

## DAFTAR PUSTAKA

- Adler, P. A., & Adler, P. (1994). *Observational techniques: Handbook of qualitative research*. Sage Publications, pp. 377–392.
- Ahyana, N. (2021). *Analisis kemampuan berpikir tingkat tinggi menurut teori Anderson dan Krathwohl materi program linear pada peserta didik kelas XI SMA negeri 18 Bone*. [Skripsi, Universitas Muhammad Makassar].
- Ana, N. (2018). Penggunaan model pembelajaran discovery learning dalam peningkatan hasil belajar siswa di sekolah dasar. *Jurnal Imiah Pendidikan dan Pembelajaran*, 2(1). <https://doi.org/10.23887/jipp.v2i1.13851>.
- Anderson, L. W. (Ed.). (2001). *A taxonomy for learning, teaching, and assessing: a revision of bloom's taxonomy of educational objectives*. Allyn & Bacon. ISBN: 978-0801319037.
- Arends, R. I. (2012). *Learning to teach* (9<sup>th</sup> ed.). McGraw Hill Book. ISBN: 978-0-07-802432-0.
- Arif, M. (2015). *Penerapan model pembelajaran problem based learning untuk meningkatkan aktivitas dan hasil belajar siswa pada kompetensi dasar mengidentifikasi dan mempraktikkan cara membuat komunikasi tulis di smk widya praja Ungaran*. [Thesis, Universitas Negeri Semarang]. <http://lib.unnes.ac.id/id/eprint/22372>.
- Arifin, N. (2020). Efektifitas pembelajaran stem problem based learning ditinjau dari daya juang dan kemampuan pemecahan masalah matematis mahasiswa PGSD. *Jurnal Pendidikan Matematika Indonesia*, 5(1), 31–38. <http://dx.doi.org/10.26737/jpmi.v5i1.1644>.
- Aslan, A. (2021). Problem- based learning in live online classes: learning achievement, problem-solving skill, communication skill, and interaction. *Journal Computers & Education*. <https://doi.org/10.1016/j.compedu.2021.104237>.
- Astuti, L. S. (2017). Penguasaan konsep IPA ditinjau dari konsep diri. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 7(1), 40–48. <http://dx.doi.org/10.30998/formatif.v7i1.1293>
- Baker, L. (2006). Observation: A complex research method. *Library Trends*, 55(1), 171-189. 10.1353/lib.2006.0045.
- Baysal, Z. N. (2017). The problem-based learning process: Reflections of preservice elementary school teachers. *Educational Research and Reviews*, 12(4), 177–188. <https://doi.org/10.5897/ERR2016.3045>.
- Birgili, B. (2015). Creative and critical thinking skills in problem-based learning environments. *Journal of Gifted Education and Creativity*, 2(2), 71–80.
- Elsayary, A. (Ed.). (2015). STEM education and problem-based learning. *The Routledge International Handbook of Research on Teaching Thinking*. 357-368.

- Euefueno, W. D. (2019). Project-/problem-based learning in STEM: Impacts on student learning. *Technology & Engineering Teacher*, 78(8), 8-12
- Faikhamta, C. (2018). Dimensions of Effective STEM Integrated Teaching Practice. *K-12 STEM Education*, 4(2).
- Gunawan, Adi W. (2012). *Genius learning strategy: Petunjuk praktis untuk menerapkan accelerated learning*. Gramedia.
- Handayani, R., & Dwi, W. (2021). Modern assessment dalam menyongsong pembelajaran abad 21 dan hambatan di negara berkembang. *Jurnal Pendidikan Edutama*, 8(1), 13. <https://doi.org/10.30734/jpe.v8i1.1363>.
- Hack, C. (Ed.). (2015). An evaluation of resource development and dissemination activities designed to promote problem-based learning at the University of Ulster. *Innovations in Education & Teaching International*, 52(2), 218–228. <https://doi.org/10.1080/14703297.2013.849610>.
- Husamah, H. (2015). Thinking skills for environmental sustainability perspective of new students of biology education department through blended project based learning model. *Jurnal Pendidikan IPA Indonesia*, 4(2), 110–119. <https://doi.org/10.15294/jpii.v4i2.3878>
- Kang, N. (2019). A review of the effect of integrated STEM or STEAM (science, technology, engineering, arts, and mathematics) education in South Korea. *Asia-Pacific Science Education*, 5(1), 1-22. <https://doi.org/10.1186/s41029-019-0034-y>.
- Karyatin, K. (2016). Penerapan modified problem-based learning (PBL) dengan gallery walk (GW) untuk meningkatkan keterampilan. *JPPIPA: Jurnal Penelitian Pendidikan IPA*, 1(2), 42–51.
- Kelley, T.R., & Knowles, J.G. (2016). A conceptual framework for integrated STEM education. *International Journal of STEM Education*, 3(11). <https://doi.org/10.1186/s40594-016-0046-z>.
- Khoiriyah, A, J., & Husamah. (2018). Problem-based learning: Creative thinking ability, problem-solving ability, and learning outcome of seventh grade students. *Jurnal Pendidikan Biologi Indonesia*, 4(2), 151-160. <https://doi.org/10.22219/jpbi.v4i2.5804>
- Komala, R., Heryanti, E., & Rinawati, A. (2021). Effect of problem-based learning model on biodiversity problem-solving skills. *Biosfer: Jurnal Pendidikan Biologi*, 14(1), 120-131.
- Kurniati, D. (2016). Kemampuan berpikir tingkat tinggi siswa SMP di kabupaten Jember dalam menyelesaikan soal berstandar PISA. *Penelitian dan Evaluasi Pendidikan*, 20(2), 142-155.
- Lestari, N. (2012). Pengaruh Model Pembelajaran Berbasis Masalah (Problem Based Learning) dan Motivasi Belajar Terhadap Prestasi Belajar Fisika bagi Siswa Kelas

