JPPIPA 12(5) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

The Relationship between Metacognitive Awareness, Self-Efficacy and Learning Motivation on Biology Learning Outcomes of Grade XI Students of State Senior High Schools in Soppeng Regency

Wirna Arsyad[1], Muhiddin Palenari[1*], Alimuddin Ali[1]

[1] Graduate Program of Biology Education, Universitas Negeri Makassar, Makassar, Indonesia

Received: February 28, 2026
Revised: April 13, 2026
Accepted: May 25, 2026
Published: May 31, 2026

Corresponding Author:
Muhiddin Palenari
muhiddin.p@unm.ac.id

DOI: 10.29303/jppipa.v12i5.15117

Abstract: This study aims to analyze the relationship between metacognitive awareness, self-efficacy, and learning motivation on biology learning outcomes of eleventh-grade students in public high schools in Soppeng Regency, both directly and indirectly. This quantitative study employed an ex post facto correlation approach with Structural Equation Modeling (SEM) analysis techniques. A sample of 505 students was selected using simple random sampling and proportional sampling techniques from a total population of 1.444 students. The instruments used included questionnaires on metacognitive awareness, self-efficacy, and learning motivation, as well as a biology learning achievement test. The results showed that metacognitive awareness was significantly related to learning motivation (p=0.00), but had no direct effect on learning outcomes (p=0.06). Self-efficacy was significantly related to learning outcomes (p=0.01), but not significantly to learning motivation (p=0.06). Learning motivation was also significantly related to learning outcomes (p=0.00). Indirectly, metacognitive awareness has a significant relationship with learning outcomes through the mediation of learning motivation (p=0.00) and self-efficacy (p=0.02). However, the indirect relationship between self-efficacy and learning outcomes through learning motivation was not significant (p=0.16). The conclusion of this study confirms that learning motivation plays a crucial role as a primary mediator. Increasing metacognitive awareness and self-efficacy needs to be optimized in an integrated manner to improve student learning outcomes.

Keywords: Learning Motivation; Learning Outcomes; Metacognitive Awareness: Self-Efficacy

Introduction

Education is a conscious effort undertaken by families, communities, and the government through guidance, teaching, and training activities in schools (Hepburn et al., 2025; Kelty & Wakabayashi, 2020). Educational success is measured not only by grades on report cards or diplomas, but also by cognitive abilities reflected in student learning outcomes. Therefore, the quality of education is largely determined by the learning process experienced by students and the results achieved. The quality of education is closely related to students' understanding of effective learning methods (learning how to learn) and their ability to solve various problems, both academic and social (Stanton et al., 2021). Education also plays a role in shaping character and providing life skills so students can adapt to dynamic, competitive, and uncertain situations (Zega, 2021). However, the state of education in Indonesia still faces various challenges, particularly in achieving national education goals. This is characterized by a gap between expectations and reality, which is closely related to the

How to Cite:
Arsyad, W., Palenari, M., & Ali, A. (2026). The Relationship between Metacognitive Awareness, Self-Efficacy and Learning Motivation on Biology Learning Outcomes of Grade XI Students of State Senior High Schools in Soppeng Regency. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 1–7. https://doi.org/10.29303/jppipa.v12i5.15117

learning process experienced by students (Sander et al., 2025; Timmis et al., 2024).

Observations at several public high schools in Soppeng Regency indicate that biology learning is still considered difficult by students due to the dominance of memorization and theory. Consequently, student learning outcomes are low, with many failing to meet the Minimum Completion Criteria (KKM). Furthermore, students' metacognitive awareness is also low, evident in their lack of ability to plan, monitor, and evaluate their learning process. Metacognitive awareness is a crucial factor in improving learning outcomes. Students with metacognitive awareness are able to control their thinking processes through planning, monitoring, and evaluation, resulting in more effective learning (An et al., 2024; Anthonysamy et al., 2025). Furthermore, the quality of learning outcomes is related to students' ability to continuously control cognitive processes (Ramdhani et al., 2024; Rivas et al., 2022). Individuals with strong metacognitive abilities tend to have more optimal learning management skills (Abdelrahman, 2020; Jiang et al., 2025). In addition to metacognitive awareness, self-efficacy also plays a crucial role in learning success. Self-efficacy is an individual's belief in their ability to complete tasks and face challenges (Monika & Adman, 2017). Students with high self-efficacy tend to be more active and confident in learning (Meng & Zhang, 2023; Prifti, 2022), and have better persistence and learning strategies (AL-Qadri et al., 2024; Eren et al., 2025).

