



## Meta-analysis of The Ethopedagogical Based Blended Learning Model on Students' Problem Solving Ability

Loso Judijanto<sup>1\*</sup>, Andrie Oktavio<sup>2</sup>, Jeheskial Saudale<sup>3</sup>, Rian Mitasari<sup>4</sup>, Sutarto<sup>5</sup>, Miftachul Amri<sup>6</sup>, Tomi Apra Santosa<sup>7</sup>

<sup>1</sup> IPOSS Jakarta, Indonesia

<sup>2,4</sup> Universitas Ciputra Surabaya, Indonesia

<sup>3</sup> Institut Agama Kristen Negeri Kupang, Indonesia

<sup>5</sup> STAI NIDA El-Adabi Bogor, Indonesia

<sup>6</sup> Universitas Negeri Surabaya, Indonesia

<sup>7</sup> Akademi Teknik Adikarya, Indonesia

\* Corresponding Author. E-mail: losojudijantobumn@gmail.com

**Receive: 17/01/2024**

**Accepted: 27/02/2024**

**Published: 01/03/2024**

### Abstrak

Abad-21 telah memberikan pengaruh yang begitu besar terhadap perkembangan dunia pendidikan. Pendidikan saat ini telah berbasis teknologi yang sangat membantu guru dalam melakukan kegiatan pembelajaran. Blended learning merupakan salah model pembelajaran yang memanfaatkan teknologi. Akan tetapi, banyaknya pengaplikasian model blended learning belum didapatkan kesimpulan yang mendalam terkait model blended learning berbasis etnopedagogi terhadap kemampuan pemecahan masalah siswa. Penelitian ini bertujuan untuk mengetahui pengaruh model blended learning berbasis etnopedagogi terhadap kemampuan pemecahan masalah siswa. Penelitian ini adalah jenis penelitian meta-analisis. Data penelitian berasal dari analisis 17 jurnal nasional dan internasional yang telah terbit tahun 2019-2024. Kriteria eligibility data adalah penelitian harus metode eksperimen atau quasi eksperimen; penelitian berasal dari jurnal nasional dan internasional terindeks SINTA dan Scopus, Penelitian terkait model blended learning berbasis etnopedagogi terhadap kemampuan pemecahan masalah siswa, data penelitian diperoleh melalui database terpercaya yaitu mendeley, ERIC, ScienceDirect, Wiley dan Google Scholar. Tekni pengampilan sampel data adalah purposive sampling. Analisis data dalam penelitian adalah analisis data kuantitatif dengan menghitung nilai effect size dengan bantuan aplikasi OpenMEE. Hasil penelitian menyimpulkan bahwa penerapan model blended learning berbasis etnopedagogi berpengaruh signifikan terhadap kemampuan pemecahan masalah siswa dengan nilai rata-rata effect size sebesar 0.927 dengan kategori effect size yang tinggi

**Kata Kunci:** *Etnopedagogi; Blended Learning; Efek Size, Problem Solving*

### Abstract

*The 21st century has had such a big influence on the development of the world of education. Education today has been based on technology which is very helpful for teachers in carrying out learning activities. Blended learning is a learning model that utilizes technology. However, the many applications of the blended learning model have not reached in-depth conclusions*

*related to ethnopedagogy-based blended learning models on students' problem-solving abilities. This study aims to determine the effect of ethnopedagogy-based blended learning models on students' problem-solving skills. This study is a type of meta-analysis research. The research data comes from an analysis of 17 national and international journals that have been published in 2019-2024. The criteria for data eligibility are that research must be experimental methods or quasi-experiments; Research comes from national and international journals indexed by SINTA and Scopus, Research related to ethnopedagogy-based blended learning models on students' problem-solving abilities, research data obtained through trusted databases namely mendeley, ERIC, ScienceDirect, Wiley and Google Scholar. The technique of displaying data samples is purposive sampling. Data analysis in research is quantitative data analysis by calculating the value of effect size with the help of the OpenMEE application. The results showed that the application of ethnopedagogy-based blended learning models had a significant effect on students' problem-solving abilities with an average effect size value of 0.927 with a high effect size category.*