VII SMP. *Jurnal Teknologi Pembelajaran Indonesia*, 1(2).  
<https://doi.org/10.23887/jtpi.v1i2.297>.

- Machuve, J., & Mkenda, E. (2019). Promoting STEM education through sustainable manufacturing: Case study of photovoltaic toys. *Procedia Manufacturing*, 33. <https://doi.org/10.1016/j.promfg.2019.04.093>.
- Maknun, L., & Kamila, H. (2022). Model pembelajaran dalam rangka menghadapi pembelajaran tatap muka di era new normal pada tingkat sekolah dasar/ madrasah ibtidaiyah. *Jurnal Basicedu*, 6(1), 684–691. <https://doi.org/10.31004/basicedu.v6i1.2004>
- Manz, E., & Renga, I. P. (2017). Understanding how teachers guide evidence construction conversations. *Science Education*, 101(4), 584–615. <https://doi.org/10.1002/sce.21282>.
- Martin, A. M., & Hand, B. (2009). Factors affecting the implementation of argument in the elementary science classroom: A longitudinal case study. *Research in Science Education*, 39(1), 17–38.
- Mayang P, S. (Ed.). (2016). Pengembangan sintaks model pembelajaran fisika berbasis inkuiri dalam melatih kemampuan ilmiah. *Jurnal Pembelajaran Fisika*, 4(1).
- Mintasih, D. (2022). Mengembangkan literasi bagi calon pendidik dalam menghadapi era revolusi industri 4.0 melalui PBL berbasis kehidupan. *Jurnal Pendidikan Agama Islam*, 1(1), 21–37. <https://doi.org/10.21831/cp.v1i1.4145>.
- Moore, T. (Ed.). (2014). Implementation and integration of engineering in K-12 STEM education. Purdue University Press. (pp. 35–60).
- McNeill, K. L., & Pimentel, D. S. (2010). Scientific discourse in three urban classrooms: The role of the teacher in engaging high school students in argumentation. *Science Education*, 94(2), 203–229.
- Ng, C. H., & Adnan, M. (2018). Integrating STEM education through Project-Based Inquiry Learning (PIL) in topic space among year one pupils. *IOP Conference Series: Materials Science and Engineering*, 296(1). <https://doi.org/10.1088/1757-899X/296/1/012020>.
- Navy, S. L., & Kaya, F. (2020). PBL as a pedagogical approach for integrated STEM: Evidence from prospective teachers. *School Science and Mathematics*, 120(5), 221–232. <https://doi.org/10.1111/ssm.12408>.
- Nuraini, J., Suryanda, A., & Sartono, N. (2019). The correlation between intrapersonal intelligence with student academic achievement in biology. *Biodidaktika: Jurnal Biologi dan Pembelajarannya*, 14(2), 1–10. <https://doi.org/http://dx.doi.org/10.30870/biodidaktika.v14i2>.
- Orozco, J. A., & Yangco, R. T. (2016). Problem-based learning: Effects on critical and creative thinking ability in biology. *Asian Journal of Biology Education*, 9(3), 2-10.

