Science Education Research (Search) Journal
Volume 4, Nomor 1 : October 2025
E-ISSN: 3032-6435
https://e-jurnal.iainsorong.ac.id/index.php/jaser

Correlation between Critical Thinking Ability and the Quality of Students' Independent Assignments in Histology Course

Nelda Anasthasia Serena, Masitah, Zenia Lutfi Kurniawati
Biology Education, Mulawarman University, Samarinda, Indonesia;

Email: nelda@fkip.unmul.ac.id, masitah@fkip.unmul.ac.id, zeniakurniawati2211@gmail.com

Abstract

Critical thinking skills are a key component required in completing independent tasks. This study aims to analyze correlation between students' critical thinking skills and the quality of independent assignments in Histology courses. The research method used was a correlational quantitative approach involving 35 Biology Education study program students who were taking Histology courses. Data were collected through a histology context-based critical thinking test and independent assignment assessment using an analysis rubric. The correlation test results showed a positive correlation between critical thinking skills and the quality of students' independent assignments ($r = 0.244$, $p < 0.05$). This finding indicates that although there is a positive correlation coefficient between critical thinking ability and independent assignment quality, the significance value (Sig.) of 0.157 indicates that the correlation is not statistically significant. Based on this data, it can be concluded that there is no significant correlation between students' critical thinking skills and the quality of their independent assignments in the Histology course. Although no significant correlation was found, the results suggest that critical thinking still influences students' independent assignments and should be strengthened through analytical and evidence-based tasks.

Article History:
Received 15 July 2025
Revised 23 October 2025
Accepted 24 October 2025
Published 25 October 2025

Keyword:
Critical Thinking, Independent Assignment, Histology, Biology Education, Correlation

DOI; https://doi.org/10.47945/search.v4i`1.2133
How to Cite:
Serena, Nelda Anasthasia; Masitah; Kurniawati, Zenia Lutfi. (2025). Correlation between Critical Thinking Ability and the Quality of Students' Independent Assignments in Histology Course. *Science Education Research Journal*, 4(1), 1-10.

INTRODUCTION

Education in Indonesia is currently undergoing a significant transformation toward competency-based and outcome-oriented learning. The Merdeka Belajar initiative introduced by the Ministry of Education emphasizes flexibility, creativity, and the cultivation of critical and independent thinking among students (Zidan & Qamariah, 2023). This reform seeks to move away from teacher-centered instruction toward a model that values exploration, reflection, and innovation in the learning process. In this context, students are encouraged to become active participants who take ownership of their learning, while educators act as facilitators who guide and evaluate the development of essential competencies (Haq & Wakidi, 2024).

Aligned with this vision, higher education institutions are increasingly adopting the Outcome-Based Education (OBE) framework, which focuses on measurable learning outcomes such as critical thinking, problem-solving, communication, and collaboration skills. The implementation of OBE requires lecturers to design learning experiences that foster these competencies through authentic assessments and active learning strategies (Bahri et al., 2025).

Consequently, OBE promotes a learner-centered approach in which students construct their own understanding through reflection, analysis, and inquiry. This paradigm shift harmonizes with global trends that advocate for lifelong learning and intellectual autonomy, placing shared responsibility on both educators and students in achieving holistic educational outcomes (Iyer & Benner, 2022).

In this evolving educational context, biology education holds a particularly strategic role in realizing OBE principles. As one of the fundamental scientific disciplines, biology develops students' analytical reasoning, inquiry-based learning, and evidence-based decision-making skills. Courses such as histology exemplify the practical application of OBE, as they require students to integrate theoretical knowledge with laboratory observation and analysis (Kristoffersen et al., 2025). Through independent assignments, microscopic examinations, and interpretative discussions, histology provides a tangible platform for students to demonstrate the learning outcomes targeted by OBE, specifically, critical thinking, scientific reasoning, and independent learning (De Souza et al., 2024). Therefore, the histology course not only supports the implementation of the OBE framework but also contributes directly to the cultivation of competent, reflective, and adaptive biology educators in Indonesia's higher education system.

