

DAFTAR PUSTAKA

- Abad, S. D. I. (2024). *Cendikia pendidikan*. 9(4).
<https://doi.org/10.9644/sindoro.v3i9.252>
- Affandy, H., Sunarno, W., Suryana, R., & Harjana. (2024). Integrating creative pedagogy into problem-based learning: The effects on higher order thinking skills in science education. *Thinking Skills and Creativity*, 53, 101575.
<https://doi.org/https://doi.org/10.1016/j.tsc.2024.101575>
- Affandy, H., Sunarno, W., Suryana, R., & Harjana. (2026). Unveiling the Global Instructional Impact of Problem-Based Learning in Science Education: A Comprehensive Systematic Review. *Interdisciplinary Journal of Problem-Based Learning*, 20. <https://doi.org/10.14434/ijpbl.v20i1.37007>
- Alabbasi, A. M. A., Alansari, A. M., Deifalla, A., Runco, M. A., Sequeira, R. P., Alotaibi, G. A., & Alsaleh, A. (2026). *Convergent thinking, divergent thinking, and openness to experience as predictors of academic success among high-achieving and typical-achieving medical students*. 3.
- Alali, R., & Al-barakat, A. (2024). *Young children ' s attitudes toward science learning in early learning grades*. 13(4), 340–355.
<https://doi.org/10.1108/AEDS-02-2024-0036>
- Albarracín-vivo, D., Jerez-martínez, I., & Encabo-fern, E. (2023). *International Journal of Educational Research Open Evaluative research on the critical thinking of primary school students*. 4(April).
<https://doi.org/10.1016/j.ijedro.2023.100249>
- Alqahtani, I. M. (2020). *Implementing Learner-Centered Approach to Teaching Science in Higher Education*. 5(2), 45–66.
<https://doi.org/10.5430/irhe.v5n2p45>
- Am, M. A., Hadi, S., Istiyono, E., & Retnawati, H. (2023). *Does differentiated instruction affect learning outcome? Systematic review and meta-analysis*. 7(5), 18–33.
- Anazifa, R. D. (2017). *Jurnal Pendidikan IPA Indonesia Project- Based Learning And Problem- Based Learning : Are They Effective To Improve Student ' S Thinking Skills ?* 6(2), 346–355. <https://doi.org/10.15294/jpii.v6i2.11100>

- Anggraeni, D. M., Prahani, B. K., Suprpto, N., Shofiyah, N., & Jatmiko, B. (2023). Systematic review of problem based learning research in fostering critical thinking skills. *Thinking Skills and Creativity*, 49, 101334. <https://doi.org/https://doi.org/10.1016/j.tsc.2023.101334>
- Antonio, D., Alarcon, U., Talavera-mendoza, F., Hugo, F., Paucar, R., Sandra, K., & Caceres, C. (2022). *Science and inquiry-based teaching and learning : a systematic review*.
- Antonio, R. P., & Effects, P. M. S. (2024). *Effects of Inquiry-Based Approaches on Students ' Higher -Order Thinking Skills in Science : A Meta-Analysis To cite this article : higher-order thinking skills in science : A meta-analysis . International Journal of Education Effects of Inquiry-Based Approaches o n Students ' Higher -Order Thinking Skills in Science : A Meta-Analysis*.
- Aryadi, K. S., & Margunayasa, I. G. (2022). *Instrumen Penilaian High Order Thinking Skills (HOTS) pada Pembelajaran IPA*. 3, 34–41.
- Asilevi, M. N. (2024). *Secondary school teachers ' interest and self-efficacy in implementing STEM education in the science curriculum*. 12(2), 297–311.
- Ayuni, R. S., Putri, S., Purnama, S. R., & Fauzi, S. (2024). *Problem Based Learning Model in Natural Science Learning in Elementary Schools : Systematic Literature Review & Bibliometric Analysis*. 138–153.
- Barak, M., & Dori, Y. (2009). Enhancing Higher Order Thinking Skills Among Inservice Science Teachers Via Embedded Assessment. *Journal of Science Teacher Education*, 20, 459–474. <https://doi.org/10.1007/s10972-009-9141-z>
- Barbosa, A., Silva, D., Carolina, A., Araújo, K. De, Rodriguez, D. G., Ialyson, F., & Vasquez, F. (2017). *Problem-based learning A proposal for structuring PBL and its implications for learning among students in an undergraduate management degree program*. 25(2), 160–177. <https://doi.org/10.1108/REGE-03-2018-030>
- Barton, A. M. C. (n.d.). *Citizen(s') Science*. 1–4.
- Bi, M., Struyven, K., & Zhu, C. (2023). Variables that influence teachers' practice of differentiated instruction in Chinese classrooms: A study from teachers' perspectives. *Frontiers in Psychology*, Volume 14-2023. <https://doi.org/10.3389/fpsyg.2023.1124259>

