reports the improvement in students' argumentation skills between the experimental and control classes, measured through the N-Gain score derived from the pre-test and post-test results, as summarized in Table 2. Table 1 presents the recapitulation of portfolio assessment implementation

observed across the three meetings, based on the mode score obtained for each indicator.

Table 1. Recapitulation of portfolio assessment implementation

No	Observed Aspects	P1	P2	P3	Modus	Criteria
1	Portfolio Assessment Planning	4	4	4	4	Very good
2	Implementation of Portfolio Assessment	4	4	4	4	Very good
3	Argumentation Skills	3	3	3	3	Good
4	Reflection & Feedback	4	4	4	4	Very good

Based on Table 1, almost all implementation aspects received a mode score of 4 (Very Good), except Argumentation Skills, which consistently received a score of 3 (Good) across all meetings. Overall, portfolio assessment implementation reached 93.75%, classified under the Very Good category.

Table 2 presents the pre-test and post-test averages, along with the N-Gain score, for both the experimental and control classes, showing the extent of improvement in argumentation skills achieved by each group.

Table 2. Results of argumentation skill improvement (N-Gain)

Group	Pre-test Average	Post-test Average	N-Gain (Category)
Experiment	39,67	82,70	0,71 (High)
Control	40,42	78,15	0,63 (Medium)

Based on Table 2, the experimental class showed greater improvement in argumentation skills than the control class. The average N-Gain score of the experimental class was 0.71 (high category), while the control class achieved 0.63 (medium category). The Shapiro-Wilk normality test indicated that all data were normally distributed (Sig. > 0.05). The paired t-test revealed significant improvement in both groups ($p < 0.001$): the experimental class obtained $t = -91.222$ ($df = 32$) with a mean difference of −43.03 points, while the control class obtained $t = -83.313$ ($df = 32$) with a mean difference of −37.73 points. However, the independent-samples t-test between groups showed no significant difference in post-test scores ($t = 0.680$; Sig. 2-tailed = 0.499 > 0.05).

Discussion

The implementation of portfolio-based performance assessment in this study proceeded very well (93.75%). The portfolio process, consisting of three meetings, was designed to guide students in progressively developing scientific arguments: from formulating initial claims, collecting data, and constructing warrants to presenting final arguments through posters. The consistent mode score of 4 across the planning, implementation, and reflection aspects indicates that the assessment instrument effectively guided teachers to implement the assessment in a structured manner.

Nevertheless, argumentation skills only reached the Good category (score 3) at each meeting, specifically on the indicators of constructing warrants and providing rebuttals,

the two components of TAP that require students to justify claims against alternative viewpoints. This is consistent with the nature of the PBL model, in which students are required to investigate an authentic problem (in this case, global warming) collaboratively before arriving at a justified claim; the warrant- and rebuttal-construction stages depend on students' ability to synthesize evidence from multiple sources, a skill that typically develops more slowly than claim formulation. As Agustini et al. (2025) found, portfolio assessment can enhance conceptual understanding in physics. However, it does not always immediately lead to the development of higher-order thinking skills such as critical evaluation of evidence. Argumentation therefore requires a long-term practice process embedded within an inquiry-oriented model like PBL, rather than a single instructional cycle. This is reinforced by Ling (2025), who emphasizes that rubric quality is a critical determinant of the success of performance-based assessment.

The argumentation skills of the experimental class improved more substantially than those of the control class. The experimental class achieved an N-Gain of 0.71 (high category), which was higher than the control class at 0.63 (medium category). This difference was also reflected in the distribution of student categories: 87.88% of students in the experimental class reached the high category, compared to only 6.06% in the control class. These findings indicate that integrating portfolios with the TAP-based PBL model had a greater positive impact on the development of argumentation skills.

Portfolios encouraged students to reflect on their thinking processes, revisit their previously constructed arguments, and refine them based on continuously collected scientific evidence. This process aligns with Pols et al. (2023), who argue that integrating argumentation into scientific inquiry is an important way to develop critical thinking skills. Furthermore, Pitt and Quinlan (2022) affirm that authentic, performance-based assessment provides richer feedback compared to conventional tests.