The histology course holds a crucial role in the Biology Education curriculum. It provides students with foundational skills to microscopically identify animal tissue structures (Hortsch, 2023). Through this course, students deepen their understanding of the form and function of biological systems (Kotzé & Mole, 2015). Emphasis is placed not only on theoretical mastery but also on practical application. Students are expected to analyze tissue preparations independently and develop confidence in laboratory techniques (Harrison et al., 2024). Therefore, histology learning not only strengthens students' theoretical understanding but also develops their ability.

Histology learning develops students' ability to apply biological concepts through observation and analysis. By examining tissue structures under a microscope, students bridge abstract theory with concrete visualization, allowing them to recognize how cellular organization reflects physiological function (Schoenherr et al., 2024). This process cultivates precision, attention to detail, and conceptual integration—skills that are vital for mastering the complexity of biological systems. Moreover, histology encourages learners to connect microscopic evidence with broader biological principles, reinforcing both their scientific literacy and analytical reasoning.

Histology serves as an effective medium for nurturing intellectual independence. The course requires students to observe, interpret, and reason autonomously when analyzing microscopic structures, fostering the habit of inquiry and self-directed learning. This emphasis on independent analysis is inherently linked to the development of critical thinking skills, which form the foundation of scientific inquiry and academic autonomy . Through repeated practice in interpreting data and drawing evidence-based conclusions, students not only enhance their cognitive skills but also build confidence as independent scientific thinkers (Prakong, 2024). Given this close relationship between independent analysis and higher-order reasoning, it becomes essential to explore the concept of critical thinking as a core cognitive

ability that underpins students' success in managing complex academic tasks (García-Carmona, 2025).

The ability to think critically is a fundamental component required for successfully completing independent tasks (Sukenda, 2016). It involves assessing information objectively, identifying patterns, and drawing reasonable inferences from available data (Hamdani et al., 2019). Critical thinking empowers students to approach challenges methodically and make sound, evidence-based decisions (Ngatminiati et al., 2024). In the context of academic work, this ability enhances both problem-solving and analytical depth. Therefore, it forms the backbone of intellectual autonomy and academic growth (Khatri et al., 2024).

Students who possess strong critical thinking skills are expected to excel in academic tasks that require deep reasoning, logical evaluation, and evidence-based analysis (Nold, 2017) These students demonstrate the ability to interpret complex problems, identify relationships between concepts, and evaluate the validity of information before forming conclusions. In doing so, they approach learning as an active process of inquiry rather than mere information absorption. This capacity to question, analyze, and synthesize ideas reflects the core of intellectual maturity essential in higher education.

Critical thinkers are capable of constructing coherent and relevant arguments that connect theoretical frameworks with empirical evidence. They move beyond surface-level understanding by engaging with the underlying logic of a problem and justifying their reasoning with well-supported explanations (Golden, 2023). Such learners are not satisfied with simplistic answers; instead, they strive to understand causes, mechanisms, and implications. This reflective process allows them to integrate multiple perspectives and develop comprehensive insights that enrich both their individual learning and collaborative academic discussions.

Through consistent engagement in critical reflection and analytical reasoning, students refine their intellectual judgment and cultivate a more sophisticated approach to learning. This iterative process strengthens metacognitive awareness—the ability to evaluate and regulate one's own thinking—and fosters academic independence. Ultimately, critical thinking nurtures learners who are not only competent in mastering disciplinary knowledge but also capable of applying their understanding to novel and complex situations. Such students are better prepared to face real-world challenges with clarity, confidence, and adaptability—qualities that define successful lifelong learners and future professionals (Ghafar, 2023).

