



The Effect of Field Study Implementation on the Critical and Creative Thinking Skills of Pre-Service Science Teachers

Geterudis Kerans^{1*}, Yulita Adelfin Lede¹, Khristoforus Palli Ngongo²,
Angela Ghunu¹, and Falentina Tamo Ina¹

¹Science Education Study Program, FKIP, Universitas Katolik Weetebula, Sumba, Indonesia

²Primary School Teacher Education Study Program, FKIP, Universitas Katolik Weetebula, Sumba, Indonesia

*geterudiskerans@gmail.com

Article Info	Abstract
Article history: Received: February 23, 2026 Accepted: April 20, 2026 Published: May 25, 2026	Learning processes implemented in higher education institutions must be student-centered. Such processes provide opportunities for students to actively engage in learning activities, enabling them to acquire understanding and skills aligned with the intended learning objectives. To achieve this condition, active learning methods are required, one of which is the Field Study method. The purpose of this study is to analyze the effect of the Field Study method on the critical and creative thinking skills of pre-service science teachers. This study employed a quasi-experimental design using a one-group pre-test–post-test approach. The effect of the method on students’ critical and creative thinking skills was examined through pre-test and post-test scores. The results indicate that the Field Study method has a positive effect on improving students’ critical and creative thinking skills, as evidenced by the pre-test and post-test scores. The Wilcoxon test results for pre-test and post-test scores on students’ critical and creative thinking skills show a Sig. (2-tailed) value of 0.000, indicating a significant difference between pre-test and post-test scores. In conclusion, the Field Study method significantly enhances students’ critical and creative thinking skills and is appropriate for use in exploring subject matter related to real-world problems encountered by students. The implication for future science education is that the Field Study method can be effectively applied to learning activities involving real-life issues surrounding students. Science education is not solely concerned with theoretical knowledge but also with developing the ability to critically analyze problems and generate creative solutions.
Keywords: Case study Critical thinking skills Creative thinking skills Science teacher candidates	
This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.	
© 2026 Journal of Mathematics, Science, and Computer Education	
To cite this article: Kerans, G., Lede, Y. A., Ngongo, K. P., Ghunu, A., & Ina, f. T. (2026). The effect of field study implementation on the critical and creative thinking skills of pre-service science teachers . <i>Journal of Mathematics, Science, and Computer Educatio</i> n. 6(1), 147-157.	

INTRODUCTION

The rapid development in the fields of science, technology, politics, economics, as well as in communication facilities and infrastructure, becomes both an opportunity and a challenge for every group in society. Through these changes, societies that possess effective strategies will be able to seize various opportunities and achieve prosperity and unlimited efficiency. Conversely, societies that are not yet prepared for these changes will face

significant life challenges (Habeahan et al., 2025;Yondra, 2025). Globalization and the rapid advancement of science and technology are no longer a choice, but rather a reality that forces society to adapt. Every society is compelled to possess Global Awareness because economic and technological progress will otherwise become a threat to social stability and cultural integrity (Kusuma, 2026; Selfia & Widodo, 2025). These changes require individuals to work hard to adjust themselves in various aspects of life.

“The 4Cs” are 21st-century skills that include critical thinking, creativity, communication, and collaboration. “The 4Cs,” in the context of rapid global development, have become essential skills in facing complex life challenges (Azkiah & Hamami, 2021; Chiruguru, 2016; Tohani & Aulia, 2022). The complexity of life in the 21st century encourages individuals to continually develop the skills and abilities required. For this purpose, education in the present era should guide and prepare learners with the necessary abilities and skills. The skills that need to be developed in learners should also refer to the four pillars of education. The first pillar, learning to know, helps learners not only master concepts but also understand what is learned. The second pillar, learning to do, directs learners to relate the concepts learned to practices occurring in the field. The third pillar, learning to be, helps develop learners’ potential to the maximum, and the fourth pillar, learning to live together, trains learners to develop empathy, tolerance, and the ability to solve problems in social life (Mella, 2014; Zhao, 2004).