**Keywords:** *Ethnopedagogy; Blended Learning; Effect Size, Problem Solving*

## **Introduction**

Problem-solving ability is at the core of effective student learning. In the classroom, students skilled in problem solving are able to face a variety of academic challenges with creativity and perseverance (Suryono et al., 2023; Nurtamam et al., 2023; Rahman, 2019). In addition, students are not only able to understand complex concepts, but also able to apply their knowledge into real situations (Simanjuntak, 2021). Students who are proficient in problem solving can apply a variety of strategies to find solutions (Öztürk et al., 2020; Zulkifli et al., 2022), such as breaking down a problem into smaller parts or using patterns that have been proven to work before (Ichsan et al., 2022). This ability also allows students to learn from their mistakes, seeing them as opportunities to grow and develop a deeper understanding (Yayuk et al., 2020).

Problem-solving skills help students face challenges in everyday life. They learn to cope with problems in a systematic and efficient way, developing their confidence in the face of unexpected situations (Ummah & Yuliati, 2020). Students skilled in problem solving can use communication

and negotiation skills to find solutions that are satisfactory to all parties (Pongsakdi et al., 2020); . This ability also helps students develop a sense of self-responsibility, as they learn to take initiative in solving their own problems without always relying on the help of others. Thus, problem-solving abilities not only prepare students for success in academics, but also to face life's challenges with confidence and peace of mind (Priemer et al., 2020; Utomo et al., 2023; Suharyat et al., 2022).

The problem-solving ability of students in Indonesia is often in the spotlight because of the challenges faced in its implementation. One of the main problems is the lack of a learning approach that encourages students to think critically and creatively. Many schools still apply passive learning methods, where students receive more information than develop problem-solving skills (Winarto et al., 2022; Luciana et al., 2023). In addition, there are also limitations in access to resources that support the development of these capabilities, such as relevant books, technology, and adequate teacher training (Treepob et al., 2023; Tessema et al., 2024; Haryanto et al., 2024; Fradila et al., 2021). This leads to a gap between students'

problem-solving abilities in urban and rural areas, as well as between schools that have adequate facilities (Zulyusri et al., 2020; Mahmudi et al., 2023).

In addition to the lack of appropriate learning approaches, another problem that affects students' problem-solving abilities in Indonesia is the lack of emphasis on developing soft skills in schools (Santosa et al., 2023; Oktarina et al., 2021). Although academic ability is often the main focus, the importance of soft skills such as critical thinking, collaboration, and communication skills is often overlooked. In fact, this ability is very important in helping students face real-world challenges in the future (Ozpinar & Arslan, 2023). A holistic approach is needed in education that not only pays attention to academic aspects, but also explores and develops students' social and emotional abilities (Sitopu et al., 2024; Santosa & Yulianti, 2020). Thus, there is a need for reform in the education system to ensure that every student has an equal opportunity to develop the problem-solving skills necessary to succeed in life (Widodo, 2023; Icela, 2022). Therefore, there is a need for a model that can encourage students' problem-solving abilities in learning.

Blended-based learning is a learning model that can encourage students' problem-solving abilities (Chen et al., 2020; Şentürk, 2021). In this model, the combination of face-to-face learning and online learning provides greater flexibility and opportunities for students to access course materials (Prifti, 2022; Suharyat et al., 2022). The teacher's blended learning model can introduce new concepts and provide direction to students directly, while additional materials, practice exercises, or assignments can be accessed online through online learning platforms (Lestari et al., 2021). This allows students to study at their own pace and get additional help as

per their needs. In addition, the blended learning model also allows for richer interactions between students and teachers, as well as between fellow students, both in the classroom environment and through online forums, creating a more diverse and engaging learning experience.

One of the main advantages of the blended learning model is its ability to integrate technology into the learning experience. Through the use of digital tools such as learning videos, interactive simulations, and online discussion forums, students can engage in more dynamic and engaging learning (Bouilheres et al., 2020; Mahardika et al., 2021). In addition, technology also allows teachers to better track students' individual progress and provide more specific feedback, allowing for better adjustments to each student's learning needs. The blended learning model creates a responsive and adaptive learning environment, which helps improve student engagement and their overall learning outcomes (Setiawan et al., 2022; Martin & Carolina, 2022). With the ever-evolving technology and the need for flexibility in education, blended learning models have great potential to become an increasingly relevant and effective learning approach in the future (Badawi et al., 2023).