Several studies have explored the relationship between critical thinking and academic performance in science education. For example, Arvianti (2023) found that digital-based learning strategies could significantly enhance students' critical reasoning in language contexts. Similarly, Kusmiyati (2022) emphasized that analytical and creative thinking development supports better learning independence. However, few studies have specifically examined how critical thinking correlates with the quality of independent assignments in biology education, particularly in histology—a subject that heavily relies on visual analysis and conceptual understanding. This gap highlights the novelty of the present research, which seeks to bridge cognitive ability and assignment quality within the histology learning

framework. Therefore, this study is urgent to better understand how critical thinking contributes to students' capacity to complete independent scientific tasks effectively.

In academic practice, it is frequently observed that many students adopt a reproductive learning approach when completing assignments, characterized by the repetition of existing information without engaging in deeper analysis or synthesis (Ventista & Brown, 2023). This pattern often emerges in traditional learning environments where assessment primarily emphasizes factual recall rather than conceptual understanding. As a result, students tend to focus on reproducing what they have learned from textbooks or lectures instead of developing independent insights or critical evaluations. Such behavior reflects a surface-level engagement with academic material and limits opportunities for intellectual growth.

This tendency demonstrates a restricted use of higher-order thinking skills—such as analysis, evaluation, and creation—which are central to critical thinking and scientific reasoning (Rahma et al., 2024). When students fail to question, compare, or interpret information, they are unable to construct meaningful knowledge connections. Consequently, the learning process becomes mechanical rather than reflective. This not only undermines the development of academic rigor but also hinders the formation of essential problem-solving abilities that are necessary for professional competence.

Moreover, a reproductive learning style reduces the effectiveness of educational outcomes because it prioritizes memorization over understanding (Rusmin et al., 2024). Students who rely on memorization often perform well on short-term assessments but struggle to apply their knowledge in new or complex situations. This lack of transferability indicates shallow learning, which is unsustainable in higher education contexts that demand critical reasoning and independent inquiry. Over time, such patterns may contribute to decreased motivation and engagement, as learners perceive academic tasks as routine rather than intellectually stimulating.

In disciplines such as histology, this issue becomes particularly problematic. The study of microscopic structures requires not only visual recognition but also conceptual analysis and interpretation to connect structure with function (Mohammedsaleh, 2024). When students merely describe what they observe without questioning or analyzing its significance, they miss the essence of scientific learning. Therefore, it is imperative to investigate the factors that contribute to this tendency and to identify instructional strategies that can foster deeper, more reflective learning behaviors. Encouraging students to adopt analytical and inquiry-based approaches may help transform reproductive learning into a more meaningful, critical, and independent academic practice.

Accordingly, this study seeks to investigate the correlation between students' critical thinking abilities and the quality of their independent assignments within Histology courses. By examining this correlation, the research aims to identify whether the depth of students' reasoning and evaluation contributes to stronger academic performance. The findings are expected to provide valuable insight into how cognitive skills impact students' engagement with complex biological material. Furthermore, the study aspires to inform future pedagogical strategies that foster analytical thinking and enhance independent learning capacities.

Ultimately, the goal is to support the cultivation of more reflective, competent learners in the domain of biological sciences.

RESEARCH METHODS

The research was conducted from May 7th to June 18th during the even semester of the 2025 academic year at Mulawarman University. This study employed a quantitative correlational design, aiming to determine the relationship between students' critical thinking ability and the quality of their independent assignments in the Histology course. The research subjects consisted of 35 students enrolled in the Biology Education Study Program, who were selected based on their active participation in the course. This approach allowed the researcher to obtain representative data reflecting students' analytical performance in a real academic context.

The research instruments included a Histology context-based critical thinking test, composed of seven open-ended descriptive questions validated by expert lecturers, and an independent assignment assessment rubric. The rubric evaluated four aspects: accuracy of identification, depth of analysis, relevance of theoretical application, and independence of ideas. Data were analyzed through several stages, beginning with a normality test using Shapiro–Wilk to determine the distribution pattern. Subsequently, a Pearson correlation test was applied to normally distributed data, while the Spearman correlation test was used for data that did not meet the normality assumption.