Research shows that self-efficacy has a positive effect on student learning outcomes (Honicke et al., 2023; Miao et al., 2025), Learning motivation is also a crucial factor in improving student learning outcomes. Motivation serves as a driver, guide, and reinforcer in the learning process (Siziba et al., 2025; Urhahne & Wijnia, 2023). Students with high motivation tend to be more active and persistent in learning, which impacts learning outcomes (Acosta-Gonzaga & Ramirez-Arellano, 2021; Kamberi, 2025). Furthermore, metacognitive awareness and self-efficacy can increase learning motivation, which ultimately impacts student learning outcomes (Ho & Lau, 2025; Zeitlhofer et al., 2023). Based on this description, this study was conducted to analyze the relationship between metacognitive awareness, self-efficacy, and learning motivation on students' biology learning outcomes.

Methods

This research is a quantitative, ex post facto correlational study. It aims to analyze the relationship between metacognitive awareness, self-efficacy, learning motivation, and students' biology learning outcomes. Data analysis was conducted using Structural Equation Modeling (SEM) to examine direct and indirect relationships between variables. The study population was all 1.444 eleventh-grade students at public high schools in Soppeng Regency, with a sample size of 505 students determined using proportional random sampling. The research instruments consisted of a questionnaire to measure metacognitive awareness, self-efficacy, and learning motivation, and a test to measure students' biology learning outcomes. The data obtained were analyzed using SEM software to test the structural model and examine the significance of the relationships between variables.

Results and Discussion

Descriptive Analysis

The descriptive analysis of the research variables, it is known that the metacognitive awareness variable has a minimum value of 58 and a maximum of 120, with an average (mean) of 94.90 and a standard deviation of 8.18, indicating relatively moderate data variation. The self-efficacy variable has a minimum value of 20 and a maximum of 42, with an average value of 31.74 and a standard deviation of 2.99, indicating that the data distribution tends to be more homogeneous than other variables as shown in Table 1. Furthermore, the learning motivation variable has a minimum value of 32 and a maximum of 60, with an average of 49.04 and a standard deviation of 4.496, indicating moderate data variation. Meanwhile, the learning outcome variable has a minimum value of 11 and a maximum of 94, with an average value of 70.49 and a standard deviation of 13.689, indicating that this variable has the highest level of data distribution among the other variables. In general, the results of this descriptive analysis provide an overview that all research variables have a fairly diverse range of values with varying levels of variation.

Table 1. Descriptive Analysis of Research Variables

Variables	Mini	Maxi	Mean	Std. Deviation
Metacognitive Awareness	58	120	94.90	8.18
Self-Efficacy	20	42	31.74	2.99
Learning Motivation	32	60	49.04	4.49
Learning Outcomes	11	94	70.49	13.68

Based on Table 1 regarding the descriptive analysis of the research variables, it is known that the metacognitive awareness variable has a minimum value of 58 and a maximum of 120, with an average (mean) of 94.90 and a standard deviation of 8.18, indicating relatively moderate data variation. The self-efficacy

variable has a minimum value of 20 and a maximum of 42, with an average value of 31.74 and a standard deviation of 2.99, indicating that the data distribution tends to be more homogeneous than other variables. Furthermore, the learning motivation variable has a minimum value of 32 and a maximum of 60, with an average of 49.04 and a standard deviation of 4.496, indicating moderate data variation. Meanwhile, the learning outcome variable has a minimum value of 11 and a maximum of 94, with an average value of 70.49 and a standard deviation of 13.68, indicating that this variable has the highest level of data distribution among the other variables. In general, the results of this descriptive analysis provide an overview that all research variables have a fairly diverse range of values with varying levels of variation.

SEM (Structural Equation Model) Analysis

Based on the Direct Effect Table 2, it can be seen that not all relationships between variables show a significant effect. The relationship between metacognitive awareness and self-efficacy yielded a T-statistic of 6.76 with a p-value of 0.00, thus confirming that this relationship is significant and the hypothesis is accepted. This indicates that the better a person's metacognitive awareness, the higher their self-efficacy. Furthermore, metacognitive awareness also significantly impacted learning motivation with a T-statistic of 11.66 and a p-value of 0.00, indicating that the hypothesis was also accepted. However, metacognitive awareness did not significantly impact learning outcomes, with a T-statistic of 1.882 and a p-value of 0.06 (greater than 0.05), thus rejecting the hypothesis. This indicates that even if a person has good metacognitive awareness, it does not directly impact learning outcomes.