- Chapman, A., & Wyndham, J. (2012). *HUMAN RIGHTS A Human Right to Science*. 2.
- Chen, F., & Chen, G. (2025). Learning analytics in inquiry-based learning: a systematic review. *Educational technology research and development*, 73(4), 2131–2161. <https://doi.org/10.1007/s11423-025-10507-9>
- Chueh, H., & Kao, C. (2024). Heliyon Exploring the impact of integrating problem based learning and agile in the classroom on enhancing professional competence. *Heliyon*, 10(3), e24887. <https://doi.org/10.1016/j.heliyon.2024.e24887>
- Compen, B., Verstegen, D., Maussen, I., Hülsman, C., & Dolmans, D. (2025). Good practices for differentiated instruction in vocational education: the combined perspectives of educational researchers and teachers. *International Journal of Inclusive Education*, 29(6), 1017–1034. <https://doi.org/10.1080/13603116.2024.2305652>
- Craig, S. L., Smith, S. J., & Frey, B. B. (2024). Universal design for learning: connecting teacher implementation to student outcomes. *International Journal of Inclusive Education*, 28(11), 2458–2474. <https://doi.org/10.1080/13603116.2022.2113459>
- D’Intino, J. S., & Wang, L. (2021). Differentiated instruction: A review of teacher education practices for Canadian pre-service elementary school teachers. *Journal of Education for Teaching*, 47(5), 668–681. <https://doi.org/10.1080/02607476.2021.1951603>
- Darmawati, Y., & Mustadi, A. (2023). *Jurnal Prima Edukasia*, 11 (2), 142-151
The Effect of Problem-Based Learning on the Critical Thinking Skills of Elementary School Students. 11(2), 142–151.
- Deunk, M. I., Smale-Jacobse, A. E., de Boer, H., Doolaard, S., & Bosker, R. J. (2018). Effective differentiation Practices: A systematic review and meta-analysis of studies on the cognitive effects of differentiation practices in primary education. *Educational Research Review*, 24, 31–54. <https://doi.org/https://doi.org/10.1016/j.edurev.2018.02.002>
- Digna, D., & Widyasari, C. (2023). *Teachers ’ Perceptions of Differentiated Learning in Merdeka Curriculum in Elementary Schools*. 7(2), 255–262.

- Dillon, J., Rickinson, M., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2006). The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review*, 87, 107–111.
- Dolmans, D. H. J. M., & Loyens, S. M. M. (2016). *Deep and surface learning in problem-based learning: a review of the literature*. 1087–1112. <https://doi.org/10.1007/s10459-015-9645-6>
- Eymur, G., & Çetin, P. S. (2024). Investigating the role of an inquiry-based science lab on students' scientific literacy. *Instructional Science*, 52(5), 743–760. <https://doi.org/10.1007/s11251-024-09672-w>
- Eysink, T. H. S., & Schildkamp, K. (2021). A conceptual framework for Assessment-Informed Differentiation (AID) in the classroom. *Educational Research*, 63(3), 261–278. <https://doi.org/10.1080/00131881.2021.1942118>
- Faiz Mudofir, E. C. dan S. S. (2025). *Implementation of problem-based learning and the challenges in science education : A systematic literature review*. 6(1), 24–36. <https://doi.org/10.58524/jasme.v6i1.1020>
- Fauzi, W. N. A., Wuryandani, W., & Supartinah. (2025). Creative thinking in global primary education: Pedagogical innovations and learning outcomes through an integrated bibliometric and systematic review. *Social Sciences & Humanities Open*, 12, 102216. <https://doi.org/10.1016/j.ssaho.2025.102216>
- Fidan, M., & Tuncel, M. (2019). Integrating augmented reality into problem based learning: The effects on learning achievement and attitude in physics education. *Computers & Education*, 142, 103635. <https://doi.org/10.1016/j.compedu.2019.103635>
- Flunger, B., & Gaspard, H. (2021). *Relevance Interventions in the Classroom : A Means to Promote Students ' Homework Motivation and Behavior*. 7(1), 1–20. <https://doi.org/10.1177/23328584211052049>
- Freeman, S., Eddy, S. L., Mcdonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Pat, M. (2014). *Active learning increases student performance in science , engineering , and mathematics*. 111(23), 8410–8415. <https://doi.org/10.1073/pnas.1319030111>
- Furtak, E. M., Seidel, T., Iverson, H., & Briggs, D. C. (2012). Experimental and