RESULTS AND DISCUSSION

The results of the study provide an overview of students' critical thinking ability and the quality of their independent assignments in the Histology course. Data were collected from 35 students enrolled in the Biology Education Study Program during the 2025 academic year. The analysis focused on students' performance in the critical thinking test and the independent task assessment rubric. The purpose of this stage was to describe students' learning outcomes before conducting correlation analysis between the two variables. Overall, the results indicate that students achieved relatively high scores in both critical thinking and independent assignment performance, as presented in Table 1.

Table 1. Critical Thinking Skills and Independent Assignment Score

Test Results	Average	Maximum Score	Percentage
Critical Thinking Ability	7,8	10	78%
Independent Task	13,3	16	83,1%

Based on Table 1, it can be seen that the average score of students' critical thinking ability is 7.8, or equivalent to 78%. This percentage indicates that the students possess a fairly good level of critical thinking, yet there remains considerable potential for further improvement. In the context of higher education, a score at this level demonstrates that students have begun to develop essential analytical skills, but may still require consistent exposure to inquiry-based and reflective learning activities to achieve mastery. Thus, the results serve as an important indicator of students' cognitive development within the Histology course.

Critical thinking skills encompass several interconnected abilities, including the capacity to identify problems, collect and evaluate relevant information, make logical conclusions, and communicate findings effectively. The relatively high average score suggests that most students are capable of engaging in analytical and evaluative thought when faced with academic challenges. However, it also implies that some students may still rely on descriptive or reproductive approaches rather than fully analytical reasoning. Therefore, the development of critical thinking requires continuous reinforcement through active learning methods, problem-based assignments, and guided reflection.

Meanwhile, students' independent assignment scores showed an average of 13.3, or 83.1%, which is higher than the percentage obtained for critical thinking. This result illustrates that students generally performed well in completing tasks that required independent analysis, integration of theory, and structured presentation. High scores on independent assignments also suggest that learners were able to demonstrate a strong grasp of course material and translate their conceptual understanding into written and applied work. Moreover, the structured assessment rubric likely supported students in organizing their ideas more effectively, contributing to the overall quality of their outputs.

Although the percentage of independent assignment scores (83.1%) was slightly higher than that of critical thinking (78%), this difference may reflect the influence of multiple factors beyond analytical ability. Variables such as students' perseverance, clarity of assignment guidelines, access to academic resources, and time management skills may have contributed to the enhanced assignment performance. Nonetheless, the consistently high scores indicate that students were able to apply elements of critical thinking in practical contexts. The slight discrepancy between the two scores also suggests that while critical thinking underlies assignment quality, additional affective and motivational factors play a role in shaping students' academic outcomes.

Before conducting the correlation test, the data were analyzed for normality using the Shapiro–Wilk test to determine whether the distribution of the variables met the assumptions required for parametric analysis. The normality test was applied to both the critical thinking ability scores and the independent assignment scores obtained from 35 students. In interpreting the results, the main criterion used was the Significance (Sig.) value or p-value. If the Sig. value is less than 0.05, the data are considered not normally distributed, whereas if the Sig. value is equal to or greater than 0.05, the data are regarded as normally distributed. The results of the normality test for both variables are presented in Table 2 below.

Table 2. Data Normality Test Results

Test Results	Statistic	df	Sig.
Critical Thinking Ability	0.842	35	0.000
Independent Task	0.546	35	0.000

Based on Table 2, the results of the normality test show that the data for students' critical thinking ability obtained a significance value of 0.000 < 0.05, indicating that the data are not normally distributed. Similarly, the data for the independent assignment quality produced a significance value of 0.000 < 0.05, which also shows that this variable does not follow a normal

distribution. These findings suggest that the assumption of normality required for parametric analysis is not met. In such cases, non-parametric statistical methods are more appropriate because they do not rely on the assumption of normal distribution.