The learning process implemented in every higher education institution must be student-centered, emphasizing learning activities that build knowledge and provide varied, meaningful learning experiences. Graduates of higher education must be prepared to become skilled professionals who are shaped through an effective learning process that not only emphasizes understanding of concepts and theories but also equips and develops skills required in 21st-century life (Kerans & Sanjaya, 2024). Science, as one of the fields of learning, is directly related to the environment. Learning science is not only focused on mastering scientific concepts; more than that, to understand and deepen the meaning of science, students must be invited to directly observe what occurs in their environment (Idris et al., 2022; Nur et al., 2023). After this process, they can use their thinking abilities to describe and then communicate their findings. This process can take place through collaboration and by generating creative ideas to solve problems found in the environment (Ananda et al., 2023; Pujiana et al., 2024). This aims to ensure that students are ultimately prepared to face the rapidly and continuously developing challenges of 21st-century life. To achieve this goal, the learning process needs to select an appropriate method to accommodate an active and impactful process.

Field Study is a learning activity that involves directly observing the surrounding environment. The Field Study method through field observation is regarded as an important instrument in contextual learning (Kerans, 2022; Wei & Kaewurai, 2024). This method enables learners to interact directly with their surrounding environment, thereby providing flexibility to explore real phenomena and significantly improve mastery of competencies. As an active process, field study involves activities of collecting primary data through observation, interviews, and direct documentation at the research site (Martinez, 2022; Wei & Kaewurai, 2024).

The effectiveness of the Field Study method lies in its ability to bridge the gap between classroom theory and field reality through intensive scientific communication among peers in discussion (Acut, 2024; Nonkula, 2025; Spell et al., 2014). In addition, this learning process is designed to involve deep interaction between students and the environment, which aims to convert physical experiences into conceptual understanding and substantial material that will be observed, thereby providing greater flexibility for learners to be involved in the learning process and to improve mastery of the competencies to be achieved

(Foo & Foo, 2022; Jones & Washko, 2026). Field Study helps learners by presenting real experiences and stimulating curiosity. Through this process, learners obtain additional relevant knowledge and gain direct observation and perception experiences. At the end of the process, there is an improvement in interpersonal development (communication and collaboration). All of these descriptions are objectives of Field Study, which aim to help students develop understanding and cultivate 21st-century communication and collaboration skills to compete in the global arena (Behrendt & Franklin, 2014; Hefferan et al., 2007).

Based on the description of the problems presented, it is necessary to conduct a study that applies Field Study learning to lectures on child nutrition and stunting. The material on Maternal and Child Nutrition and Stunting is studied in the Nutrition and Health course in the Science Education study program. To understand the concepts of maternal and child nutrition and stunting, direct field observation is required. Cases of stunting and malnutrition in pregnant women and children are aspects that need to be observed because they represent cases with high prevalence in Sumba. These cases are real in students' lives; they need to understand what occurs in the field so that, when they teach, they can relate scientific material to the context of local problems. In studying this material, the Field Study method becomes an alternative that can be used to broaden students' insight in relation to the material. By directly observing the actual conditions in the field, students are trained to develop critical thinking skills. Critical thinking skills are needed to describe and draw conclusions about the problems encountered in the field and to determine strategies and tactics to address these problems.

The research problem of this study is whether Field Study learning affects the critical and creative thinking skills of pre-service science teachers. The purpose of this study is to analyze the effect of the Field Study method on the critical and creative thinking skills of pre-service science teachers. This study is considered important because it is related to the demands of contemporary education, namely the mastery of skills required in human life in the 21st century. In addition, directly studying the material on Maternal and Child Nutrition and Stunting in the field will provide broader experience for students regarding the material and serve as a good stimulus for students to generate various new ideas that are appropriate to the actual needs in the field. Maternal and child nutrition and stunting cases have currently become a major concern for the Government of Indonesia, particularly in Southwest Sumba. The number of stunting and malnutrition cases in the community of Southwest Sumba has received special attention. It is expected that the implementation of Field Study learning will then produce concrete actions from students in addressing this problem. Furthermore, this learning becomes an important part of sustainable education. As pre-service science teachers who will teach science material, students have also been prepared with field experience that provides them with contextual learning that can be developed when they become teachers.

METHODS

Research Design

The method used in this study is a quasi-experimental study with a one-group pretest–posttest design. This study was conducted at a private higher education institution in Southwest Sumba. The variables in this study include 1) the independent variable, which is the Field Study method; 2) the dependent variable, which is 21st-century skills consisting of critical thinking skills and creative thinking skills; and 3) the control variables in this study, which are teaching, testing, and the timing of the learning implementation.