- Quasi-Experimental Studies of Inquiry-Based Science Teaching: A Meta-Analysis. *Review of Educational Research*, 82(3), 300–329. <https://doi.org/10.3102/0034654312457206>
- Ganajová, M., Orosová, R., & Sotáková, I. (2025). *The effect of inquiry-based teaching on students' attitudes toward science as an academic subject as well as science and technology in general*. 2025(December). <https://doi.org/10.3389/feduc.2025.1708139>
- García-carmona, A. (2025). Scientific Thinking and Critical Thinking in Science Education Two Distinct but Symbiotically Related Intellectual Processes. *Science & Education*, 34(1), 227–245. <https://doi.org/10.1007/s11191-023-00460-5>
- Ge, X., & Huang, K. (2023). *Designing Online Learning Environments to Support Problem-Based Learning BT - Handbook of Open, Distance and Digital Education* (O. Zawacki-Richter & I. Jung (ed.); hal. 1269–1286). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2080-6_76
- Gheysens, E., Coubergs, C., Griful-Freixenet, J., Engels, N., & Struyven, K. (2022). Differentiated instruction: the diversity of teachers' philosophy and praxis to adapt teaching to students' interests, readiness and learning profiles. *International Journal of Inclusive Education*, 26(14), 1383–1400. <https://doi.org/10.1080/13603116.2020.1812739>
- Gillies, R. M. (2023). *education sciences Using Cooperative Learning to Enhance Students' Learning and Engagement during Inquiry-Based Science*.
- Gir, A. U. (2023). *Studies on scienti fi c literacy in primary education : A bibliometric and content analyses*. 1–26. <https://doi.org/10.1556/063.2023.00220>
- Giwanti, T. I., Priyono, A., Prasetyo, B., & Banowati, E. (2021). *Science Literacy Ability and Student Learning Outcomes On Project Based Learning (PjBL)*. 10(3), 242–247.
- Grecu, Y. V. (2023). Differentiated instruction: Curriculum and resources provide a roadmap to help English teachers meet students' needs. *Teaching and Teacher Education*, 125, 104064. <https://doi.org/https://doi.org/10.1016/j.tate.2023.104064>

- Grohnert, T., Gromotka, L., Gast, I., Delnoij, L., & Beusaert, S. (2023). Effective master's thesis supervision – A summative framework for research and practice. *Educational Research Review*, 42, 100589. <https://doi.org/10.1016/j.edurev.2023.100589>
- Guilford, J. P. (n.d.). *The nature of human intelligence*.
- Haetami. (2023). The Effect of STEM-Based Differentiated Learning to Improve Students ' Critical Thinking Skills : A Meta-Analysis Study. *Journal of Research in Science Education*, 9(9), 655–663. <https://doi.org/10.29303/jppipa.v9i9.5084>
- Harackiewicz, J. M., Smith, J. L., & Priniski, S. J. (2016). Interest Matters: The Importance of Promoting Interest in Education. *Policy Insights from the Behavioral and Brain Sciences*, 3(2), 220–227. <https://doi.org/10.1177/2372732216655542>
- Harris, R., & Clayton, B. (2019). The current emphasis on learning outcomes. *International Journal of Training Research*, 17, 93–97. <https://doi.org/10.1080/14480220.2019.1644777>
- Hasibuan, A., Dasar, P., Islam, U., Syekh, N., Hasan, A., & Addary, A. (2025). *Analisis Integrasi Materi IPAS dalam Kurikulum Merdeka : Tinjauan Sistematis Terhadap Strategi Pembelajaran di Sekolah Dasar*. 9, 19117–19125.
- Hasibuan, M. P., Sunarno, W., & Info, A. (2025). *Creative thinking enhancement through project-based learning in science : a meta-analytic review*. 14(5), 3994–4005. <https://doi.org/10.11591/ijere.v14i5.34521>
- Haverly, C., Lyle, A., Spillane, J. P., Davis, E. A., & Peurach, D. J. (2022). Leading instructional improvement in elementary science: State science coordinators' sense-making about the Next Generation Science Standards. *Journal of Research in Science Teaching*, 59(9), 1575–1606. <https://doi.org/https://doi.org/10.1002/tea.21767>
- He, S., Xie, Y., & Lavonen, J. (2022). Exploring the Structure of Students' Scientific Higher Order Thinking in Science Education. *Thinking Skills and Creativity*, 43, 100999. <https://doi.org/10.1016/j.tsc.2022.100999>
- Hecht, C. A., Grande, M. R., & Harackiewicz, J. M. (2020). *The Role of Utility*

Value in Promoting Interest Development.