Since both sets of data—critical thinking ability and independent assignment quality—were found to be not normally distributed, the next step was to perform a non-parametric correlation analysis. The Spearman's Rank Correlation Test was selected to determine whether there was a statistically significant relationship between the two variables. This test is particularly suitable for ordinal or non-normally distributed data, as it measures the strength and direction of the monotonic relationship between variables.

The Spearman correlation analysis not only identifies the existence of a relationship but also provides insight into the pattern and consistency of that relationship. In this analysis, attention is given to the correlation coefficient (r_s), which indicates the degree of association between the variables. The value of this coefficient ranges from –1 to +1, where +1 represents a perfect positive correlation, –1 a perfect negative correlation, and 0 indicates no correlation. The closer the correlation coefficient is to either extreme, the stronger the relationship between the two variables.

By interpreting the correlation coefficient together with the significance (Sig.) value, researchers can determine not only the strength but also the statistical validity of the observed relationship. A low significance value ($p < 0.05$) indicates that the correlation is statistically significant, meaning it is unlikely to have occurred by chance. Based on this rationale, the analysis proceeded with the Spearman correlation test, the results of which are presented in Table 3 below.

Table 3. Spearman Correlation Test Results

Correlations				
			Kemampuan Berpikir Kritis	Kualitas Tugas Mandiri
Spearman's rho	Kemampuan Berpikir Kritis	Correlation Coefficient	1.000	0.244
		Sig. (2-tailed)		0.157
		N	35	35
	Kualitas Tugas Mandiri	Correlation Coefficient	0.244	1.000
		Sig. (2-tailed)	0.157	
		N	35	35

In the context of correlation analysis, the Sig. (2-tailed) value shown in Table 3 represents the significance level or p-value. This value is used to determine whether the observed correlation between two variables is statistically meaningful or merely a result of random variation. In general, if the significance value (Sig. < 0.05), it indicates that the correlation is statistically significant, meaning that there is strong evidence to reject the null hypothesis of no relationship. Conversely, if Sig. ≥ 0.05, the correlation is considered not statistically

significant, implying that the association found may have occurred by chance. The sample size (N) used in this analysis was 35 students, which provides a moderate level of statistical power for correlation testing.

Table 3 presents the results of the Spearman correlation analysis between critical thinking ability and the quality of students' independent assignments. The correlation coefficient obtained was 0.244, which indicates a weak positive relationship between the two variables. In practical terms, this means that students who tend to have higher critical thinking scores also tend to produce slightly better-quality independent assignments. However, the relationship is not strong enough to be considered substantial. Weak correlations such as this may reflect the influence of multiple uncontrolled factors that mediate or moderate the relationship between the two variables.

The corresponding significance value (Sig. 2-tailed) obtained from the analysis was 0.157, which is greater than the conventional alpha level of 0.05. Because the p-value exceeds this threshold, the observed relationship cannot be considered statistically significant. This suggests that while there is a tendency for critical thinking ability to be associated with assignment quality, the pattern may have occurred randomly within this particular sample. Therefore, it cannot be confidently generalized to represent the wider population of biology education students.