Previous research by Çevik & Bakioglu (2022) The blended learning model can encourage student creativity and learning outcomes. Research by Rahman et al., (2022) The application of the blended learning model can improve students' critical thinking and communication skills in learning. This state-of-the-art approach represents a fusion of traditional pedagogy with modern technological tools, offering a multifaceted framework that transcends conventional boundaries in teaching and learning. At its core, the model emphasizes the cultivation of not only cognitive skills

but also ethical reasoning, fostering a holistic educational experience that prepares students to navigate the complexities of the 21st-century world. However, the implementation of ethnopedagogy-based blended learning models on problem-solving abilities has not found a size effect, so it is necessary to conduct a meta-analysis to get a deep conclusion. So, the study aims to determine the influence of ethnopedagogy-based blended learning models on students' problem-solving skills.

## Methods

This research is a type of meta-analysis research. Meta-analysis is a research approach that aims to collect and analyze previous research quantitatively (Tamur et al., 2021; Zulyusri et al., 2023; Putra et al., 2023; Rahman et al., 2023; Chamdani et al., 2022). This meta-analysis study aims to determine the effect of the size of ethnopedagogy-based blended learning models on students' problem-solving abilities. According to Borenstein et al., (2009) The meta-analysis research procedure consists of 1) formulating a research problem; 2) collect and encode data; and 3) analysis and interpretation of data.

Furthermore, the research data comes from an analysis of 17 national and international journals that have been published in 2019-2024. The criteria for data eligibility are that research must be experimental methods or quasi-experiments; Research comes from national and international journals indexed by SINTA and Scopus, Research related to ethnopedagogy-based blended learning models on students' problem-solving abilities, research data obtained through trusted databases namely mendeley, ERIC, ScienceDirect, Wiley and Google Scholar. The technique of displaying data samples is

purposive sampling. Data analysis in research is quantitative data analysis by calculating the value of effect size with the help of the OpenMEE application. Furthermore, the criteria for effect size in research can be seen in Table 1.

**Table 1.** Effect Size Value Criteria

Effect Size	Effect Size Criteria
$0.0 \leq ES \leq 0.2$	Small
$0.2 \leq ES \leq 0.8$	Medium
$ES \geq 0.8$	Large

Source:(Cohen et al., 2007)

## Result and Discussion

Hasil From the search results of the mendeley, ERIC, ScienceDirect, Wiley and Google Scholar databases related to ethnopedagogy-based blended learning models on problem solving skills obtained 127 journals. Furthermore, the data was selected based on predetermined inclusion criteria, then 17 relevant journals were obtained. The data selection process through the PRISMA method consists of identification, screening, eligibility and inclusion. Furthermore, data that have met the inclusion criteria are calculated effect size values which can be seen in Table 2.

**Table 2.** Value of Effect Size 17 Journal

Journal Code	Year	N	Effect Size	Criterion
JR1	2020	60	0.83	Large
JR2	2022	124	1.07	Large
JR3	2022	56	0.66	Medium
JR4	2022	30	0.87	Large
JR5	2023	80	0.97	Large
JR6	2021	66	1.17	Large
JR7	2020	100	2.34	Large
JR8	2019	30	0.41	Medium
JR9	2024	28	0.50	Medium
JR10	2023	78	0.72	Medium
JR11	2024	46	0.88	Large
JR12	2021	60	1.56	Large
JR13	2021	124	0.62	Medium

JR14	2022	90	0.33	Medium
JR15	2023	88	0.96	Large
JR16	2024	60	1.19	Large
JR17	2024	36	0.69	Medium
Average Value of Effect Size			0.927	Large

Based on Table 2, the effect size value of 17 research journals analyzed the highest effect size value was 2.34 and the lowest effect size value was 0.33. According to the criteria (Cohen et al., 2007) Seven research journals had medium criteria effect size values and ten research journals had high criteria effect size values. In addition, the analysis of 17 research journals had an average effect size value of 0.927 with a large effect size category These results conclude that ethnopedagogy-based blended learning models have a major positive influence on students' problem-solving abilities. The results of this study are in line Utaminingsih et al.,(2023) Explaining the implementation of the blended learning model can foster students' problem-solving skills in learning. Furthermore, research by (Setyosari et al., 2023) The blended learning model has a positive influence on improving students' problem-solving abilities in learning.