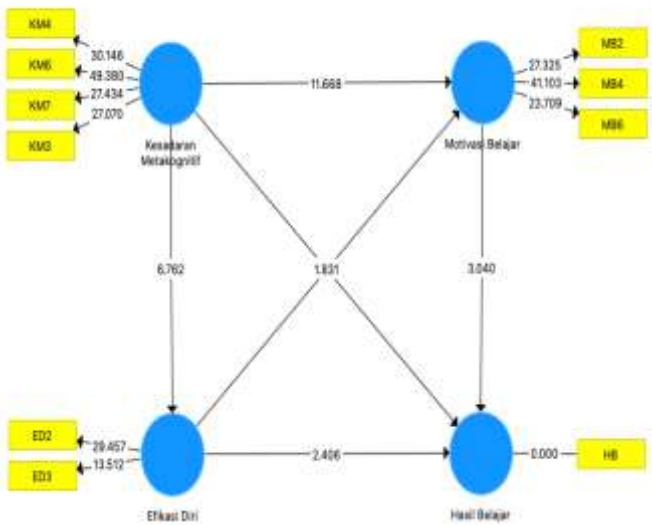

Figure 1. SEM (Structural Equation Model) Analysis

Table 2. Direct Effect

Path Structure	T-Statistics	P-Value	Results
Metacognitive Awareness -> Self-Efficacy	6.76	0.00	Accepted
Metacognitive Awareness -> Learning Outcomes	1.88	0.06	Rejected
Metacognitive Awareness -> Learning Motivation	11.66	0.00	Accepted
Self-Efficacy -> Learning Outcomes	2.40	0.01	Accepted
Self-Efficacy -> Learning Motivation	1.83	0.06	Rejected
Learning Motivation -> Learning Outcomes	3.04	0.00	Accepted

Furthermore, regarding the relationship between self-efficacy and learning outcomes, the T-statistic was 2.40 with a p-value of 0.01, thus accepting the hypothesis. This indicates that self-efficacy has a positive and significant influence on learning outcomes. Conversely, the relationship between self-efficacy and learning motivation did not show a significant effect, with a T-statistic of 1.83 and a p-value of 0.06, thus rejecting the hypothesis. Finally, regarding the relationship between learning motivation and learning outcomes, the T-statistic was 3.04 with a p-value of 0.00, indicating a significant relationship and accepting the hypothesis. This indicates that learning motivation plays a significant role in improving learning outcomes. Overall, these results indicate that learning motivation and self-efficacy have a direct influence on learning outcomes, while metacognitive awareness has a more indirect influence through other variables.

Based on Table 3 regarding the indirect effect, it can be seen that not all mediation pathways have a significant influence or relationship. In the metacognitive awareness → self-efficacy → learning outcomes pathway, the T-statistics value was obtained at 2.29 with a p-value of 0.02, so it was declared significant and the hypothesis was accepted. This indicates that metacognitive awareness can influence learning outcomes indirectly through self-efficacy as an intermediary variable. Conversely, in the self-efficacy → learning motivation → learning outcomes pathway, the T-statistics value was obtained at 1.40 with a p-value of 0.16, so it was not significant and the hypothesis was rejected. This means that learning motivation is not able to be a strong mediator in the relationship between self-efficacy and learning outcomes. Similar results were also

found in the metacognitive awareness → self-efficacy → learning motivation → learning outcomes pathway, with a T-statistics value of 1.31 and a p-value of 0.19, indicating that this chain mediation pathway was also not significant.

Table 3. Indirect Effect

Path Structure	T-Statistics	P-Value	Results
Metacognitive Awareness -> Self-Efficacy -> Learning Outcomes	2.29	0.02	Accepted
Self-Efficacy -> Learning Motivation -> Learning Outcomes	1.40	0.16	Rejected
Metacognitive Awareness -> Self-Efficacy -> Learning Motivation -> Learning Outcomes	1.31	0.19	Rejected
Metacognitive Awareness -> Learning Motivation -> Learning Outcomes	2.81	0.00	Accepted
Metacognitive Awareness -> Self-Efficacy -> Learning Motivation	1.76	0.07	Rejected

However, for the metacognitive awareness → learning motivation → learning outcomes pathway, the T-statistic was 2.81 with a p-value of 0.005, thus accepting the hypothesis. This indicates that learning motivation can act as a significant mediator in the relationship between metacognitive awareness and learning outcomes. This means that metacognitive awareness can improve learning outcomes by increasing learning motivation. Finally, for the metacognitive awareness → self-efficacy → learning motivation pathway, the T-statistic was 1.76 with a p-value of 0.07, thus not significant. Overall, these results indicate that not all variables can act as mediators, but self-efficacy and learning motivation have been shown to be mediators in certain pathways, particularly in explaining the influence of metacognitive awareness on learning outcomes.