Despite the absence of a statistically significant correlation, the positive coefficient still provides useful insight into the learning dynamics within the Histology course. The result implies that critical thinking may play an indirect or supportive role in improving assignment quality when combined with other factors such as motivation, time management, and instructional clarity. Thus, the finding should not be interpreted as evidence that critical thinking has no influence, but rather that its effect might be mediated by additional cognitive and contextual variables. This highlights the need for further research involving larger sample sizes and more comprehensive instruments to better capture the complex relationship between critical thinking and academic performance. The absence of a significant correlation between critical thinking skills and the quality of independent assignments, despite the positive correlation coefficient, can be influenced by several factors (Yusniar et al., 2025). Based on the available data, improving students' critical thinking skills does not consistently or significantly go hand in hand with improving the quality of independent assignments (Wiwikananda & Susanti, 2022). One possible explanation is that the instrument used to measure critical thinking might not fully capture all dimensions relevant to independent task performance (Desnita, 2022). Additionally, some independent assignments may not require deep reasoning, allowing students with strong factual memory or technical accuracy to achieve high scores even with limited critical thinking engagement (Wani & Hussian, 2024). Another factor could be the assessment rubric itself, which might emphasize formal aspects such as completeness, neatness, and format over analytical depth (Kassiavera et al., 2024). External assistance from peers, tutors, or online sources could also influence assignment quality regardless of individual critical thinking ability (McCormick et al., 2015). Furthermore, motivational differences, time management, and perseverance levels among students may contribute to variations in performance (Davidovitch & Dorot, 2023). Technical errors in the

presentation or writing of the assignment (e.g., grammatical errors, poor formatting) may lower the grade of the independent assignment even though the content may demonstrate critical thinking (Golden, 2023). Collectively, these factors demonstrate the complexity of linking critical thinking directly to independent task quality, suggesting the need for more refined instruments and contextualized task designs in future research.

By considering these factors, future researchers can design studies that employ more precise and valid measurement instruments. The development of assessment tools that comprehensively capture various dimensions of critical thinking—such as analysis, evaluation, and synthesis—will help generate more reliable data. In addition, the establishment of clearer and more standardized assessment criteria will ensure that the evaluation of independent assignments accurately reflects students' levels of reasoning and cognitive engagement. Well-defined criteria can also minimize subjective bias and enhance the objectivity of scoring, making the findings more consistent across different contexts.

Moreover, future research should consider employing larger and more diverse samples to strengthen the generalizability of the results. Including participants from different academic levels, study programs, or institutions can provide a more comprehensive understanding of how critical thinking skills influence independent academic performance. Expanding the scope of inquiry to multiple learning settings will also allow researchers to explore contextual factors—such as motivation, instructional design, and learning environment—that may mediate or moderate this relationship. Through these improvements, future studies can offer a more nuanced and empirically grounded explanation of the link between critical thinking ability and the quality of students' independent assignments.

CONCLUSION

Based on the result and discussion, it can be concluded that there is no significant correlation between students' critical thinking skills and the quality of their independent assignments in the Histology course. Although this study found no statistically significant correlation between critical thinking ability and independent assignment quality, the findings have several pedagogical implications. The weak positive relationship suggests that critical thinking contributes partially to students' independent task performance but is mediated by other variables such as motivation, task clarity, and feedback quality. Therefore, educators should design independent assignments that explicitly require analytical reasoning, argument development, and evidence-based justification. It is also recommended that future studies employ mixed-method approaches or longitudinal designs to explore how instructional interventions can strengthen the link between critical thinking and independent learning outcomes in biology education.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all those who have contributed to the completion of this article. Special thanks go to:

1. Fellow lecturers of the Histology course, for their guidance, valuable input, and invaluable support during the research and writing process of this article.

2. All students who have attended Histology lectures. The active participation and data provided by the students are the main foundation for the analysis in this article. Hopefully the results of this research can provide benefits back to their learning process in the future.

Hopefully this article can make a positive contribution to the development of science and the practice of learning Histology.

REFERENCES

Arvianti, I. (2023, November 15). Infusing digital technology in critical literacy pedagogy to generate critical thinker. *UNNES-TEFLIN National Conference*. https://proceeding.unnes.ac.id/utnc/article/view/2624

Bahri, R., Rasul, M. S., Azman, D. N., Mohd Matore, E., Sofhi @ Subhi, A. H., Md Yusop, S. R., Abd Kadir, R., & Abdul Rahman, M. A. (2025). The Impact of Outcome-Based Education on Lecturers' Professional Growth in Vocational Programs. *International Journal of Academic Research in Progressive Education and Development*, *14*(1). https://doi.org/10.6007/IJARPED/v14-i1/24862