The independent samples t-test showed no statistically significant difference between the two classes' post-test scores ($p = 0.499$). However, this result warrants careful interpretation. The relatively great improvement in the control class may have been influenced by the Global Warming topic, which intrinsically encourages students to argue about environmental issues. The limited duration of the study (three meetings) also constrained the opportunity for the portfolio approach to demonstrate a more statistically significant advantage.

This study offers several advantages: the portfolio instrument directly aligns assessment criteria with the components of TAP, allowing argumentation development to be tracked stage by stage rather than assessed only at the endpoint; and the use of an authentic, high-relevance topic (global warming) increased students' engagement in constructing arguments. However, the study also has notable limitations. The three-meeting treatment duration limited the depth of scaffolding that could be provided, which likely explains why argumentation skills plateaued at the Good category and why the between-group difference in post-test scores did not reach statistical

significance. In addition, the purposive sampling method and the single-school context limit the generalizability of these findings to other populations or physics topics.

CONCLUSION

Fundamental Finding: This study shows that portfolio-based performance assessment integrated with Problem-Based Learning (PBL) and Toulmin's Argument Pattern (TAP) provides a structured, authentic approach to developing students' scientific argumentation skills in physics. The implementation of portfolio-based performance assessment was categorized as very good, achieving 93.75%, indicating that the assessment process could be applied consistently through planning, implementation, argumentation activities, and reflection and feedback. Furthermore, students who experienced portfolio-based assessment showed greater improvement in argumentation skills, with an average N-Gain score of 0.71 (high category), compared to 0.63 (medium category) in the control class. However, the statistical analysis revealed that the difference in post-test scores between the experimental and control groups was not statistically significant ($p = 0.499$). Therefore, portfolio-based assessment contributes positively to students' argumentation development, although the study conditions did not statistically confirm its superiority over conventional assessment. **Implication:** The findings imply that portfolio-based performance assessment can serve as an alternative assessment strategy in physics learning by documenting students' argumentation processes progressively rather than evaluating only final learning outcomes. Integrating portfolio assessment with TAP and PBL gives students opportunities to formulate claims, collect scientific evidence, construct warrants, revise arguments, and reflect on their learning processes. This approach can complement conventional assessment systems and support more authentic evaluation of scientific argumentation skills in physics education. **Limitation:** This study has several limitations. First, the intervention was conducted in only three learning meetings, which limited students' opportunity to develop more complex argumentation components, particularly warrants and rebuttals. Second, purposive sampling of students from only one school, SMA Negeri 1 Bubulan, limits the generalizability of the findings to other schools, student populations, and physics topics. Third, although the experimental class achieved a higher N-Gain score, the limited duration of treatment may have contributed to the lack of statistically significant differences between the experimental and control groups. **Future Research:** Future studies should examine the implementation of portfolio-based performance assessment over a longer period with more intensive scaffolding to strengthen higher-order argumentation components, especially warrants and rebuttals. Further research is also recommended to involve larger and more diverse samples from multiple schools, explore different physics topics, and investigate the effectiveness of integrating PBL and TAP-based portfolio assessment across various educational levels. These efforts are expected to provide stronger evidence regarding the effectiveness and broader applicability of portfolio-based performance assessment in improving students' scientific argumentation skills.

AUTHOR CONTRIBUTIONS

Hatta Daeng Langga contributed to the conceptual framework, research design, data collection and analysis, and drafting of the manuscript; **Abu Zainuddin** supervised the research, validated the methodology and instruments, and reviewed and revised the manuscript. All listed authors have reviewed and approved the final version of this submission.

CONFLICT OF INTEREST STATEMENT

The authors confirm that there are no conflicts of interest, either financial or personal, that may have influenced the content or outcome of this study.

ETHICAL COMPLIANCE STATEMENT

This manuscript complies with research and publication ethics. The authors affirm that the work is original, conducted with academic integrity, and free from any unethical practices, including plagiarism.

STATEMENT ON THE USE OF AI OR DIGITAL TOOLS IN WRITING

The authors acknowledge the use of digital tools, including AI-based technologies, as support in the research and writing stages of this article. Specifically, Claude was employed to assist with translation, Grammarly assisted with grammar checking, and so on. All outputs generated with digital assistance were critically evaluated and revised to ensure academic rigor and ethical standards were upheld. The final responsibility for the manuscript rests entirely with the authors.

