

## DAFTAR PUSTAKA

- Abdurrahman, R., Distrik, S., Herlina, I. W., Umam, K., Ramadhani, R., & Sumarni, R. (2020). *European Journal of Educational Research Development and Validation of Open Ended Based on Worksheet for Growing Higher Level Thinking Skills of Students*. <https://doi.org/10.12973/eu-jer.9.1.445>
- Bakri, F., Permana, H., Wulandari, S., & Muliwati, D. (2020). Student worksheet with ar videos: Physics learning media in laboratory for senior high school students. *Journal of Technology and Science Education*, 10(2), 231–240. <https://doi.org/10.3926/JOTSE.891>
- Bani-Hamad, A. M. H., & Abdullah, A. H. (2019). The Effect of Project-Based Learning to Improve the 21st Century Skills among Emirati Secondary Students. *International Journal of Academic Research in Business and Social Sciences*, 9(12), 560–573. <https://doi.org/10.6007/IJARBS/v9-i12/6749>
- Banks, F., & Barlex, D. (2021). *Teaching STEM in the Secondary School*. New York: Routledge.
- Barak, M., & Yuan, S. (2021). A cultural perspective to project-based learning and the cultivation of innovative thinking. *Thinking Skills and Creativity*, 39. <https://doi.org/10.1016/j.tsc.2020.100766>
- Boca, G. D., & Saraçlı, S. (2019). Environmental education and student's perception, for sustainability. *Sustainability (Switzerland)*, 11(6). <https://doi.org/10.3390/su11061553>
- Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. New York: Springer Science+Business Media.
- Capraro, R. M., Capraro, M. M., & Morgan, J. R. (2013). *STEM Project-Based Learning*. AW Rotterdam: Sense Publishers.
- Creswell, J. W. (2014). *Research Design*. Singapore: Sage Publication.
- De, A. K., & De, A. K. (2004). *Environmental Education*. New Delhi: New Age International (P) Limited, Publishers.

- Depdiknas. (2008). *Panduan Pengembangan Bahan Ajar*. Jakarta: Departemen Pendidikan Nasional
- Doğan, A., & Kahraman, E. (2021). The effect of STEM activities on the scientific creativity of middle school students. *International Journal of Curriculum and Instruction*, 13(2), 1241–1266.
- Duran, M., Hoft, M., Medjahed, B., Lawson, D. B., & Orady, E. A. (2016). *STEM Learning IT Integration and Collaborative Strategies*. Switzerland: Springer International Publishing.
- Dziob, D., Górska, U., Kołodziej, T., & Čepič, M. (2022). Physics competition to inspire learning and improve soft skills: a case of the Chain Experiment. *International Journal of Technology and Design Education*, 32(1), 413–446. <https://doi.org/10.1007/s10798-020-09620-y>
- Erdogan, N., & Bozeman, T. D. (2015). Models of Project-Based Learning for the 21st Century. Dalam A. Sahin, *A Practice-based Model of STEM Teaching* (hal. 31-42). Sense Publishers.
- Eshiemogie, S. O., Ighalo, J. O., & Banji, T. I. (2022). Knowledge, perception and awareness of renewable energy by engineering students in Nigeria: A need for the undergraduate engineering program adjustment. *Cleaner Engineering and Technology*, 6. <https://doi.org/10.1016/j.clet.2021.100388>
- Gao, X., Li, P., Shen, J., & Sun, H. (2020). Reviewing assessment of student learning in interdisciplinary STEM education. In *International Journal of STEM Education* (Vol. 7, Issue 1). Springer. <https://doi.org/10.1186/s40594-020-00225-4>
- Gay, L. R., Mills, G. E., & Airasian, P. W. (2012). *Educational Research Competencies for Analysis and Application*. New Jersey: Pearson Education.
- González-pérez, L. I., & Ramírez-montoya, M. S. (2022). Components of Education 4.0 in 21st Century Skills Frameworks: Systematic Review. In *Sustainability (Switzerland)* (Vol. 14, Issue 3). MDPI. <https://doi.org/10.3390/su14031493>
- Han, J., Park, D., Hua, M., & Childs, P. R. N. (2022). Is group work beneficial for producing creative designs in STEM design education? *International Journal of Technology and Design Education*, 32(5), 2801–2826. <https://doi.org/10.1007/s10798-021-09709-y>
- Hayati, R., Hadi, W., & Purba, E. (2019). The Development of Student Worksheets to Improve Students' Literacy Activities in The Fourth Grade Elementary School