The blended learning model combines conventional learning elements with technology, while ethnopedagogy emphasizes the importance of understanding students' cultures and backgrounds in the learning process (Shamsuddin & Kaur, 2020). The integration of these two concepts creates an inclusive and engaging learning environment, which has the potential to improve students' problem-solving abilities. One of the main impacts of using ethnopedagogy-based blended learning models is increased student involvement in the learning process (Rafiola et al.,

2019;Yilmaz et al., 2023). Through this approach, students are invited to actively engage with learning content tailored to their needs and culture. This can create a more meaningful and relevant learning experience for students, which in turn increases their motivation to develop problem-solving skills.

In addition, the blended learning model also allows for personalized learning, where teachers can adjust the learning approach to the individual needs of students. By considering aspects of ethnopedagogy, such as the cultural and social needs of students, learning can be adapted more effectively. Thus, students can feel more connected to the learning material and more motivated to hone their problem-solving skills. Collaboration between students is also an important aspect in the ethnopedagogy-based blended learning model (Princess et al., 2023). Through online platforms and collaborative activities in the classroom, students can learn from each other's experiences and perspectives, which contributes to the development of their problem-solving skills. By accommodating cultural diversity and student experiences, such collaborations can enrich discussions and help students see issues from multiple perspectives.

The implementation of ethnopedagogy-based blended learning models also allows better monitoring of student progress and provides more detailed feedback (Selvi, 2020; Fahrutdinova, 2016). Through technology, teachers can track student progress in real-time and provide additional support as needed. This allows students to identify areas that need improvement in their problem-solving abilities and improve the overall quality of learning. Furthermore, analyzing the effect of size to determine the effectiveness of ethnopedagogy-based

blended learning models on students' problem-solving abilities based on education levels can be seen in Table 3.

**Table 3.** The effect of the size of ethnopedagogy-based blended learning model > Student Problem Solving Ability based on education level

Education	Average Effect Size	Standard error	Criterion
Elementary School	0.67	0.23	Medium
Junior School	0.78	0.31	Medium
High School	0.87	0.38	Large
College	0.91	0.42	Large

Table 3, the average effect size value of elementary school level is 0.67 and standard error is 0.23, junior high school is 0.78 with standard error 0.31, high school is 0.87 and standard error is 0.38 and college is 0.91 and standard error is 0.91 and standard error is 0.42. These results conclude that ethnopedagogy-based blended learning effectively improves students' problem-solving abilities. The ethnopedagogy-based blended learning model also facilitates more effective monitoring of student progress. Through the use of technology, teachers can collect data on student progress in real-time and provide timely feedback (Supriyadi et al., 2022). This allows students to proactively identify their weaknesses in solving problems and take necessary corrective steps (Fakhri & Saleh, 2023).

Furthermore, the influence of ethnopedagogy-based blended learning models on students' problem-solving abilities is not only seen in terms of increasing student engagement and motivation, but also in terms of forming inclusive and collaborative learning

communities (Sulistyanto et al., 2023). Through the integration of technology and ethnopedagogical principles, this kind of learning model has the potential to improve the quality of education and empower students to become creative and open-minded problem solvers in facing the challenges of the globalization era.

## Conclusion

From this study, it can be concluded that the application of ethnopedagogy-based blended learning models has a significant effect on students' problem-solving abilities with an average effect size value of 0.927 with a high effect size category. The integration of traditional learning approaches with technology, coupled with a deep understanding of students' cultures and backgrounds, creates an inclusive and relevant learning environment for the development of students' problem-solving skills. With higher engagement, personalized learning, collaboration among students, and effective progress monitoring, ethnopedagogy-based blended learning models encourage students to develop critical and creative thinking skills needed in facing the complex challenges of this digital age. Therefore, the implementation of this model is expected to make a significant contribution in improving the quality of education and preparing students for a future full of dynamics and changes.