Subject of Research

This study involved Science Education students who enrolled in the Nutrition and Health course, with a total of 41 students in the odd semester of the 2024/2025 academic year. The graduate learning outcomes assigned to this course include 1) working collaboratively and having social sensitivity and concern for society and the environment; 2) mastering integrated applied science concepts related to local wisdom in Sumba; 3) applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology in accordance with their field of expertise; and 4) being able to collaborate, adapt, and be creative in applying science in social life.

The instruments used include the Semester Learning Plan, Student Worksheets, and Assessment Rubrics (test items for critical thinking skills and creative thinking skills).

Data Analysis Technique

The Wilcoxon test is used because the data from the critical and creative thinking skills tests are not normally distributed.

Research Procedures

In general, the research procedures can be seen in Figure 1.

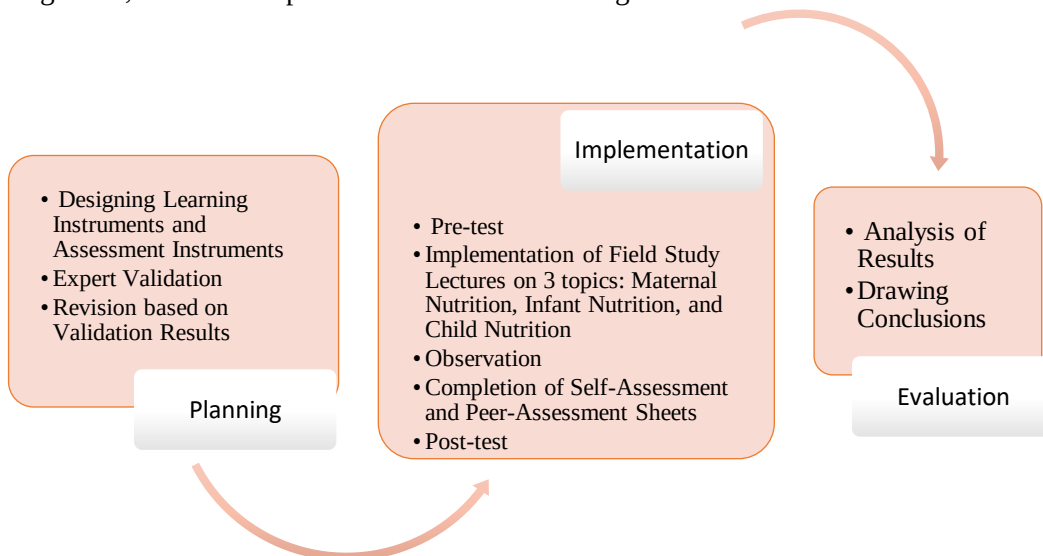


Figure 1 Research procedure

This study was conducted in three stages, namely the planning stage, which involved designing learning instruments, conducting expert validation of the developed instruments, and making revisions based on expert feedback. Furthermore, during the implementation stage, the researcher conducted the study using the Field Study method. Before the lectures, students were given a pretest. After the learning process, a posttest was administered. In the final stage, data analysis was conducted based on the pretest and posttest scores.

RESULTS AND DISCUSSION

Planning

The initial stage of this study involved developing learning instruments, including lesson plans and lecture scenario sheets, on maternal nutrition, child nutrition, and stunting cases. The preparation of the instruments was based on problems that must be observed by students in their surrounding environment. One of the problems in the Southwest Sumba region is malnutrition and stunting. The developed instruments were then validated by

experts to assess their feasibility. This process was then followed by revising the parts that received comments.

Implementation of Field Study

Field Study began with the learning process in the classroom, which took place in two meetings. The first meeting started with an introduction to the material by the lecturer and planning for the interview and observation processes. The second meeting was filled with presentations of the plans to ensure the readiness and feasibility of the interview instruments to be used. In this initial process, the lecturer provided various guiding questions to be discussed by the students, and then, to deepen their understanding of the material studied, the students discussed plans to conduct interviews with nutritionists or midwives and carried out observations in *posyandu* activities to examine the extent to which the implementation of nutritional fulfillment is carried out in *posyandu*.

In the second stage, interviews were conducted with midwives or nutritionists to obtain direct information regarding proper nutrition for pregnant women and children, as well as cases of malnutrition. This process trains students in communication and collaboration.