Direct Relationship Between Metacognitive Awareness, Self-Efficacy, and Learning Motivation on Biology Learning Outcomes of 11th-Grade Students at Public Senior High Schools in Soppeng Regency

The results of the direct effect analysis indicate that not all variables significantly influence students' biology learning outcomes. Of the six paths tested, four relationships were significant and two were insignificant, indicating that the relationships between variables in learning are complex and not always direct, but rather involve mediating variables. These results align with recent research confirming that the learning process is influenced by the interaction between metacognition, motivation, and self-regulation within an interconnected system (Geng & Su, 2025; Hashmi et al., 2026). Furthermore, the relationship between psychological variables in learning has also been shown to influence each other indirectly through learning strategies (Rožman et al., 2025; Smarandache et al., 2022). Metacognitive awareness has been shown to significantly influence self-efficacy and learning motivation, but has no direct effect on learning outcomes.

This suggests that metacognitive awareness plays a more important role in managing the learning process by increasing students' self-confidence and motivation to learn. These results align with recent research showing that metacognition functions as a mediator that improves self-efficacy and academic performance (Huang et al., 2022) and plays a role in helping students organize learning strategies more effectively (Kleka et al., 2024). Thus, metacognition does not always have a direct impact, but rather strengthens other variables that contribute to learning outcomes. Meanwhile, self-efficacy and learning motivation were shown to have a significant direct influence on student learning outcomes, while the relationship between self-efficacy and learning motivation was insignificant. These results indicate that students with high self-confidence and motivation tend to be more active, persistent, and focused in learning, resulting in better results. These findings are supported by recent research showing that self-efficacy has a direct influence on learning achievement and interacts with metacognition to improve academic performance (Duratun & Maryani, 2023; Sadeghi et al., 2025). Overall, these research findings confirm that improving learning outcomes depends not only on cognitive aspects but also on psychological aspects, with metacognitive awareness playing an indirect role.

Indirect Relationship between Metacognitive Awareness, Self-Efficacy, and Learning Motivation on Biology Learning Outcomes of 11th-Grade Students in Public Senior High Schools in Soppeng Regency

The results of the indirect effect analysis indicate that not all mediating pathways significantly influence students' biology learning outcomes. Of the five pathways tested, only two were significant, while the other three were insignificant. This finding indicates that the role of mediating variables such as self-efficacy and learning motivation does not always strengthen the relationship between variables, but rather depends on the strength of the relationship within each pathway (Leasa et al., 2023; Valenzuela & Balon, 2026). This aligns with the concept that the learning process is a complex system involving the interaction of various psychological factors within students (Jiang & Yang, 2022; Ramirez-Arellano, 2019). Metacognitive awareness has been shown to have a significant indirect effect on learning outcomes through self-efficacy and learning motivation. This suggests that increasing metacognitive awareness can improve learning outcomes if it can first boost students' self-confidence and motivation.

These findings align with metacognitive theory, which states that understanding thinking processes can enhance self-efficacy (Sapulete et al., 2024; Yang, 2021) and are supported by research showing that metacognition contributes to learning outcomes through mediating variables such as self-efficacy and motivation (Akamatsu et al., 2019; Urban & Urban, 2025). Conversely, several mediating pathways, such as self-efficacy → learning motivation → learning outcomes, and the chain pathway of metacognitive awareness → self-efficacy → learning motivation → learning outcomes, did not show significant effects. This suggests that not all relationships between psychological variables can work simultaneously to improve learning outcomes. Overall, the results of this study confirm that learning motivation is a stronger mediator than self-efficacy in the relationship between metacognitive awareness and learning outcomes. Therefore, improving student learning outcomes requires an integration of metacognitive awareness, self-efficacy, and especially learning motivation as the primary driving factors (Almayez et al., 2025; Wangguway et al., 2025).