- District Of Hamparan Perak. In *International Journal of Education, Learning and Development* (Vol. 7, Issue 4). [www.eajournals.org](http://www.eajournals.org)
- Hebebcı, M. T. (2022). STEM Schools: Benefits, Challenges and Impact on Education. In O. T. Ozturk, & S. E. Takach, *Studies on Social and Education Sciences 2022* (pp. 322-341). ISTES Organization.
- Holman, D., & Švejdarová, E. (2023). The 21st-Century Empowering Wholeness Adaptive (EWA) Educational Model Transforming Learning Capacity and Human Capital through Wholeness Systems Thinking towards a Sustainable Future. *Sustainability*, 15(2), 1301. <https://doi.org/10.3390/su15021301>
- Keiler, L. S. (2018). Teachers' roles and identities in student-centered classrooms. *International Journal of STEM Education*, 5(1). <https://doi.org/10.1186/s40594-018-0131-6>
- Kemendikbud. (2014). Materi pelatihan guru implementasi kurikulum 2013 tahun ajaran 2014/2015. Mata Pelajaran Matematika SMP/MTs. Jakarta: Kementerian Pendidikan dan Kebudayaan
- Khudriyah. (2021). *Metodologi Penelitian dan Statistik Pendidikan*. Malang: Kelompok Intrans Publishing.
- Laboy-Rush, D. (2010). Integrated STEM Education through Project-Based Learning. Diambil kembali dari Learning.com: [www.learning.com/stem/whitepaper/integrated-through-Project-based-Learning](http://www.learning.com/stem/whitepaper/integrated-through-Project-based-Learning)
- Lu, S. Y., Lo, C. C., & Syu, J. Y. (2022). Project-based learning oriented STEAM: the case of micro-bit paper-cutting lamp. *International Journal of Technology and Design Education*, 32(5), 2553–2575. <https://doi.org/10.1007/s10798-021-09714-1>
- Macalalag, A. Z., Sahin, I., Johnson, J., & Bicer, A. (2022). *Internalization of STEM Education*. Monument, CO: ISTES Organization.
- Malicoban, E. V., & Castro, E. J. (2022). Development of a Physics Laboratory Activity Kit for the Do-It-Yourself (DIY) Physics Equipment and Laboratory Activity. *International Journal of STEM Education for Sustainability*, 2(2), 172–179. <https://doi.org/10.53889/ijses.v2i2.7>
- Markula, A., & Aksela, M. (2022). The key characteristics of project-based learning: how teachers implement projects in K-12 science education. *Disciplinary and Interdisciplinary Science Education Research*, 4(1). <https://doi.org/10.1186/s43031-021-00042-x>