In the third stage, observations were conducted at *posyandu* by examining the programs implemented and attempting to observe and record the problems that arise. This process trains students' thinking skills, including both critical and creative thinking skills, as well as communication and collaboration skills.

In the fourth stage, presentations and large-class discussions were conducted. At this stage, students presented the interview results, related them to the observation results, and then identified the problems found in the field. Furthermore, in the large-class discussion, students attempted to find solutions as one of the alternatives proposed in addressing the identified problems.

In the fifth stage, planning of real actions was carried out and followed by the implementation of real actions as a form of solution offered in addressing the problems found in the field. Overall, the process of activities can be seen in Figure 2.



Figure 2 Implementation of field study learning and real action as learning outcomes

Evaluation of Result

a. Critical Thinking Skills

The achievement of critical thinking skills is determined based on the results of the pre-test and post-test of the students. The average score of critical thinking skills can be seen in Figure 3.

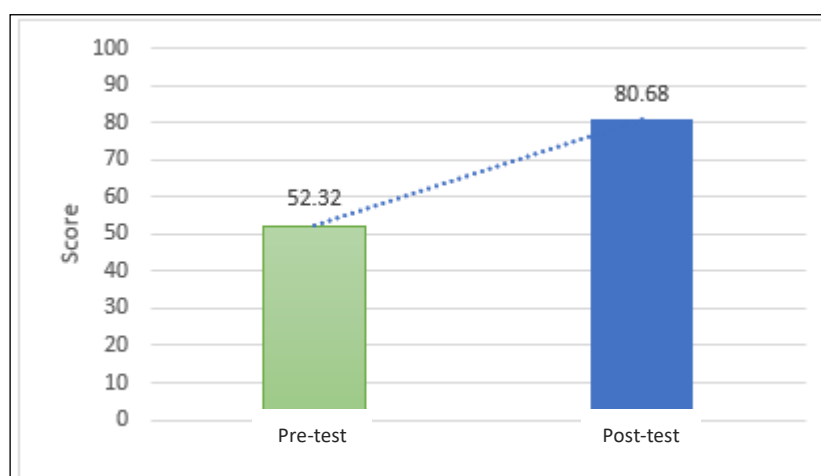


Figure 3 Average pretest and posttest scores of critical thinking skills

Next, a statistical test was conducted to determine whether the treatment improved critical thinking skills. Before conducting the hypothesis test, a normality test was performed, and the results showed that the data were not normally distributed; therefore, a non-parametric test using the Wilcoxon test was subsequently conducted. The test results are presented in Table 1.

Table 1 Wilcoxon test results for critical thinking skills

Descriptive Test	Pre-test Score	Post-test Score	Inferential Statistical Test		
			Mean Difference	Asymp. Sig. (2-tailed)	Interpretation
N	41	41			
Mean	52.32	80.68			
Maximum Score	70	90	28.36	0.000	significantly different
Minimum Score	45	75			
Normality Test	0,000	0,000			

The Wilcoxon test results of the pre-test and post-test scores on students' critical thinking skills show that the Asymp. Sig. (2-tailed) value is 0.000, which means that there is a significant difference between the pre-test and post-test scores of students' critical thinking skills.

b. Creative Thinking Skills

The achievement of creative thinking skills is determined based on the results of the students' pre-test and post-test. The average score of creative thinking skills can be seen in Figure 4.

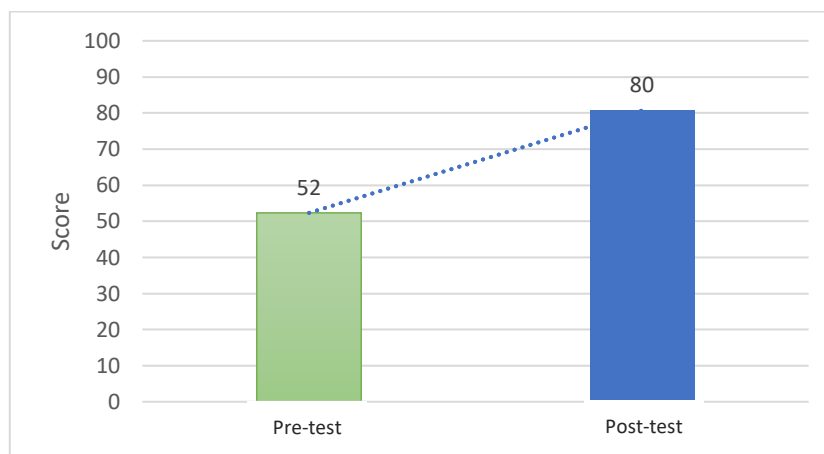


Figure 4 Average pretest and posttest scores of creative thinking skills

Next, a statistical test was conducted to determine whether the treatment had an effect on improving creative thinking skills. Before conducting the hypothesis test, a normality test was performed, and the results showed that the data were not normally distributed; therefore, a non-parametric test using the Wilcoxon test was subsequently conducted. The test results are presented in Table 2.