Conclusion

Self-efficacy and learning motivation were shown to have a significant direct influence on learning outcomes, while metacognitive awareness had no direct influence. However, metacognitive awareness did influence self-efficacy and learning motivation. Furthermore, metacognitive awareness had a significant indirect influence on learning outcomes through self-efficacy and learning motivation, particularly through the learning motivation pathway. However, not all mediating pathways showed a significant influence. Considering that not all mediation pathways showed significant influence, further researchers can explore other moderating variables such as social support or digital learning environment.

Acknowledgements

Thank you to all the eleventh-grade students at Soppeng Regency Public High Schools who volunteered to be respondents during my research.

Author Contributions

Conceptualization; methodology.; W. A.; validation; formal analysis; investigation; M. P.; resources; data curation; writing—original draft preparation; writing—review and editing.; visualization: A. A. All authors have read and agreed to the published version of the manuscript.

Funding

The research and writing of this article were funded by personal funds.

Conflicts of Interest

The researchers funded this research independently.

Reference

Abdelrahman, R. M. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. *Heliyon*, *6*(9), e04192. https://doi.org/10.1016/j.heliyon.2020.e04192

Acosta-Gonzaga, E., & Ramirez-Arellano, A. (2021). The Influence of Motivation, Emotions, Cognition, and Metacognition on Students' Learning Performance: A Comparative Study in Higher Education in Blended and Traditional Contexts. *Sage Open*, *11*(2), 21582440211027561. https://doi.org/10.1177/21582440211027561

Akamatsu, D., Nakaya, M., & Koizumi, R. (2019). Effects of Metacognitive Strategies on the Self-Regulated Learning Process: The Mediating Effects of Self-Efficacy. *Behavioral Sciences*, *9*(12), 128. https://doi.org/10.3390/bs9120128

Almayez, M. A., Al-khresheh, M. H., AL-Qadri, A. H., Alkhateeb, I. A., & Alomaim, T. I. M. (2025). Motivation and English self-efficacy in online learning applications among Saudi EFL learners: Exploring the mediating role of self-regulated learning strategies. *Acta Psychologica*, *254*, 104796. https://doi.org/10.1016/j.actpsy.2025.104796

AL-Qadri, A. H., Mouas, S., Saraa, N., & Boudouaia, A. (2024). Measuring academic self-efficacy and

learning outcomes: The mediating role of university English students' academic commitment. *Asian-Pacific Journal of Second and Foreign Language Education*, *9*(1), 35. https://doi.org/10.1186/s40862-024-00253-5

An, D., Ye, C., & Liu, S. (2024). The influence of metacognition on learning engagement the mediating effect of learning strategy and learning behavior. *Current Psychology*, *43*(40), 31241–31253. https://doi.org/10.1007/s12144-024-06400-y

Anthonysamy, L., Wut, T. E., & Lim, O. W. (2025). Metacognitive strategy interventions to improve analytical thinking skills: A quasi-experimental study. *Social Sciences & Humanities Open*, *12*, 102021. https://doi.org/10.1016/j.ssaho.2025.102021

Duratun, A. D., & Maryani, I. (2023). The Influence of Self-Efficacy on Metacognition Skills of High Grade Students. *International Journal of Elementary Education*, *7*(3), 403–409. https://doi.org/10.23887/ijee.v7i3.62125

Eren, E., Yada, A., Schwab, S., & Savolainen, H. (2025). Teacher student-specific self-efficacy and its impact on students' academic self-concept, emotional well-being and social inclusion. *Teaching and Teacher Education*, *165*, 105152. https://doi.org/10.1016/j.tate.2025.105152

Geng, X., & Su, Y.-S. (2025). The effects of different metacognitive patterns on students' self-regulated learning in blended learning. *Computers & Education*, *227*, 105211. https://doi.org/10.1016/j.compedu.2024.105211

Hashmi, Z. F., Iqbal, J., Asghar, M. Z., & Siming, L. (2026). The influence of online learning interactions on self-regulated learning: Mediating role of technology proficiencies among higher education students. *Open Learning: The Journal of Open, Distance and e-Learning*, *41*(1), 41–66. https://doi.org/10.1080/02680513.2025.2492657

Hepburn, S.-J., Trompf, M., Hodges, J., MacLeod, L. M., Ma, T., Teng, J., Johnson, A., Boyle, C., & Sanders, M. (2025). Creating a positive home-school partnership through professional learning for teachers – A scoping review of the international literature. *Teaching and Teacher Education*, *165*, 105127. https://doi.org/10.1016/j.tate.2025.105127