Davidovitch, N., & Dorot, R. (2023). The Effect of Motivation for Learning Among High School Students and Undergraduate Students—A Comparative Study. *International Education Studies*, *16*(2), 117. https://doi.org/10.5539/ies.v16n2p117

De Souza, F. M., Karapurkar, N. M., Clarista Meleena, Q., & Alvares, J. J. (2024). Integrated virtual teaching, learning and testing in histology: A student's perspective. *Journal of Medical Education Development*, *17*(53), 72–81. https://doi.org/10.61186/edcj.17.53.72

Desnita, D. (2022). Validity and Reliability of Critical Thinking Instruments to Measure the Effectiveness of Context-Based Physics E-Module on Wave Materials. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *8*(1), 57–64. https://doi.org/10.21009/1.08106

García-Carmona, A. (2025). Scientific Thinking and Critical Thinking in Science Education . *Science & Education*, *34*(1), 227–245. https://doi.org/10.1007/s11191-023-00460-5

Ghafar, Z. N. (2023). The Impact of Critical Thinking on Learners to Increase their Self regulate in the Education Process: An Overview. *International Journal of Arts and Humanities*, *1*(1), 23–30. https://doi.org/10.61424/ijah.v1i1.13

Golden, B. (2023). Enabling critical thinking development in higher education through the use of a structured planning tool. *Irish Educational Studies*, *42*(4), 949–969. https://doi.org/10.1080/03323315.2023.2258497

Haq, H., & Wakidi, W. (2024). Evaluation of the Implementation of the Merdeka Belajar Curriculum in Secondary Schools in the Digital Era. *International Journal of Post Axial: Futuristic Teaching and Learning*, *2*(4), 215–218.

Harrison, A., Evans, G., & Blanco, G. (2024). Expanding science skills: teaching tissue culture, data analysis, and reporting through imaging the actin cytoskeleton. *Journal of Microbiology & Biology Education*, *25*(2). https://doi.org/10.1128/jmbe.00190-23

Hortsch, M. (2023). Histology as a paradigm for a science-based learning experience: Visits by histology education spirits of past, present, and future. *Anatomical Sciences Education*, *16*(3), 372–383. https://doi.org/10.1002/ase.2235

Iyer, G. S., & Benner, S. (2022). Outcome-based teaching and evaluation - a paradigm shift. *RABINDRA BHARATI JOURNAL OF PHILOSOPHY*, *23*(17), 1–8. https://www.researchgate.net/publication/377695157

Kassiavera, S., Suparmi, A., Cari, C., & Sukarmin, S. (2024). Application of rasch model in two-tier test for assessing critical thinking in physics education. *Journal of Baltic Science Education*, *23*(6), 1227–1242. https://doi.org/10.33225/jbse/24.23.1227

Khatri, P., Duggal, H. K., Lim, W. M., Thomas, A., & Shiva, A. (2024). Student well-being in higher education: Scale development and validation with implications for management education. *The International Journal of Management Education*, *22*(1), 100933. https://doi.org/10.1016/j.ijme.2024.100933

Kotzé, S. H., & Mole, C. G. (2015). Making large class basic histology lectures more interactive: The use of draw-along mapping techniques and associated educational activities. *Anatomical Sciences Education*, *8*(5), 463–470. https://doi.org/10.1002/ase.1514

Kristoffersen, C. S. M., Ziesler, C. E. Ø., Thune, N. H., Kristensen, A. T., Sehic, A., Utheim, T. P., & Khan, Q. (2025). Towards a Modernized Framework of Histology Teaching to Integrate Genetics: Pedagogical Perspectives for Oral Histology. *Genes*, *16*(5), 512. https://doi.org/10.3390/genes16050512