Table 2 Wilcoxon test results for creative thinking skills

Descriptive Test	Pre-test Score	Post-test Score	Inferential Statistical Test		
			Mean Difference	Asymp. Sig. (2-tailed)	Interpretasi
N	41	41			
Mean	52	80			
Maximum Score	70	90	28	0.000	significantly different
Minimum Score	45	75			
Normality Test	0.000	0.000			

The Wilcoxon test results of the pre-test and post-test scores on students' creative thinking skills show that the Asymp. Sig. (2-tailed) value is 0.000, which means that there is a significant difference between the pre-test and post-test scores of students' creative thinking skills.

The learning process in higher education needs to be implemented actively and student-centered. This process will then affect the quality of graduates ready to enter society. The current development of science, technology, and arts requires higher education institutions to produce graduates who are not only academically proficient but also possess the required skills and good character. For this purpose, learning in higher education must be able to present real conditions. One of the efforts carried out is by conducting field studies in locations that are relevant to the material being studied. In this process, students conduct field observations and interviews with field officers to obtain data. This learning enables students to discover concepts and develop their skills. Field study presents contextual learning and provides observational experience in improving material understanding (Martinez, 2022; Wei & Kaewurai, 2024).

The skills that are rational and required for current developments include critical and creative thinking. Critical thinking skills help individuals adapt to and overcome the problems they face. These skills enable a person to reflect on a problem and focus on the issue at hand until a solution is found (Changwong et al., 2018; Ennis, 2018). In field study

learning, students are encouraged to discuss, observe field events, communicate findings, and seek solutions to problems encountered, thereby sharpening students' critical thinking skills. This supports the statement that science learning is not only about mastering concepts but also involves direct observation, which then contributes to the improvement of critical thinking skills (Idris et al., 2022; Kerans, 2022; Nur et al., 2023). Based on the research process, critical thinking skills are developed through in-depth interviews with experts in the field to understand the concepts being studied, observations to examine field conditions, relating these to the interview results, and identifying various problems existing in society.

The field study process also has a real effect on creative thinking skills. In this study, creative thinking skills are also demonstrated through creative ideas proposed as solutions to problems encountered in the field. These skills enable students to observe problems in the field, discuss them, and then generate creative ideas to address those problems as solutions (Jumrodah et al., 2021; Dewita & Witarsa, 2023). Creative thinking skills are developed during the problem-discussion stage in the classroom. Students express various problems found and then propose various ideas as solutions.

CONCLUSION

The Field Study method affects the critical and creative thinking skills of pre-service science teachers in the Maternal Nutrition, Child Nutrition, and Stunting materials. The stages carried out include planning, interviews, observation, presentation, and discussion, followed by real action. The effect of the method on critical thinking skills is evidenced by the Asymp. Sig. (2-tailed) value of 0.000, which means that there is a significant difference between the pre-test and post-test scores of critical thinking skills. The effect of the method on creative thinking skills shows an Asymp. Sig. (2-tailed) value of 0.000, which means that there is a significant difference between the pre-test and post-test scores of students' creative thinking skills. This study still has several limitations, including not yet conducting a comprehensive assessment of communication and collaboration skills and not linking these to their effect on conceptual understanding. Future research is expected to complement the results by providing a comprehensive assessment of communication and collaboration skills.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Each author contributed to the completion of this study. The first author, GK, acted as the coordinator and instrument developer; YAL, as a research member, assisted in instrument development and the implementation of the study; KPN. Assisted in administrative tasks and observation. AG and FTI. were students who assisted in the research implementation process, preparing all administrative requirements and documentation.