Ho, W. W. Y., & Lau, Y. H. Y. (2025). Role of reflective practice and metacognitive awareness in the relationship between experiential learning and positive mirror effects: A serial mediation model. *Teaching and Teacher Education*, *157*, 104947. https://doi.org/10.1016/j.tate.2025.104947

Honicke, T., Broadbent, J., & Fuller-Tyszkiewicz, M. (2023). The self-efficacy and academic performance reciprocal relationship: The influence of task difficulty and baseline achievement on learner trajectory. *Higher Education Research & Development*, *42*(8), 1936–1953. https://doi.org/10.1080/07294360.2023.2197194

Huang, X., Bernacki, M. L., Kim, D., & Hong, W. (2022). Examining the role of self-efficacy and online metacognitive monitoring behaviors in undergraduate life science education. *Learning and Instruction*, *80*, 101577. https://doi.org/10.1016/j.learninstruc.2021.101577

Jiang, L., Zhang, S., Li, J., Gong, Y., Sun, N., Wang, H., Xiao, T., & Yi, X. (2025). Individuals with High Mindfulness Are Better at Metacognitive Ability: A Latent Profile Analysis Approach. *Behavioral Sciences*, *15*(10), 1341. https://doi.org/10.3390/bs15101341

Jiang, Y., & Yang, X. (2022). Individual and contextual determinants of students' learning and performance. *Educational Psychology*, *42*(4), 397–400. https://doi.org/10.1080/01443410.2022.2055958

Kamberi, M. (2025). The types of intrinsic motivation as predictors of academic achievement: The mediating role of deep learning strategy. *Cogent Education*, *12*(1), 2482482. https://doi.org/10.1080/2331186X.2025.2482482

Kelty, N. E., & Wakabayashi, T. (2020). Family Engagement in Schools: Parent, Educator, and Community Perspectives. *Sage Open*, *10*(4), 2158244020973024. https://doi.org/10.1177/2158244020973024

Kleka, P., Brycz, H., Zięba, M., & Fanslau, A. (2024). Longitudinal study of metacognition's role in self-efficacy and hope development. *Scientific Reports*, *14*(1), 29379. https://doi.org/10.1038/s41598-024-80180-0

Leasa, M., Batlolona, J. R., Jamaludin, J., Nuniary, S., & Salhuteru, V. (2023). Elementary School Students' Metacognitive Awareness: PBL Study with HPC Strategy in Science Learning. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8982–8989. https://doi.org/10.29303/jppipa.v9i10.3686

Meng, Q., & Zhang, Q. (2023). The Influence of Academic Self-Efficacy on University Students' Academic Performance: The Mediating Effect of Academic Engagement. *Sustainability*, *15*(7), 5767. https://doi.org/10.3390/su15075767

Miao, H., Guo, R., & Li, M. (2025). The influence of research self-efficacy and learning engagement on Ed.D students' academic achievement. *Frontiers in Psychology*, *16*, 1562354. https://doi.org/10.3389/fpsyg.2025.1562354

Monika, & Adman. (2017). Peran efikasi diri dan motivasi belajar dalam meningkatkan hasil

belajar siswa sekolah menengah kejuruan. *Jurnal Pendidikan Manajemen Perkantoran, 2*(2). https://doi.org/10.17509/jpm.v2i2

Prifti, R. (2022). Self–efficacy and student satisfaction in the context of blended learning courses. *Open Learning: The Journal of Open, Distance and e-Learning*, *37*(2), 111–125. https://doi.org/10.1080/02680513.2020.1755642

Ramdhani, L. I., Triana, D. D., & Madani, F. (2024). Enhancing Student Learning Outcomes through Formative Assessment: A Systematic Literature Review. *Mimbar Ilmu*, *29*(3), 529–536. https://doi.org/10.23887/mi.v29i3.89840

Ramirez-Arellano, A. (2019). Students learning pathways in higher blended education: An analysis of complex networks perspective. *Computers & Education*, *141*, 103634. https://doi.org/10.1016/j.compedu.2019.103634

Rivas, S. F., Saiz, C., & Ossa, C. (2022). Metacognitive Strategies and Development of Critical Thinking in Higher Education. *Frontiers in Psychology*, *13*, 913219. https://doi.org/10.3389/fpsyg.2022.913219