- Phungsuk, R., Viriyavejakul, C., & Ratanaolarn, T. (2017). Development of a Problem-Based Learning Model via a Virtual Learning Environment. *Kasetsart Journal of Social Sciences*, 38(3), 297– 306. <https://doi.org/10.1016/j.kjss.2017.01.001>.
- Popov, V., Schelkin, L. K., & Faux, R. (2016). *Preparing globally competent and competitive stem workforce of the 21st century in the global STEM classroom*. ASEE International Forum.
- Purwanto, M. (2013). *Psikologi Pendidikan*. PT. Remaja Rosda Karya.
- Rehmat, A. P., & Hartley, K. (2020). Building engineering awareness: Problem-based learning approach for STEM integration. *Interdisciplinary Journal of Problem-based Learning*, 14(1), 1–15. <https://doi.org/10.14434/ijpbl.v14i1.28636>
- Ristanto, R. H. (Ed.). (2018). From a reader to a scientist: developing cirgi learning to empower scientific literacy and mastery of biology concept. *Biosfer: Jurnal Pendidikan Biologi*, 11(2), 90-100.
- Rosnaeni. (2021). Karakteristik dan asesmen pembelajaran abad 21. *Jurnal Basicedu*, 5(5), 4334 - 4339.
- Rusdi, R., Dewahrani, Y. R., & Sholihah, T. (2022). The relationship between self-regulated learning and higher-order thinking skills on musculoskeletal system topics. *Bioedukasi: Jurnal Pendidikan Biologi*, 15(1).
- Sanders, M. (2009). *STEM, STEM education, STEMmania*. *The Technology Teacher*, 68(4), 20–26.
- Santoso, P. B. (2019). Efektivitas penggunaan media penilaian google form terhadap hasil belajar pelajaran TIK. *Prosiding Seminar Nasional PEP*, 1(1)
- Santrock, J. W. (2014). *Psikologi pendidikan*. Salemba Humanika
- Saputra, H. (2016). *Pengembangan mutu pendidikan menuju era global: Penguatan mutu pembelajaran dengan penerapan HOTS (high order thinking skills)*. SMILE's Publishing.
- Schettino, C. (2016). A framework for problem based learning: Teaching mathematics with a relational problem- based pedagogy. *Interdisciplinary Journal of Problem-Based Learning*, 10(2). <https://doi.org/10.7771/1541-5015.1602>.
- Schmidt, H. (2012). A brief history of problem-based learning. 10.1007/978-981-4021-75-3\_2.
- Sigit, D. V., Ristanto, R. H., & Mufida, S. N. (2022). Integration of project-based e-learning with STEAM: An innovative solution to learn ecological concept. *International Journal of Instruction*, 15(3), 23-40. <https://doi.org/10.29333/iji.2022.1532a>.
- Siti, Z. (2016). Keterampilan abad ke-21: Keterampilan yang diajarkan melalui pembelajaran. [Seminar Nasional Pendidikan].

- Smith, K. (Ed.). (2022). Principles of Problem-Based Learning (PBL) in stem education: Using expert wisdom and research to frame educational practice. *Educ. Sci*, 12(10), 728. <https://doi.org/10.3390/educsci12100728>.
- Suciana, D. (Ed.). (2023). A meta-analysis study: The effect of problem based learning integrated with stem on learning outcomes. *European Journal of Education and Pedagogy*, 4(2), 133–138. <https://doi.org/10.24018/ejedu.2023.4.2.619>
- Suryanda, A. (Ed.). (2020). Analogy and critical thinking skills: Implementation learning strategy in biodiversity and environment topic. *Universal Journal of Educational Research*, 8(4A), 45-50.
- Sugiyono. (2017). Metode penelitian kuantitatif, kualitatif dan r & d. CV Alfabeta.
- Sutaphan, S., & Yuenyong, C. (2019). STEM education teaching approach: Inquiry from the context based. *Journal of Physics: Conference Series*, 1340. doi:10.1088/1742-6596/1340/1/012003.
- Supriyatin & Ichsan, Ilmi Z. (2018). Pengayaan materi pertumbuhan dan perkembangan tumbuhan melalui pengembangan bahan ajar. *Jurnal Biotek*. 6(2), 13-24.
- Tom, T., & Susan, A. B. (2014). *Innovate A Blueprint for STEM Education Science*. <https://www.cde.ca.gov/pd/ca/sc/documents/innovate.pdf>.
- Triyanto, T. 2014. *Pengantar Pendidikan*. PT Bumi Aksara.
- Widana, I. W., et al. (2018). Higher order thinking skills assessment towards critical thinking on mathematics lesson. *International Journal of Social Sciences and Humanities*, 2(1), pp. 24-32. doi:10.29332/ijssh.v2n1.74.
- Widodo, T & Kadarwati, S. (2013). *High order thinking berbasis pemecahan masalah untuk meningkatkan hasil belajar berorientasi pembentukan karakter siswa*. *Cakrawala Pendidikan*. 32(1), 161-171.