- Hernández, M., Prado-Calderón, J., Gonzalez-Torres, A., & García-Peñalvo, F. (2025). Direct Measurement of Learning Outcomes in Higher Education: A Proposal of Nine Standardized Scales for Continuous Improvement in Engineering Programs. *Evaluation and Program Planning*, 112, 102638. <https://doi.org/10.1016/j.evalprogplan.2025.102638>
- History, A. (2025). 1,2,3 ,. 13.
- Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, 16(3), 235–266. <https://doi.org/10.1023/B:EDPR.0000034022.16470.f3>
- Holbrook, J., & Rannikmae, M. (2007). The Nature of Science Education for Enhancing Scientific Literacy. *International Journal of Science Education*, 29. <https://doi.org/10.1080/09500690601007549>
- Hursen, C. (2021). The Effect of Problem-Based Learning Method Supported by Web 2.0 Tools on Academic Achievement and Critical Thinking Skills in Teacher Education. *Technology, Knowledge and Learning*, 26(3), 515–533. <https://doi.org/10.1007/s10758-020-09458-2>
- Irsyad, K., Fauziyah, Z., & Ali, M. (2024). Enhancing Conceptual Understanding in Elementary Science Learning through the Problem-Based Learning Model: A Literature Review. *ISEJ: Indonesian Science Education Journal*, 5, 9–15. <https://doi.org/10.62159/isej.v5i1.93>
- Kahmann, R., Droop, M., & Lazonder, A. W. (2022). Meta-analysis of professional development programs in differentiated instruction. *International Journal of Educational Research*, 116, 102072. <https://doi.org/https://doi.org/10.1016/j.ijer.2022.102072>
- Kalinowski, E., Westphal, A., Jurczok, A., & Vock, M. (2024). The essential role of teacher self-efficacy and enthusiasm for differentiated instruction. *Teaching and Teacher Education*, 148, 104663. <https://doi.org/https://doi.org/10.1016/j.tate.2024.104663>
- Kamaludin Irsyad, Zumrotul Fauziah, M. A. (2024). Enhancing Conceptual Understanding in Elementary Science Learning through the Problem-Based Learning Model: A Literature Review. *ISEJ Indonesian Science*, 5(1), 9–15.

- Kärner, T., Warwas, J., & Schumann, S. (2021). A Learning Analytics Approach to Address Heterogeneity in the Classroom: The Teachers' Diagnostic Support System. *Technology, Knowledge and Learning*, 26(1), 31–52. <https://doi.org/10.1007/s10758-020-09448-4>
- Khaokhajorn, W., & Srisawasdi, N. (2024a). Assessing pre-service science teachers' understanding of the nature of scientific inquiry to develop a sustainable technology-infused pedagogical program in teacher education. *Cogent Education*, 11(1), 2439160. <https://doi.org/10.1080/2331186X.2024.2439160>
- Khaokhajorn, W., & Srisawasdi, N. (2024b). Assessing pre-service science teachers' understanding of the nature of scientific inquiry to develop a sustainable technology-infused pedagogical program in teacher education. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2439160>
- Kim, K. H. (2017). The Torrance Tests of Creative Thinking - Figural or Verbal: Which One Should We Use? *Creativity. Theories – Research - Applications*, 4(2), 302–321. <https://doi.org/10.1515/ctra-2017-0015>
- Kim, N. J., Belland, B. R., & Walker, A. E. (2018). Effectiveness of Computer-Based Scaffolding in the Context of Problem-Based Learning for Stem Education: Bayesian Meta-analysis. *Educational Psychology Review*, 30(2), 397–429. <https://doi.org/10.1007/s10648-017-9419-1>
- Kirschner, P. A., Sweller, J., Clark, R. E., Kirschner, P. A., Sweller, J., Clark, R. E., Minimal, W., Kirschner, P. A., & Clark, R. E. (2010). *Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Experiential, and Inquiry-Based Teaching Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching*. 1520. <https://doi.org/10.1207/s15326985ep4102>
- Klopčič, M., & Torkar, G. (2025). Emerging themes of empirical research into outdoor science teaching: A systematic literature review. *Journal of Outdoor and Environmental Education*. <https://doi.org/10.1007/s42322-025-00215-6>
- Kusumaningpuri, A. R. (2024). Implementasi Pembelajaran Berdiferensiasi pada Pembelajaran IPAS Fase B Kelas IV Sekolah Dasar. *Jurnal Didaktika Pendidikan Dasar*, 8(1), 199–220.