## Reference

- Badawi et al. (2023). Integration of Blended Learning and Project-Based Learning (BPjBL) on Achievement of Students' learning goals : A Meta-analysis study. *Pegem Journal of Education and Instruction*, 1(4), 4–11. <https://doi.org/10.47750/pegegog.1>
- Blended Learning in terms of Intrapersonal Intelligence on Problem Solving Ability.

- (2023). *Pegem Journal of Education and Instruction*, 13(4), 224–232. <https://doi.org/10.47750/pegegog.1>
- Borenstein, M., & Hedges, L. V. (2009). *Introduction to Meta-Analysis Introduction*.
- Bouilheres, F., Le, L. T. V. H., McDonald, S., Nkhoma, C., & Jandug-Montera, L. (2020). Defining student learning experience through blended learning. *Education and Information Technologies*, 25(4), 3049–3069. <https://doi.org/10.1007/s10639-020-10100-y>
- Çevik, M., & Bakioğlu, B. (2022). The Effect of STEM Education Integrated into Teaching-Learning Approaches (SEITLA) on Learning Outcomes: A Meta-Analysis Study. *International Journal of Progressive Education*, 18(2), 119–135. <https://doi.org/10.29329/ijpe.2022.431.8>
- Chamdani et al. (2022). Meta-Analysis Study: The Relationship Between Reflective Thinking And Learning Achievement. *ERIES Journal*, 15(3), 181–188.
- Chen, J., Zhou, J., Wang, Y., Qi, G., Xia, C., Mo, G., & Zhang, Z. (2020). Blended learning in basic medical laboratory courses improves medical students' abilities in self-learning, understanding, and problem solving. *Advances in Physiology Education*, 44(1), 9–14. <https://doi.org/10.1152/advan.00076.2019>
- Cohen, L., Manion, L., Lecturer, P., Morrison, K., & Lecturer, S. (2007). *Research Methods in Education*. Routledge is an imprint of the Taylor & Francis Group, an informa business.
- Fahrutdinova, G. Z. (2016). Ethno-Pedagogical Factor of Polycultural Training. *International Journal of Environmental & Science Education*, 11(6), 1185–1193. <https://doi.org/10.12973/ijese.2016.388a>
- Fakhri, M. M., & Saleh, A. (2023). *Analysis of Artificial Intelligence Literacy in the Blended Learning Model in Higher Education*. 3(4), 0–9.
- Fradila, E., Razak, A., Santosa, T. A., Arsih, F., & Chatri, M. (2021). Development Of E-Module-Based Problem Based Learning ( PBL ) Applications Using Sigil The Course Ecology And Environmental Education Students Master Of Biology. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, 27(2), 673–682.
- Icela, L. (2022). Components of Education 4 . 0 in 21st Century Skills Frameworks : Systematic Review. *Sustainability*, 14, 1–31.
- Ichsan et al. (2022). Pengaruh Model Pembelajaran Problem Based Learning Berbasis TPACK Terhadap Keterampilan Literasi Sains Dalam Pembelajaran IPA Siswa Tingkat SD Sampai SMA: Sebuah Meta-Analisis. *Jurnal Pendidikan Dan Konseling*, 4, 2173–2181.
- Karaoglan-yilmaz, F. G., Berk, A., Orcid, U., Orcid, K. Z., Orcid, R. Y., & Received, T. (2023). Metacognitive Awareness , Reflective Thinking , Problem Solving , And Community Of Inquiry As Predictors Of Academic Self-Efficacy In Blended Learning : A Correlational Study. *Turkish Online Journal of Distance Education-TOJDE J*, 24(1), 20–36.
- Lestari, H., Rahmawati, I., Siskandar, R., & Dafenta, H. (2021). Implementation of Blended Learning with A STEM Approach to Improve Student Scientific Literacy Skills During The Covid-19 Pandemic. *Jurnal Penelitian Pendidikan IPA*, 7(2), 224. <https://doi.org/10.29303/jppipa.v7i2>