REFERENCES

Agustini, S., Dahlan, A., Yani, A., & Swandi, A. (2025). Portfolio assessment as an alternative evaluation instrument in basic physics learning: A study of experimental reports and student reflections. *KLASIKAL: Journal of Education, Language Teaching and Science, 7*(1), 361–368. https://doi.org/10.52208/klasikal.v7i1.1301

Aini, I., & Suprapto, N. (2022). Penerapan online performance assessment guna mengukur kemampuan argumentasi ilmiah peserta didik materi fluida dinamis. *Inovasi Pendidikan Fisika, 10*(3), 13–20. https://doi.org/10.26740/ipf.v10n3.p13-20

Amiruddin, A., Aripin, A., Nana, N., Hernawati, D., & Badriah, L. (2025). Persepsi pemahaman argumentasi ilmiah peserta didik di MTsN 11 Tasikmalaya. *Jurnal Pendidikan MIPA, 15*(1), 101–112. https://doi.org/10.37630/jpm.v15i1.2192

Anderson, R., & Lee, H. (2021). Constructivist approaches to authentic assessment in science education: Portfolio-based evaluation. *International Journal of Science Education, 43*(6), 831–847. https://doi.org/10.1080/09500693.2021.1871234

Biggs, R., Preiser, R., De Vos, A., Schlüter, M., Maciejewski, K., & Clements, H. (2021). *The Routledge handbook of research methods for social-ecological systems*. Routledge.

Block, N. C. (2020). Evaluating the efficacy of using sentence frames for learning new vocabulary in science. *Journal of Research in Science Teaching, 57*(3), 454–478. https://doi.org/10.1002/tea.21602

Candra, E., Mulvia, R., & Warliani, R. (2024). Argumentasi ilmiah siswa pada pembelajaran fisika berbasis mobile learning dengan video presentasi. *Jurnal Pendidikan MIPA, 14*(4), 861–871. https://doi.org/10.37630/jpm.v14i4.1895

Delhita, A., Suyono, S., & Sukarmin, S. (2025). Validitas instrumen penilaian portofolio sebagai pendukung program perumusan kerangka berpikir penelitian. *Jurnal Pendidikan MIPA, 15*(3), 1347–1354. https://doi.org/10.37630/jpm.v15i3.3353

Driessen, E., Van Der Vleuten, C., Schuwirth, L., Van Tartwijk, J., & Vermunt, J. (2005). The use of qualitative research criteria for portfolio assessment as an alternative to reliability evaluation: A case study. *Medical Education, 39*(2), 214–220. https://doi.org/10.1111/j.1365-2929.2004.02059.x

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., … Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*(4), 1-47. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Erduran, S., Simon, S., & Osborne, J. (2004). TAPping into argumentation: Developments in the application of Toulmin's argument pattern for studying science discourse. *Science Education, 88*(6), 915–933. https://doi.org/10.1002/sce.20012

Fatimah, S., Rusiolwati, A., Cahyono, E., & Rokhmaniyah. (2024). STEM learning in higher education: A comparative study of science curriculum in Singapore and Indonesia. *International Journal of Scientific Multidisciplinary Research, 2*(8), 1003–1030. https://doi.org/10.55927/ijsmr.v2i8.11048

Guo, H., & Li, D. (2024). The effect of electronic portfolio-based writing instruction on the second language writing performance and writing self-efficacy of EFL learners: A mixed methods study. *SAGE Open, 14*(2), 1–18. https://doi.org/10.1177/21582440241257697

Hakim, I. A., & Purba, A. (2023). Penerapan asesmen unjuk kerja dalam pembelajaran menulis teks eksposisi siswa kelas VIII SMP Negeri 3 Kota Jambi tahun ajaran 2022/2023. *Sasando: Jurnal Bahasa, Sastra Indonesia, dan Pengajarannya, 6*(1), 11–26. https://doi.org/10.24905/sasando.v6i1.200

Harahap, M., Mujib, A., & Nasution, A. S. (2022). Pengembangan media uno math untuk mengukur pemahaman konsep luas bangun datar. *All Fields of Science Journal Liaison Academia and Society, 2*(1), 209–217. https://doi.org/10.58939/afosj-las.v2i1.158