<https://doi.org/10.26811/didaktika.v8i1.1321>

- Kutlu, neşe, Bozgun, K., & Uluçınar Sağır, Ş. (2023). Studies on scientific literacy in primary education: A bibliometric and content analyses. *Hungarian Educational Research Journal*, 14. <https://doi.org/10.1556/063.2023.00220>
- Lambert, R., McNiff, A., Schuck, R., Imm, K., & Zimmerman, S. (2023). “UDL is a way of thinking”; theorizing UDL teacher knowledge, beliefs, and practices. *Frontiers in Education*, Volume 8-2023. <https://doi.org/10.3389/feduc.2023.1145293>
- Langelan, B. N., Gaikhorst, L., Smets, W., & Oostdam, R. J. (2024). Differentiating instruction: Understanding the key elements for successful teacher preparation and development. *Teaching and Teacher Education*, 140, 104464. <https://doi.org/https://doi.org/10.1016/j.tate.2023.104464>
- Lavanaia, M., Bt, F., & Nor, M. (2020). *Review Article Barriers In Differentiated Instruction : A Systematic Review Of The Literature*. 7(6), 293–297.
- Lederman, N. G., Lederman, J. S., Nature, A., Lederman, N. G., Lederman, J. S., & Antink, A. (2013). *Nature of Science and Scientific Inquiry as Contexts for the Learning of Science and Achievement of Scientific Literacy To cite this article : Nature of Science and Scientific Inquiry as Contexts for the Learning of Science and Achievement of Scientific Literacy*.
- Letzel, V., Pozas, M., & Schneider, C. (2023). Challenging but positive! – An exploration into teacher attitude profiles towards differentiated instruction (DI) in Germany. *British Journal of Educational Psychology*, 93(1), 1–16. <https://doi.org/https://doi.org/10.1111/bjep.12535>
- Lindner, K.-T., Nusser, L., Gehr, K., & Schwab, S. (2021). Differentiation and Grouping Practices as a Response to Heterogeneity – Teachers’ Implementation of Inclusive Teaching Approaches in Regular, Inclusive and Special Classrooms. *Frontiers in Psychology*, Volume 12-2021. <https://doi.org/10.3389/fpsyg.2021.676482>
- Liou, S.-R., Cheng, C.-Y., Chu, T.-P., Chang, C.-H., & Liu, H.-C. (2023). Effectiveness of differentiated instruction on learning outcomes and learning satisfaction in the evidence-based nursing course: Empirical research quantitative. *Nursing Open*, 10(10), 6794–6807.

<https://doi.org/10.1002/nop2.1926>

- Lisette Wijnia, Gera Noordzij, Lidia R. Arends, R. M. J. P. R. · S. M. M. L. (2024). The Effects of Problem - Based , Project - Based , and Case - Based Learning on Students ' Motivation : In *Educational Psychology Review* (Vol. 36, Nomor 1). Springer US. <https://doi.org/10.1007/s10648-024-09864-3>
- Loyens, S. M. M., van Meerten, J. E., Schaap, L., & Wijnia, L. (2023). Situating Higher-Order, Critical, and Critical-Analytic Thinking in Problem- and Project-Based Learning Environments: A Systematic Review. *Educational Psychology Review*, 35(2), 39. <https://doi.org/10.1007/s10648-023-09757-x>
- Made, N., Puspita, M., Suarjana, I. M., Putu, L., & Mahadewi, P. (2021). *Assessing Science Learning Outcomes Using Assessment Instruments Based on Higher Order Thinking Skills*. 5(2), 242–249.
- Magaji, A., Adjani, M., & Coombes, S. (2024). A Systematic Review of Preservice Science Teachers' Experience of Problem-Based Learning and Implementing It in the Classroom. *Education Sciences*, 14(3). <https://doi.org/10.3390/educsci14030301>
- Mammadov, S., & Schroeder, K. (2023). A meta-analytic review of the relationships between autonomy support and positive learning outcomes. *Contemporary Educational Psychology*, 75, 102235. <https://doi.org/https://doi.org/10.1016/j.cedpsych.2023.102235>
- Maor, R., Paz-Baruch, N., Grinshpan, N., Milman, A., Mevarech, Z., Levi, R., Shlomo, S., & Zion, M. (2023). Relationships between metacognition, creativity, and critical thinking in self-reported teaching performances in project-based learning settings. *Thinking Skills and Creativity*, 50, 101425. <https://doi.org/10.1016/j.tsc.2023.101425>
- Marlina, M. (2023). *Differentiated Learning Assessment Model to Improve Involvement of Special Needs Students in Inclusive Schools*. 16(4), 423–440.
- Melesse, T., & Belay, S. (2022). Differentiating instruction in primary and middle schools: Does variation in students' learning attributes matter? *Cogent Education*, 9(1), 2105552. <https://doi.org/10.1080/2331186X.2022.2105552>
- Meutstege, K., Van Geel, M., & Visscher, A. (2023). Evidence-Based Design of a Teacher Professional Development Program for Differentiated Instruction: A