- Mahardika, A. I., Adini, M. H., & M, A. S. (2021). Hybrid Learning as an Alternative for Learning to Improve Students' Physics and Digital Literacy Competencies on The Topic of Fluid Physics. *International Journal of Innovative Science and Research Technology*, 6(2), 66–71.
- Mahmudi, A. A., & Fionasari, R. (2023). Integration of Artificial Intelligence Technology in Distance Learning in Higher Education. *Journal of Social Science Utilizing Technology*, 1(4), 1–12.
- Martin, F., & Carolina, N. (2022). A Meta-Analysis on the Community of Inquiry Presences and Learning Outcomes in Online and Blended Learning Environments. *Online Learning Journal*, 26(1), 325–359. <https://doi.org/10.24059/olj.v26i1.2604>
- Nurtamam, M. E., Santosa, T. A., Aprilisia, S., Rahman, A., & Suharyat, Y. (2023). Meta-analysis : The Effectiveness of lot-Based Flipped Learning to Improve Students' Problem Solving Abilities. *Edumaspul:Jurnal Pendidikan*, 7(1), 1491–1501.
- Occe Luciana<sup>1\*</sup>, Tomi Apra Santosa<sup>2</sup>, Agus Rofi'i<sup>3</sup>, Taqiyuddin<sup>4</sup>, B. N. (2023). Meta-analysis: The effect of problem-based learning on students' critical thinking skills. *Edumaspul: Jurnal Pendidikan*, 7(2), 2058–2068. <https://doi.org/10.1063/1.5139796>
- Oktarina, K., Santosa, T. A., Razak, A., & Ahda, Y. (2021). Meta-Analysis : The Effectiveness of Using Blended Learning on Multiple Intelligences and Student Character Education during the Covid-19 Period. *IJECA International Journal of Education & Curriculum Application*, 4(3), 184–192.
- Özpinar, İ., & Arslan, S. (2023). Teacher-based Evaluation of Students' Problem Solving Skills. *International Journal of Psychology and Educational Studies*, 10(2), 543–560.
- Öztürk, M., Akkan, Y., & Kaplan, A. (2020). Reading comprehension, Mathematics self-efficacy perception, and Mathematics attitude as correlates of students' non-routine Mathematics problem-solving skills in Turkey. *International Journal of Mathematical Education in Science and Technology*, 51(7), 1042–1058. <https://doi.org/10.1080/0020739X.2019.1648893>
- Pongsakdi, N., Kajamies, A., Veermans, K., Lertola, K., Vauras, M., & Lehtinen, E. (2020). What makes mathematical word problem solving challenging? Exploring the roles of word problem characteristics, text comprehension, and arithmetic skills. *ZDM - Mathematics Education*, 52(1), 33–44. <https://doi.org/10.1007/s11858-019-01118-9>
- Priemer, B., Eilerts, K., Filler, A., Pinkwart, N., Rösken-Winter, B., Tiemann, R., & Zu Belzen, A. U. (2020). A framework to foster problem-solving in STEM and computing education. *Research in Science and Technological Education*, 38(1), 105–130. <https://doi.org/10.1080/02635143.2019.1600490>
- Prifti, R. (2022). Self-efficacy and student satisfaction in the context of blended learning courses. *Open Learning*, 37(2), 111–125. <https://doi.org/10.1080/02680513.2020.1755642>
- Putra, M., Rahman, A., Suhayat, Y., Santosa, T. A., & Putra, R. (2023). The Effect of STEM-Based REACT Model on Students' Critical Thinking Skills : A Meta-Analysis Study. *LITERACY : International Scientific Journals Of Social, Education and Humaniora*, 2(1), 207–217.