AI DISCLOSURE STATEMENT

In writing this article, the authors used DeepL to assist with the translation process. In addition, the authors did not use any other AI tools.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to LPPM Universitas Katolik Weetebula for funding this research. The authors also thank the Miserior Team from Germany for funding the publication of this article.

REFERENCES

- Acut, D. P. (2024). From classroom learning to real-world skills : an autoethnographic account of school field trips and STEM work immersion program management. *Disciplinary and Interdisciplinary Science Education Research*, 6(20), 1–13. <https://doi.org/https://doi.org/10.1186/s43031-024-00111-x>
- Ananda, L. R., Rahmawati, Y., & Khairi, F. (2023). Critical thinking skills of chemistry students by integrating design thinking with steam-pjbl. *Journal of Technology and Science Education*. 13(1), 352–367. <https://doi.org/10.3926/jotse.1938>
- Azkiah, H., & Hamami, T. (2021). Desain pengembangan Kurikulum 2013 dalam meningkatkan kemampuan critical thinking. *Bintang*, 3(1), 77-93.
- Behrendt, M., & Franklin, T. (2014). A review of research on school field trips and their value in education. *International journal of environmental and science education*, 9(3), 235-245. <https://doi.org/10.12973/ijese.2014.213a>
- Changwong, K., Sukkamart, A., & Sisan, B. (2018). Critical thinking skill development: analysis of a new learning management model for Thai high schools. *Journal of International Studies*, 11(2), 37–48. <https://doi.org/10.14254/2071-8330.2018/11-2/3>
- Chiruguru, S. B. (2016). *The essential skills of 21 st century classroom*. Shingania Univ., 10(1), 1–13.
- Dewita, M. P., & Witarsa, R. (2023). Pengaruh model pembelajaran stem terhadap keterampilan berpikir kreatif dan kritis siswa sekolah dasar. *JIKAP PGSD: Jurnal Ilmiah Ilmu Kependidikan*, 7(1), 18–27.
- Ennis, R. H. (2018). Critical thinking across the curriculum: A vision. *Topoi*, 37(1), 165–184. <https://doi.org/10.1007/s11245-016-9401-4>
- Foo, S. C., & Foo, K. K. (2022). Purposeful field trip : Impact on experiential learning opportunities and critical thinking skills. *Social Sciences & Humanities*, 30(1), 1–30. <https://doi.org/https://doi.org/10.47836/pjssh.30.1.01> E-mail
- Habeahan, A., Aulia, D., & Silalahi, E. A. (2025). Strategi pemberdayaan masyarakat dalam mengembangkan ekonomi kreatif di era society 5.0. *Jurnal Akademik Pengabdian Masyarakat*, 3(4), 312–324. <https://doi.org/10.61722/japm.v3i4.5952>
- Hefferan, K. P., Heywood, N. C., & Ritter, & M. E. (2007). Integrating field trips and classroom learning into a capstone undergraduate research experience. *Journal of Geography*, 101(5), 183–190. <https://doi.org/https://doi.org/10.1080/00221340208978498>
- 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>
- Jones, J. C., & Washko, S. (2026). More than fun in the sun : The pedagogy of field trips improves student learning in higher education. *Journal of Geoscience Education*. <https://doi.org/10.1080/10899995.2021.1984176>
- Jumrodah, J., Liliarsari, L., Adisendjaja, Y. H., & Sanjaya, Y. (2021). Keterampilan berpikir kreatif mahasiswa calon guru biologi pada konsep biota laut menuju pembangunan berkelanjutan melalui pembelajaran berbasis proyek. *Edu Sains Jurnal Pendidikan Sains & Matematika*, 9(1), 98–106. <https://doi.org/10.23971/eds.v9i1.2993>
- Kerans, G. (2022). *The effectiveness of application of field study method innovation with real time report assisted with mind mapping on ecosystem materials on student learning outcomes of prospective science teachers*. *Jurnal Penelitian Pendidikan IPA*, 8(2), 566-572. <https://doi.org/10.29303/jppipa.v8i2.1257>
- Kerans, G., & Sanjaya, Y. (2024). *Authentic inquiry in science education between 2003 and 2023 : A bibliometric analysis use rstudio*. *KnE Social Sciences*, 91–101. <https://doi.org/10.18502/kss.v9i19.16481>