Kusmiyati, K. (2022). Analysis of independence and creative thinking skills of students through assignment. *Jurnal Pijar Mipa*, *17*(6), 754–758. https://doi.org/10.29303/jpm.v17i6.4232

McCormick, N. J., Clark, L. M., & Raines, J. M. (2015). Engaging Students in Critical Thinking and Problem Solving: A Brief Review of the Literature. *Journal of Studies in Education*, *5*(4), 100. https://doi.org/10.5296/jse.v5i4.8249

Mohammedsaleh, Z. M. (2024). The Impact of Various Factors on the Difficulties in Learning and Teaching Strategies for Histology. *International Journal of Morphology*, *42*(3), 741–748. https://doi.org/10.4067/s0717-95022024000300741

Ngatminiati, Y., Hidayah, Y., & Suhono. (2024). Keterampilan Berpikir Kritis untuk Memgembangkan Kompetensi Abad 21 Siswa Sekolah Dasar. *Jurnal Review Pendidikan dan Pengajaran*, *7*(3), 8210–8216.

Nold, H. (2017). Using Critical Thinking Teaching Methods to Increase Student Success: An Action Research Project. *International Journal of Teaching*, *29*(1), 17–32. http://www.isetl.org/ijtlhe/

Prakong, S. (2024). The Role of Critical Thinking in Enhancing Students' Problem-Solving Abilities in Higher Education. *Journal of Education, Humanities, and Social Research*, *1*(1), 10–16. https://doi.org/10.70088/scx8x622

Rahma, H. D., Alimuddin, & Andi, P. (2024). Higher Order Thinking and Critical Thinking Skills in Problem-Based Learning Environments: A Systematic Review. *Journal of Learning and Development Studies*, *4*(2), 21–33. https://doi.org/10.32996/jlds.2024.2.2.3

Rusmin, L., Misrahayu, Y., Pongpalilu, F., Radiansyah, R., & Dwiyanto, D. (2024). Critical Thinking and Problem-Solving Skills in the 21st Century. *Join: Journal of Social Science*, *1*(5), 144–162. https://doi.org/10.59613/svhy3576

Schoenherr, J., Strohmaier, A. R., & Schukajlow, S. (2024). Learning with visualizations helps: A meta-analysis of visualization interventions in mathematics education. *Educational Research Review*, *45*, 100639. https://doi.org/10.1016/j.edurev.2024.100639

Sukenda, E. A. (2016). Kemampuan berpikir kritis dan kemandirian belajar dengan hasil belajar matematika. *Jurnal Pendidikan dasar*, *7*(2), 185–198.

Ventista, O. M., & Brown, C. (2023). Teachers' professional learning and its impact on students' learning outcomes: Findings from a systematic review. *Social Sciences & Humanities Open*, *8*(1), 100565. https://doi.org/10.1016/j.ssaho.2023.100565

Wani, S. A., & Hussian, Z. (2024). Developing Critical Thinking Skills: Encouraging Analytical and Creative Thinking. In *Developing Critical Thinking Skills* (pp. 114–130). https://doi.org/10.4018/979-8-3693-0868-4.ch007

Wiwikananda, S. K. S., & Susanti, A. (2022). Improving Students' Critical Thinking Skills through Digital Storytelling on Narrative Text. *Pioneer: Journal of Language and Literature*, *14*(2), 356. https://doi.org/10.36841/pioneer.v14i2.1685

Yusniar, Elpisah, & Syarifuddin. (2025). Effect of Critical Thinking, Learning Independence, and Gotong Royong in P5 Merdeka Curriculum. *International Journal of Social Welfare and Family Law*, *2*(2), 23–35. https://doi.org/10.62951/ijsw.v2i2.306

Zidan, M. R., & Qamariah, Z. (2023). A Literature Study On The Implementation Of Merdeka Curriculum. *Jurnal Riset Rumpun Ilmu Bahasa*, *2*(2), 153–167. https://doi.org/10.55606/jurribah.v2i2.1576