- Putri, A. S., Prasetyo, Z. K., Purwastuti, L. A., Prodjosantoso, A. K., & Putranta, H. (2023). Effectiveness of STEAM-based blended learning on students' critical and creative thinking skills. *International Journal of Evaluation and Research in Education*, 12(1), 44–52. <https://doi.org/10.11591/ijere.v12i1.22506>
- Rafiola, R. H., Setyosari, P., Radjah, C. L., & Ramli, M. (n.d.). *The Effect of Learning Motivation, Self-Efficacy, and Blended Learning on Students' Achievement in The*. 15(8), 71–82.
- Rahman, A. A., Santosa, T. A., Nurtamam, M. E., & Widoyo, H. (2023). Meta-Analysis: The Effect of Ethnoscience-Based Project Based Learning Model on Students' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, 9(9), 611–620. <https://doi.org/10.29303/jppipa.v9i9.4871>
- Rahman, M. (2019). 21 st Century Skill “ Problem Solving ”: Defining the Concept. *Asian Journal of Interdisciplinary Research*, 2(1), 71–81.
- Rahman, N. A., Hisyamsani, I., & Matore, M. E. E. M. (2022). Blended learning in improving students' critical thinking and communication skills at University Hasanah. *Cypriot Journal of Educational Sciences*, 17(3), 798–811.
- Santosa, T. A., Siagian, G., Razak, A., & Zulyusri, S. (2023). Development of Higher Order Thinking Skill Instruments in Biology Learning on Ecology and Environment Materials. *Jurnal Edumaspul*, 7(1), 1093–1100.
- SANTOSA, T. A., & YULIANTI, S. (2020). Pengaruh Pemberian Kuis Terhadap Peningkatan Motivasi Belajar Biologi Siswa Di Sma Negeri 7 Kerinci. *Edusaintek: Jurnal Pendidikan, Sains Dan Teknologi*, 7(2), 1–18. <https://doi.org/10.47668/edusaintek.v7i2.58>
- Selvi, K. (2020). *Investigation of Ethnopedagogical Factors in Teacher Education: Kyrgyzstan Sample Yaprak Alagöz Hamzaj, Anadolu University, Faculty of Education, April 2017*, 20–23. <https://doi.org/10.31704/ijocis.2020.011>
- Şentürk, C. (2021). Effects of the blended learning model on preservice teachers' academic achievements and twenty-first century skills. *Education and Information Technologies*, 26(1), 35–48. <https://doi.org/10.1007/s10639-020-10340-y>
- Setiawan et al. (2022). Blended Learning and Student Mathematics Ability in Indonesia: A Meta- Analysis Study. *International Journal of Instruction*, 15(2), 905–916.
- Setyosari, P., Kuswandi, D., & Ulfa, S. (2023). *Creative Problem Solving Process Instructional Design in the Context of Blended Learning in Higher Education*. 21(2), 80–97.
- Shamsuddin, N., & Kaur, J. (2020). Students' learning style and its effect on blended learning, does it matter? *International Journal of Evaluation and Research in Education (IJERE)*, 9(1), 195–202. <https://doi.org/10.11591/ijere.v9i1.20422>
- Simanjuntak, M. P. (2021). Effectiveness of Problem-Based Learning Combined with Computer Simulation on Students' Problem-Solving and Creative Thinking Skills. *International Journal of Instruction*, 14(3), 519–534.
- Sitopu et al. (2024). THE IMPORTANCE OF INTEGRATING MATHEMATICAL LITERACY IN THE PRIMARY EDUCATION CURRICULUM: A LITERATURE REVIEW. *International Journal of Teaching and Learning (INJOTEL)*, 2(1), 121–134.