Rožman, M., Vrečko, I., & Tominc, P. (2025). Psychological Factors Impacting Academic Performance Among Business Studies' Students. *Education Sciences*, *15*(2), 121. https://doi.org/10.3390/educsci15020121

Sadeghi, R., Beigzadeh, A., Bordbar, S., & Yusefi, A. R. (2025). Exploring the mediating role of academic self-efficacy between responsibility and academic success: A cross-sectional study at Sirjan school of medical sciences, Iran. *Discover Education*, *5*(1), 61. https://doi.org/10.1007/s44217-025-01077-2

Sander, Z. M., Rieder, V., & Spinath, B. (2025). Expectations versus reality: Motivational outcomes of unmet course-specific expectations in higher education. *International Journal of Educational Research*, *134*, 102843. https://doi.org/10.1016/j.ijer.2025.102843

Sapulete, H., Sopacua, F., & Sopacua, V. (2024). The Analysis of Students' Metacognitive Skills in Physics through Problem-Solving Strategies in Physics Education Students. *Jurnal Penelitian Pendidikan IPA*, *10*(7), 4453–4460. https://doi.org/10.29303/jppipa.v10i7.7102

Siziba, T., Geduld, B., & Du Toit-Brits, C. (2025). Empowering learners: Exploring teacher perceptions in motivating and fostering self-directed learning skills. *Cogent Education*, *12*(1), 2548351. https://doi.org/10.1080/2331186X.2025.2548351

Smarandache, I. G., Maricutoiu, L. P., Ilie, M. D., Iancu, D. E., & Mladenovici, V. (2022). Students' approach to learning: Evidence regarding the importance of the interest-to-effort ratio. *Higher Education Research & Development*, *41*(2), 546–561. https://doi.org/10.1080/07294360.2020.1865283

Stanton, J. D., Sebesta, A. J., & Dunlosky, J. (2021). Fostering metacognition to support student learning and performance. *CBE—Life Sciences Education, 20*(2), fe3. https://doi.org/10.1187/cbe.20-12

Timmis, M. A., Hibbs, A., Polman, R., Hayman, R., & Stephens, D. (2024). Previous education experience impacts student expectation and initial experience of transitioning into higher education. *Frontiers in Education*, *9*, 1479546. https://doi.org/10.3389/feduc.2024.1479546

Urban, K., & Urban, M. (2025). Metacognition and motivation in creativity: Examining the roles of self-efficacy and values as cues for metacognitive judgments. *Metacognition and Learning*, *20*(1), 16. https://doi.org/10.1007/s11409-025-09421-5

Urhahne, D., & Wijnia, L. (2023). Theories of Motivation in Education: An Integrative Framework. *Educational Psychology Review*, *35*(2), 45. https://doi.org/10.1007/s10648-023-09767-9

Valenzuela, C. L., & Balon, W. (2026). BSEd-English Students' Acceptance of ChatGPT in Language Education Research course: A Literature Review. *Journal of Digital Learning and Distance Education*, *4*(10), 1950–1960. https://doi.org/10.56778/jdlde.v4i10.670

Wangguway, Y., Mandala, A. S., & Ugadje, E. F. (2025). Unraveling the Interplay Between Motivation and Self-Regulated Learning in Learning Statistics: A Case of Higher Education Institutions in Papua. *Journal of Education Research and Evaluation*, *9*(2), 418–429. https://doi.org/10.23887/jere.v9i2.94144

Yang, J. (2021). Revisiting Research Methods in Language Learning Psychology From a Complexity Dynamic System Theory Perspective. *Frontiers in Psychology*, *12*, 741045. https://doi.org/10.3389/fpsyg.2021.741045

Zega, Y. (2021). Hubungan Metakognitif Dan Self Efficacy Terhadap Hasil Belajar Mahasiswa Pendidikan Matematika Ikip Gunungsitoli. *DIDAKTIK: Jurnal Ilmiah Pendidikan, Humaniora, Sains Dan Pembelajarannya*, *15*(1), 2563-2572. Retrieved from https://shorturl.asia/f8Qz7

Zeitlhofer, I., Hörmann, S., Mann, B., Hallinger, K., & Zumbach, J. (2023). Effects of Cognitive and Metacognitive Prompts on Learning Performance in Digital Learning Environments. *Knowledge*, *3*(2), 277–292. https://doi.org/10.3390/knowledge3020019