- Whole-Task Approach. *Education Sciences*, 13(10).
<https://doi.org/10.3390/educsci13100985>
- Michel, H., & Neumann, I. (2017). *Nature of Science and Science Content Learning and Their Learning About the Concept of Energy*. 2016, 951–975.
<https://doi.org/10.1007/s11191-016-9860-4>
- Mufanti, R., Carter, D., & England, N. (2024). Outcomes-based education in Indonesian higher education: Reporting on the understanding, challenges, and support available to teachers. *Social Sciences & Humanities Open*, 9, 100873.
<https://doi.org/https://doi.org/10.1016/j.ssaho.2024.100873>
- Muhamad Dah, N., Mat Noor, M. S. A., Kamarudin, M. Z., & Syed Abdul Azziz, S. S. (2024). The impacts of open inquiry on students' learning in science: A systematic literature review. *Educational Research Review*, 43, 100601.
<https://doi.org/https://doi.org/10.1016/j.edurev.2024.100601>
- Novita, L., Marpaung, E., Kurnianti, E. M., & Lestari, I. (2024). *Pengembangan LKPD Matematika Berbasis Problem Based Learning Berorientasi Kemampuan Berpikir Tingkat Tinggi Siswa Kelas IV Sekolah Dasar*. 6(4), 3772–3785.
- Ölçer, S. (2025). *Inquiry-Based Science Teaching in Primary School*. 55–66.
- Pedaste, M., Baucal, A., & Reisenbuk, E. (2021). *Towards a science inquiry test in primary education : development of items and scales*.
- Potgieter, M. L., Filmalter, C., & Maree, C. (2025). Teaching, learning and assessment of the affective domain of undergraduate students: A scoping review. *Nurse Education in Practice*, 86, 104417.
<https://doi.org/https://doi.org/10.1016/j.nepr.2025.104417>
- Pozas, M., Letzel, V., Lindner, K.-T., & Schwab, S. (2021). DI (Differentiated Instruction) Does Matter! The Effects of DI on Secondary School Students' Well-Being, Social Inclusion and Academic Self-Concept. *Frontiers in Education*, Volume 6-2021. <https://doi.org/10.3389/feduc.2021.729027>
- Pozas, M., Letzel, V., & Schneider, C. (2020). *Teachers and differentiated instruction : exploring differentiation practices to address student diversity*. 20, 217–230. <https://doi.org/10.1111/1471-3802.12481>
- Prast, E. J., Van de Weijer-Bergsma, E., Kroesbergen, E. H., & Van Luit, J. E. H.

- (2018). Differentiated instruction in primary mathematics: Effects of teacher professional development on student achievement. *Learning and Instruction*, 54, 22–34. <https://doi.org/https://doi.org/10.1016/j.learninstruc.2018.01.009>
- Puzio, K., Colby, G. T., & Algeo-Nichols, D. (2020). Differentiated Literacy Instruction: Boondoggle or Best Practice? *Review of Educational Research*, 90(4), 459–498. <https://doi.org/10.3102/0034654320933536>
- Ramey, K. E., & Stevens, R. (2023). Dilemmas experienced by teachers in adapting to the role of facilitator in the STEAM classroom. *Teaching and Teacher Education*, 133, 104271. <https://doi.org/https://doi.org/10.1016/j.tate.2023.104271>
- Ravid, M., & Sulaiman, S. (2024). Implementasi Kurikulum Merdeka dalam Menumbuhkan Kemampuan Critical Thinking di Kelas XI F1 pada Mata Pelajaran Pendidikan Agama Islam di SMAN 8 Padang. *ISLAMIKA*, 6, 1768–1779. <https://doi.org/10.36088/islamika.v6i4.5328>
- Robert Zheng, H. C. and J. S. (2022). *View of The impact of annotation on concrete and abstract visual representations in science education _ testing the expertise reversal effect.pdf*.
- Runco, M. A., Profile, S. E. E., Jaeger, G. J., Profile, S. E. E., Runco, M. A., & Jaeger, G. J. (2014). *The Standard Definition of Creativity The Standard Definition of Creativity*. February. <https://doi.org/10.1080/10400419.2012.650092>
- Runco, M., & Jaeger, G. (2012). The Standard Definition of Creativity. *Creativity Research Journal - CREATIVITY RES J*, 24, 92–96. <https://doi.org/10.1080/10400419.2012.650092>
- Salim, F., Purwanto, A., & Lestari, I. (2024). *Improving Students ' Science Problem Solving Ability through the Implementation of Problem Based Learning Models Assisted by Animation Media*. 8(2), 269–278.
- Santos, C., Rybska, E., Klichowski, M., Jankowiak, B., Jaskulska, S., Domingues, N., Carvalho, D., Rocha, T., Paredes, H., Martins, P., & Rocha, J. (2023). Science education through project-based learning: a case study. *Procedia Computer Science*, 219, 1713–1720. <https://doi.org/10.1016/j.procs.2023.01.465>