- Sri Haryanto et al. (2024). Urgensi pendidikan karakter remaja di era society 5.0. *ENTINAS: Jurnal Pendidikan Dan Teknologi Pembelajaran*, 2(1), 1–9.
- Suharyat, Y., Ichsan, Satria, E., Santosa, T. A., & Amalia, K. N. (2022). Meta-Analisis Penerapan Model Pembelajaran Problem Based Learning Untuk Meningkatkan Ketrampilan Abad-21 Siswa Dalam Pembelajaran IPA. *Jurnal Pendidikan Dan Konseling*, 4(5), 5081–5088.
- Suharyat, Y., Santosa, T. A., Aprilisia, S., & Yulianti, S. (2022). International Journal of Education and Literature (IJEL ) Meta-Analysis Study : The Effectiveness of Problem Solving Learning in Science Learning in Indonesia. *International Journal of Education and Literature (IJEL) Amik Veteran Porwokerto*, 1(3), 6–13.
- Sulistyanto, H., Prayitno, H. J., Narimo, S., & Sutopo, A. (2023). *The Effectiveness of Hybrid Learning-Based Adaptive Media to Empower Student ' s Critical Thinking Skills : Is It Really for VARK Learning Style ?* 19(1), 95–107.
- Supriyadi, A., Satria, E., & Santosa, T. A. (2022). International Journal of Education and Literature ( IJEL ) E-ISSN : 2829-6249 P -ISSN : 2829-6656 Meta-analysis : The Effectiveness of the Integrated STEM Technology Pedagogical Content Knowledge Learning Model on the 21st Century Skills of High School S. *International Journal of Education and Literature (IJEL)*.
- Suryono, W., Haryanto, B. B., Santosa, T. A., Suharyat, Y., & Sappaile, B. I. (2023). The Effect of The Blended Learning Model on Student Critical Thinking Skill : Meta-analysis. *Edumaspul - Jurnal Pendidikan*, 7(1), 1386–1397.
- Tamur, M., Fedi, S., Sennen, E., Marzuki, Nurjaman, A., & Ndiung, S. (2021). A meta-analysis of the last decade STEM implementation: What to learn and where to go. *Journal of Physics: Conference Series*, 1882(1). <https://doi.org/10.1088/1742-6596/1882/1/012082>
- Tessema, G., Michael, K., & Areaya, S. (2024). Realist hands-on learning approach and its contributions to learners' conceptual understanding and problem-solving skills on solid geometry. *Pedagogical Research*, 9(1), em0186. <https://doi.org/10.29333/pr/14096>
- Treepob, H., Hemptasin, C., & Thongsuk, T. (2023). Development of Scientific Problem-Solving Skills in Grade 9 Students by Applying Problem-Based Learning. *International Education Studies*, 16(4), 29–36. <https://doi.org/10.5539/ies.v16n4p29>
- Ummah, I. K., & Yuliaty, N. (2020). The Effect of Jumping Task Based on Creative Problem Solving on Students ' Problem Solving Ability. *International Journal of Instruction*, 13(1), 387–406.
- Utomo, W., Suryono, W., Santosa, T. A., & Agustina, I. (2023). The Effect of STEAM-Based Hybrid Based Learning Model on Students ' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, 9(9), 742–750. <https://doi.org/10.29303/jppipa.v9i9.5147>
- Widodo, S. A. (2023). International Journal of Educational Methodology Effects of Worksheets on Problem-Solving Skills : Meta-Analytic Studies. *International Journal of Educational Methodology*, 9(1), 151–167.
- Winarto, W., Cahyono, E., Sumarni, W., Sulhadi, S., Wahyuni, S., & Sarwi, S. (2022). Journal of Technology and Science Education PRE-SERVICE TEACHERS ' CREATIVE THINKING. *Journal of Technology and Science Education*, 12(2), 327–344.

- Yayuk, E., Purwanto, As'Ari, A. R., & Subanji. (2020). Primary school students' creative thinking skills in mathematics problem solving. *European Journal of Educational Research*, 9(3), 1281–1295. <https://doi.org/10.12973/eu-jer.9.3.1281>
- Zulkifli Zulkifli, Agus Supriyadi, Erwinsyah Satria, & Tomi Apra Santosa. (2022). Meta-analysis: The Effectiveness of the Integrated STEM Technology Pedagogical Content Knowledge Learning Model on the 21st Century Skills of High School Students in the Science Department. *Psychology, Evaluation, and Technology in Educational Research*, 1(2), 68–76. <https://doi.org/10.55606/ijel.v1i2.32>
- Zulyusri el at. (2020). Problematika Dalam Pembelajaran Berbasis Virtual Learning Environmen t ( VLE ) Terhadap Siswa dan Guru SMA / MA Pada Materi Biologi. *Journal of Education*, 03(01), 93–103.
- Zulyusri, Tomi Apra Santosa, Festiyed1, Yerimadesi, Yohandri, Abdul Razak, S. (2023). Effectiveness of STEM Learning Based on Design Thiking in Improving Critical Thinking Skills in Science Learning: A. *Jurnal Penelitian Pendidikan IPA*, 9(6), 112–119. <https://doi.org/10.29303/jppipa.v9i6.3709>