- McLure, F. I., Tang, K. S., & Williams, P. J. (2022). What do integrated STEM projects look like in middle school and high school classrooms? A systematic literature review of empirical studies of iSTEM projects. In *International Journal of STEM Education* (Vol. 9, Issue 1). Springer Science and Business Media Deutschland GmbH. <https://doi.org/10.1186/s40594-022-00390-8>
- Oyewo, O. A., Ramaila, S., & Mavuru, L. (2022). Harnessing Project-Based Learning to Enhance STEM Students' Critical Thinking Skills Using Water Treatment Activity. *Education Sciences*, 12(11). <https://doi.org/10.3390/educsci12110780>
- Pathak, R., & Sheth, M. (2023). STEM Education: An Interdisciplinary and Integrated Approach of Teaching. In E. Mundhe, *Interdisciplinary Approaches and Strategies for Sustainable Development* (pp. 80-86). Maharashtra.
- Penuel, W. R., Fishman, B. J., Cheng, B. H., & Sabelli, N. (2014). Organizing Research and Development at the Intersection of Learning, Implementation, and Design. *Educational Researcher*, 331-337.
- Putri, F. S., & Istiyono, E. (2017). The Development of Performance Assessment of Stem-Based Critical Thinking Skill in the High School Physics Lessons. *International Journal of Environmental and Science Education*, 12(5), 1269–1281.
- Purnomo, H., & Ilyas, Y. (2019). *Tutorial Pembelajaran Berbasis Proyek*. Yogyakarta: Penerbit K-Media.
- Roberts, T., Jackson, C., Mohr-Schroeder, M. J., Bush, S. B., Maiorca, C., Cavalcanti, M., Craig Schroeder, D., Delaney, A., Putnam, L., & Cremeans, C. (2018). Students' perceptions of STEM learning after participating in a summer informal learning experience. *International Journal of STEM Education*, 5(1). <https://doi.org/10.1186/s40594-018-0133-4>
- Sinurat, H. A. Y., Syaiful, & Muhammad, D. (2022). Jurnal Penelitian dan Pengembangan Pendidikan Fisika. *JPPPF*, 8(1), 83–94. <https://doi.org/10.21009/1>
- Speldewinde, C. (2022). STEM Teaching and Learning in Bush Kinders. *Canadian Journal of Science, Mathematics and Technology Education*, 22(2), 444–461. <https://doi.org/10.1007/s42330-022-00207-4>
- Sufiyanto, M. I. (2022). *Model-Model Pembelajaran Terbaik*. Yogyakarta: Nuta Media.
- Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Penerbit Alfabeta.

- Sugiyono. (2021). *Metode Penelitian Pendidikan*. Bandung: Penerbit Alfabeta.
- Sumarmi, Aliman, M., & Mutia, T. (2021). The Effect Of Digital Eco-Learning In Student Worksheet Flipbook To Environmental Project Literacy And Pedagogic Competency. *Journal of Technology and Science Education*, 11(2), 357–370.  
<https://doi.org/10.3926/jotse.1175>
- Suweta, I. P. (2022). *Pengembangan Perangkat Pembelajaran Fisika Bermuatan Karakter*. Yogyakarta: CV. Bintang Semesta Media.
- Syamsidar, S., Khaeruddin, & Helmi. (2021). The Effectiveness of using Student Worksheet to Practice Science Process Skills on Hooke's Law Material. *JPPPF (Jurnal Penelitian Dan Pengembangan Pendidikan Fisika)*, 7(1), 83–90.  
<https://doi.org/10.21009/1>
- Tegeh, I. M., Jampel, I. N., & Pudjiawan, K. (2014). *Model Penelitian Pengembangan*. Yogyakarta: Graha Ilmu.
- Tytler, R. (2020). STEM Education for the Twenty-First Century. In J. Anderson, & Y. Li, *Integrated Approaches to STEM Education* (pp. 21-43)
- Vennix, J., den Brok, P., & Taconis, R. (2018). Do outreach activities in secondary STEM education motivate students and improve their attitudes towards STEM? *International Journal of Science Education*, 40(11), 1263–1283.  
<https://doi.org/10.1080/09500693.2018.1473659>
- Virtue, E. E., & Hinnant-Crawford, B. N. (2019). “We’re doing things that are meaningful”: Student perspectives of project-based learning across the disciplines. *Interdisciplinary Journal of Problem-Based Learning*, 13(2).  
<https://doi.org/10.7771/1541-5015.1809>
- Wahono, B., Lin, P. L., & Chang, C. Y. (2020). Evidence of STEM enactment effectiveness in Asian student learning outcomes. In *International Journal of STEM Education* (Vol. 7, Issue 1). Springer. <https://doi.org/10.1186/s40594-020-00236-1>
- Yusuf, I., & Widyaningsih, S. W. (2022). Higher Order Thinking Skills Oriented Student Worksheet of E-learning Model in Electric Circuit Topic. *TEM Journal*, 11(2), 564–573. <https://doi.org/10.18421/TEM112-10>
- Zhan, Z., Yao, X., & Li, T. (2022). Effects of association interventions on students' creative thinking, aptitude, empathy, and design scheme in a STEAM course: considering remote and close association. *International Journal of Technology and Design Education*. <https://doi.org/10.1007/s10798-022-09801-x>