- Savery, J. (2006). Overview of Problem-based Learning: Definitions and Distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1. <https://doi.org/10.7771/1541-5015.1002>
- Scarparolo, G., & Subban, P. (2021). A systematic review of pre-service teachers' self-efficacy beliefs for differentiated instruction. *Teachers and Teaching*, 27(8), 753–766. <https://doi.org/10.1080/13540602.2021.2007371>
- Schmidt, H. G., Rotgans, J. I., & Yew, E. H. J. (2011). The process of problem-based learning: what works and why. *Medical Education*, 45(8), 792–806. <https://doi.org/10.1111/j.1365-2923.2011.04035.x>
- Schuck, P. (2022). *Science Education as a Human Right : A Systematic Review of the Literature*. 10(3), 338–351.
- Sewell, A., Kennett, A., & Pugh, V. (2022). Universal Design for Learning as a theory of inclusive practice for use by educational psychologists. *Educational Psychology in Practice*, 38(4), 364–378. <https://doi.org/10.1080/02667363.2022.2111677>
- Shafarina, A., Mustadi, A., & Purwanti, S. (2024). The Influence of Problem Based Learning on Problem Solving Ability in Science Materials in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, 10, 3850–3857. <https://doi.org/10.29303/jppipa.v10i7.7616>
- Siew, N. M., & Chong, C. L. (2015). *Fostering Fifth Graders ' Scientific Creativity Through Problem-Based Learning*. 655–669.
- Skulmowski, A., & Xu, K. M. (2022). Understanding Cognitive Load in Digital and Online Learning: a New Perspective on Extraneous Cognitive Load. *Educational Psychology Review*, 34(1), 171–196. <https://doi.org/10.1007/s10648-021-09624-7>
- Sofie M. M. Loyens, · Julianne E. van Meerten, Schaap, L. L., & Wijnia. (2025). Situating Higher - Order , Critical , and Critical - Analytic Thinking in Problem - and Project - Based Learning Environments : A Systematic Review. In *Educational Psychology Review* (Nomor 2023). Springer US. <https://doi.org/10.1007/s10648-023-09757-x>
- Sternberg, R. J., Glaveanu, V., Karami, S., Kaufman, J. C., Phillipson, S. N., & Preiss, D. D. (2021). Meta-Intelligence: Understanding, Control, and

- Interactivity between Creative, Analytical, Practical, and Wisdom-Based Approaches in Problem Solving. *Journal of Intelligence*, 9(2). <https://doi.org/10.3390/jintelligence9020019>
- Stollman, S., Meirink, J., Westenberg, M., & Driel, J. Van. (2021). *Teachers' Interactive Cognitions of Differentiated Instruction: An Exploration in Regular and Talent Development Lessons*. <https://doi.org/10.1177/01623532211001440>
- Sukartono, O. N. H. dan. (2024). *Penerapan Pembelajaran Berdiferensiasi Dalam Kurikulum Merdeka Pada Mata Pelajaran Ips Di Sekolah Dasar*. 8(1), 204–213.
- Tas, H. (2024). *The Effects of Learning Style-Based Differentiated Instructional Activities on Academic Achievement and Learning Retention in the Social Studies Course*. June, 1–14. <https://doi.org/10.1177/21582440241249290>
- Tomlinson, C. (2017). *Differentiated Instruction* (hal. 279–292). <https://doi.org/10.4324/9781315639987-26>
- Tomlinson, C. A. (2017). *How to Differentiate Instruction in Academically Diverse Classrooms, Third Edition*. ASCD. <https://books.google.co.id/books?id=zoh2DgAAQBAJ>
- Trudgill, S. (2007). Tansley, A.G. 1935: The use and abuse of vegetational concepts and terms. *Ecology* 16, 284–307. *Progress in Physical Geography - PROGRESS IN PHYS GEOG*, 31, 517–522. <https://doi.org/10.1177/0309133307083297>
- Vaiopoulou, J., Tsikalas, T., Stamovlasis, D., & Papageorgiou, G. (2023). Conceptual understanding in science learning and the role of four psychometric variables: a person-centered approach. *Frontiers in Psychology, Volume 14-2023*. <https://doi.org/10.3389/fpsyg.2023.1204868>
- van Geel, M., Keuning, T., & Safar, I. (2022). How teachers develop skills for implementing differentiated instruction: Helpful and hindering factors. *Teaching and Teacher Education: Leadership and Professional Development*, 1, 100007. <https://doi.org/10.1016/j.tatelp.2022.100007>
- Vo, D., & Simmie, G. (2024). Assessing Scientific Inquiry: A Systematic Literature Review of Tasks, Tools and Techniques. *International Journal of Science and Mathematics Education*, 23. <https://doi.org/10.1007/s10763-024-10498-8>