- Kusuma, G. A. (2026). *Ketahanan dan integrasi nasional indonesia di tengah tantangan global*. *Jurnal Ilmiah Nusantara*, 3(1), 1131-1144. <https://doi.org/10.61722/jinu.v3i1.8035>
- Martinez, C. (2022). Developing 21 century teaching skills : A case study of teaching and learning through project- based curriculum Developing 21 st century teaching skills : A case study of teaching and learning through project-based curriculum. *Cogent Education*, 00(00). <https://doi.org/10.1080/2331186X.2021.2024936>
- Mella, P. (2014). The pillars of learning, understanding, studying and explaining. *Creative Education*, 5(17), 1615..
- Nonkula, Z. (2025). Bridging classroom and real-world learning: The impact of field trips on geography students' engagement and critical thinking in South Africa. *Interdisciplinary Journal of Sociality Studies*, 5(2), a04-a04. <https://doi.org/10.38140/ijss-2025.vol5.2.04>
- Nur, S., Nulhakim, L., & Leksono, S. M. (2023). Scientific approach to learning science in elementary schools. *Jurnal Penelitian Pendidikan IPA*, 9(8), 6659-6666. <https://doi.org/10.29303/jppipa.v9i8.3680>
- Pujiana, E., Rohaeti, E., Asmiati, L., Sari, D. R., & Syahana, S. (2024). The role of communication skills in guided inquiry process to improve critical thinking skills. *Jurnal Penelitian Pendidikan IPA*, 10(3), 1458-1464. <https://doi.org/10.29303/jppipa.v10i3.6351>
- Selfia, Z., & Widodo, P. (2025). National culture as an effort to maintain national resilience in the era of globalization. *Kawakib: Journal of Multidisciplinary Research*, 2(1), 9-22. <https://doi.org/10.63738/kawakib.v2i1.28>
- Spell, R. M., Guinan, J. A., Miller, K. R., & Beck, C. W. (2014). Redefining authentic research experiences in introductory biology laboratories and barriers to their implementation. *CBE Life Sciences Education*, 13(1), 102–110. <https://doi.org/10.1187/cbe.13-08-0169>
- Tohani, E., & Aulia, I. (2022). Effects of 21st century learning on the development of critical thinking, creativity, communication, and collaboration skills. *Journal of Nonformal Education*, 8(1), 46-53. <http://dx.doi.org/10.15294/jne.v8i1.33334>
- Wei, H., Yuh, A. H., & Kaewurai, W. (2024). The case method: An effective approach to enhancing critical thinking. *Journal of Roi Kaensarn Academi*, 9(10), 1826-1840. <https://so02.tci-thaijo.org/index.php/JRKSA/article/download/273649/182416>
- Yondra, A. (2025). Tantangan dan Peluang Pemerintahan dalam Menghadapi Perubahan Sosial dan teknologi. *Jurnal Ilmu Sosial, Ekonomi Dan Pendidikan*, 1(1), 1–9.
- Zhao, Z. (2004). Four ‘pillars of learning’for the reorientation and reorganization of curriculum: Reflections and discussions. *International Bureau of Education-UNESCO*.

AUTHOR PROFILES



Dr. Geterudis Kerans, S.Pd., M.Sc., Email: geterudiskerans@gmail.com, Bidang Keahlian: Pendidikan IPA (Biologi), Affiliasi: Prodi Pendidikan IPA, Universitas Katolik Weetebula, Google scholar ID: bsUdhuYAAAAJ, Scopus ID : 57219930086, Sinta ID: 66533326



Yulita Adelfin Lede, M.Pd. email: yulitaadelfinlede@gmail.com
Bidang keahlian: Pendidikan Fisika. Affiliasi: Prodi Pendidikan IPA,
Universitas Katolik Weetebula. Google Scholar ID:
aMXc4L8AAAAJ. SINTA ID: 6736250.



Khristoforus Palli Ngongo, M.Pd., email: pallipoti12@gmail.com,
affiliasi: Prodi PGSD, Universitas Katolik Weetebula, Bidang
Keahlian: Kewarganegaraan, Google scholar ID:
jTYA0kUAAAAJ&hl, Sinta ID: 6657844



Angela Ghunu, email: angelaghunu@email.com; Mahasiswa
prodi Pendidikan IPA, Universitas Katolik Weetebula.



Falentina Tamo Ina, email: dhedefanty@gmail.com; Mahasiswa
prodi Pendidikan IPA, Universitas Katolik Weetebula.