Hardini, S. D., & Alberida, H. (2022). Analisis kemampuan argumentasi peserta didik. *Biodidaktika: Jurnal Biologi dan Pembelajarannya, 17*(1), 93–99. https://doi.org/10.30870/biodidaktika.v17i1.16108

Ishaq, I. M., Khaeruddin, K., & Usman, U. (2022). Analisis kemampuan berargumentasi dalam pembelajaran fisika peserta didik SMA Negeri 8 Makassar. *Jurnal Sains dan Pendidikan Fisika, 17*(3), 211–225. https://doi.org/10.35580/jspf.v17i3.29781

Jaafar, R., & Resnita, L. (2020). Developing student worksheets using inquiry-based learning model with scientific approach to improve tenth grade students' physics competence. *Jurnal Penelitian Fisika dan Aplikasinya, 10*(1), 56–70. https://doi.org/10.26740/jpfa.v10n1.p56-70

Ling, J. H. (2025). A review of rubrics in education: Potential and challenges. *Indonesian Journal of Innovative Teaching and Learning, 2*(1), 1–14. https://doi.org/10.64420/ijitl.v2i1.197

Magdalena, I., Aciakatura, C., Putri, W. A., & Azzizah, F. N. (2023). Efektivitas pembelajaran menggunakan penilaian portofolio. *Tsaqofah: Jurnal Penelitian Guru Indonesia, 3*(2), 802–815. https://doi.org/10.58578/tsaqofah.v3i5.1383

Maghhfirah, N., & Farikhin, F. (2023). Kontribusi performance assessment dalam meningkatkan kemandirian siswa. *Childhood Education: Jurnal Pendidikan Anak Usia Dini, 4*(1), 78–104. https://doi.org/10.53515/cej.v4i1

Marweli, M., Rahayu, W., & Hidajat, F. (2025). Validitas dan reliabilitas angket self-regulated learning matematis siswa SMA. *Supermat: Jurnal Pendidikan Matematika, 9*(1), 29–42. https://doi.org/10.33627/sm.v9i1.2941

Mubarak, A. F. (2021). Konsep penilaian berbasis portofolio dalam proses pembelajaran. *Nusantara Journal of Islamic Studies, 2*(1), 12–17. https://doi.org/10.54471/njis.2021.2.1.12-17

Neira, A., et al. (2024). Development and validation of a self-perception instrument. *Frontiers in Education, 9*(11), 1-11. https://doi.org/10.3389/feduc.2024.1476500

Nurhaifa, I., Hamdu, G., & Suryana, Y. (2020). Rubrik penilaian kinerja pada pembelajaran STEM berbasis keterampilan 4C. *Indonesian Journal of Primary Education, 4*(1), 101–110. https://doi.org/10.17509/ijpe.v4i1.24742

Nurjamin, A., Ardhianti, M., & Susilo, J. (2023). Peningkatan kemampuan menulis paragraf argumentasi melalui pendekatan pembelajaran problem-based learning. *WIDYANTARA, 1*(2), 210–216. https://doi.org/10.63629/widyantara.v1i2.55

Oestergaard, L. G., Hansen, J. S., Ravn, M. B., & Maribo, T. (2024). Enhancing coherence and student engagement through portfolio assignments and peer-feedback. *Discover Education, 3*(10), 1-14 . https://doi.org/10.1007/s44217-024-00260-1

Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021). Flexibility and resilience in corporate decision making: A new sustainability-based risk management system in uncertain times. *Global Journal of Flexible Systems Management, 22*(2), 107–132. https://doi.org/10.1007/s40171-021-00277-7

Task Force. (2020). *Computing curricula 2020*. Association for Computing Machinery.

Van den Beemt, A., MacLeod, M., Van der Veen, J., Van de Ven, A., Van Baalen, S., Klaassen, R., & Boon, M. (2020). Interdisciplinary engineering education: A review

of vision, teaching, and support. *Journal of Engineering Education, 109*(3), 508–555. https://doi.org/10.1002/jee.20347

***Hatta Daeng Langga (Corresponding Author)**
Physical Education Study Program, State University of Surabaya
Jl. Ketintang, Gayungan, Surabaya, East Java 60231
Email: hattad18@gmail.com

Abu Zainuddin
Physical Education Study Program, State University of Surabaya
Jl. Ketintang, Gayungan, Surabaya, East Java 60231
Email: abuzainudin@unesa.ac.id