- Vygotsky, L. S., & Cole, M. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press.
https://books.google.co.id/books?id=RxjjUefze_oC
- Wei, B., Wang, H., Li, F., Long, Y., Zhang, Q., Liu, H., Tang, X., & Rao, M. (2024). Effectiveness of Problem-Based Learning on Development of Nursing Students' Critical Thinking Skills: A Systematic Review and Meta-analysis. *Nurse Educator*, 49(3).
https://journals.lww.com/nurseeducatoronline/fulltext/2024/05000/effectiveness_of_problem_based_learning_on.12.aspx
- Wibowo, F. C., Nasbey, H., Suprihatin, S., Kusuma, A. A. K., Darman, D. R., & Costu, B. (2024). System differential learning for detecting learning styles in science education for students with learning disabilities. *Edelweiss Applied Science and Technology*, 8(6), 1849–1869.
<https://doi.org/10.55214/25768484.v8i6.2352>
- Wijnia, L., Noordzij, G., Arends, L. R., Rikers, R. M. J. P., & Loyens, S. M. M. (2024). The Effects of Problem-Based, Project-Based, and Case-Based Learning on Students' Motivation: a Meta-Analysis. *Educational Psychology Review*, 36(1), 29. <https://doi.org/10.1007/s10648-024-09864-3>
- Xuan, Q., Cheung, A., & Sun, D. (2022). The effectiveness of formative assessment for enhancing reading achievement in K-12 classrooms: A meta-analysis. *Frontiers in Psychology*, Volume 13-2022.
<https://doi.org/10.3389/fpsyg.2022.990196>
- Yani, Y. I., Nasution, W. N., & Halimah, S. (2025). *Implementation of the Merdeka Curriculum in Islamic Religious Education and Character Education : A Multisite Study at SMA Negeri 1 and 2 Sibolga*. 14(1), 35–49.
- Yanti, F. A., & Thohir, M. A. (2024). *Higher order thinking skills in science learning : a systematic review from 2014-2023*. 13(4), 2419–2427.
<https://doi.org/10.11591/ijere.v13i4.28082>
- Yew, E. H. J., Goh, K., Yew, E. H. J., & Goh, K. (2016). *Problem-Based Learning : An Overview of its Process and Impact on Learning Problem-Based Learning : An Overview of its Process and Impact on Learning*. 2(2).
<https://doi.org/10.1016/j.hpe.2016.01.004>

- Yoon, C.-H. (2017). A validation study of the Torrance Tests of Creative Thinking with a sample of Korean elementary school students. *Thinking Skills and Creativity*, 26, 38–50. <https://doi.org/https://doi.org/10.1016/j.tsc.2017.05.004>
- Yu, G., Piao, S., Zhang, Y., Liu, L., Peng, J., & Niu, S. (2021). Moving toward a new era of ecosystem science. *Geography and Sustainability*, 2(3), 151–162. <https://doi.org/https://doi.org/10.1016/j.geosus.2021.06.004>
- Yu, L., & Zin, Z. M. (2023). The critical thinking-oriented adaptations of problem-based learning models: a systematic review. *Frontiers in Education*, Volume 8-2023. <https://doi.org/10.3389/feduc.2023.1139987>
- Zhao, Y., Liu, X., & Han, X. (2024). *Enhancing pro-environmental behavior through nature-contact environmental education : an empirical analysis based on randomized controlled experiment design*. December, 1–15. <https://doi.org/10.3389/fenvs.2024.1491780>
- Zhou, Y., Gan, L., Chen, J., Wijaya, T. T., & Li, Y. (2023). Development and validation of a higher-order thinking skills assessment scale for pre-service teachers. *Thinking Skills and Creativity*, 48, 101272. <https://doi.org/https://doi.org/10.1016/j.tsc.2023.101272>

