

## DAFTAR PUSTAKA

- Abdurrahman, A., Nurulsari, N., Maulina, H., & Ariyani, F. (2019). Design and Validation of Inquiry-based STEM Learning Strategy as a Powerful Alternative Solution to Facilitate Gift Students Facing 21st Century Challenging. *Journal for the Education of Gifted Young Scientists*, 7(1), 33-56.
- Abdurrahman, A. (2019). Developing STEM Learning Makerspace for Fostering Student's 21st Century Skills in The Fourth Industrial Revolution Era.
- Anggraini, F. (2018). Pengembangan Penuntun Praktikum SMA Yang Inovatif Dan Interaktif Terintegrasi Discovery Learning (Pembelajaran Penemuan) Pada Materi Kimia Unsur. *Jurnal Dialog*, 6(2).
- Anwari, I., Yamada, S., Unno, M., Saito, T., Suwarma, I.R., Mutakinati, L. & Kumano, Y. (2015). Implementation of Authentic Learning and Assessment through STEM Education Approach to Improve Students' Metacognitive Skills. *K-12 STEM Education*, 1 (3): 123-136. DOI:10.14456/k12stemed.2015.24
- Anwar, S. (2017). Pengolahan Bahan Ajar (4 Step Teaching Material Development), Handout Perkuliahan. Bandung: Unpublished Manuscript.
- Arikunto, S. (2002). Metodologi Penelitian Suatu Pendekatan Proposal. Jakarta: PT. Rineka Cipta.
- Aydin, G., Saka, M., & Guzey, S. (2017). 4-8. Investigation Of Science, Technology, Engineering, Mathematics (STEM = Fetemm) Attitudes Of Classroom Students. *Mersin University Journal Of The Faculty Of Education*, 13 (2).
- A.Suhaenah Suparno. (2001). Membangun Kompetensi Belajar. Direktorat Jendral Pendidikan Tinggi Departemen Pendidikan Nasional.
- Azwar, S. (2012). Reliabilitas dan Validitas. Yogyakarta: Pustaka Pelajar.
- Barcelona, K. (2014). 21st Century Curriculum Change Initiative: A Focus On STEM Education As An Integrated Approach To Teaching And Learning. *American Journal of Educational Research*, 2(10), 862-875.
- Blumer, L. S., & Beck, C. W. (2019). Laboratory Courses With Guided-Inquiry Modules Improve Scientific Reasoning And Experimental Design Skills For The Least-Prepared Undergraduate Students. *CBE—Life Sciences Education*, 18(1), ar2.
- Bilgin, I. (2009). The Effects Of Guided Inquiry Instruction Incorporating A Cooperative Learning Approach On University Students' Achievement Of Acid And Bases Concepts And Attitude Toward Guided Inquiry Instruction. *Scientific research and essay*, 4(10), 1038-1046.

- Blumer, L. S., & Beck, C. W. (2019). Laboratory Courses With Guided-Inquiry Modules Improve Scientific Reasoning And Experimental Design Skills For The Least-Prepared Undergraduate Students. *CBE—Life Sciences Education*, 18(1), ar2.
- Borg. W.R. & Gall, M.D. (1983). Educational Research: An Introduction. Longman: New York.
- Barak, M. (2012). Teaching engineering and technology: cognitive, knowledge and problem solving taxonomies. *Journal of Engineering, Design, and Technology*, 11(3), 316– 333.
- Bybee, W Rodger. (2013). The Case for STEM Education Challenges and Oppartunities. Amerika: NSTA.
- Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. (2012). What Is STEM? A Discussion About Conceptions Of STEM In Education And Partnerships. *School Science and Mathematics*, 112(1), 3-11.
- Campbell, N. F., Reeves, M. S., Tourné, M., & Bridges, M. F. (2019). Process-Oriented Guided-Inquiry Learning At Jackson State University And Tuskegee University', Broadening Participation In STEM (Diversity In Higher Education, Volume 22).
- Celik, H., Pektaş, H. M., & Karamustafaoğlu, O. (2018). Science Teaching Laboratory Applications: Common Knowledge Construction, Learning Cycle Models And STEM Approach. *International Journal on New Trends in Education and Their Implications*, 9(3), 11-29.
- Ceylan, S., & Ozdilek, Z. (2015). Improving A Sample Lesson Plan For Secondary Science Courses Within The STEM Education. *Procedia-Social and Behavioral Sciences*, 177, 223-228.
- Ceylan, H. (2014). An Artificial Neural Networks Approach To Estimate Occupational Accident: A National Perspective For Turkey. *Mathematical problems in engineering*, 2014.
- Chen, M. (2001). A Potential Limitation Of Embedded-Teaching For Formal Learning. In *Proceedings of the Twenty-Third Annual Conference of the Cognitive Science Society* (pp. 194-199). Lawrence Erlbaum Associates.
- Ching, Y. H., Yang, D., Wang, S., Baek, Y., Swanson, S., & Chittoori, B. (2019). Elementary School Student Development Of STEM Attitudes And Perceived Learning In A STEM Integrated Robotics Curriculum. *TechTrends*, 63(5), 590-601.
- Christensen, C. M. (1997). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Business. Boston, Massachusetts, USA: Harvard Business School Press. <http://doi.org/10.1515/9783110215519.82>

- Chonkaew, P., Sukhummek, B., & Faikhamta, C. (2016). Development Of Analytical Thinking Ability And Attitudes Towards Science Learning Of Grade-11 Students Through Science Technology Engineering And Mathematics (STEM Education) In The Study Of Stoichiometry. *Chemistry Education Research and Practice*, 17(4), 842-861.
- Devan, J. (2016). Cities: Key Concepts and an Analytical Framework. Disajikan dalam Pertemuan Dewan Forum Ekonomi Dunia membahas Daya Saing, Juni 2016, Switzerland.
- DeCoito, I., & Richardson, T. (2018). Beyond Angry Birds™: Using Web-Based Tools To Engage Learners And Promote Inquiry In STEM Learning. In *Information And Technology Literacy: Concepts, Methodologies, Tools, And Applications* (pp. 410-433). IGI Global.
- Dugger, W.E. 2010. Evolution of STEM in the United States. *The 6th Biennial International Conference on Technology Education Research*. Australia: ITEEA, 1-8
- Eggen, P. D., & Kauchak, D. P. (1996). *Strategies for Teachers Teaching Content and Thinking Skills*. Allyn & Bacon : Slimon & Schuster Company.
- Feinstein, N. W., & Kirchgasser, K. L. (2015). Sustainability In Science Education? How The Next Generation Science Standards Approach Sustainability, And Why It Matters. *Science Education*, 99(1), 121–144.
- Ferk, V., Vrtacnik, M., Blejec, A., & Gril, A. (2003). Students' Understanding Of Molecular Structure Representations. *International journal of science education*, 25(10), 1227-1245.
- Frykholm, J., & Glasson, G. (2005). Connecting Science And Mathematicss Instruction: Pedagogical Context Knowledge For Teachers. *School Science and Mathematicss*, 105(3), 127–141.
- Gall, M. D., Gall, J. P., & Borg, W. R. (Eds.). 2003. *Educational Research: An Introduction* (7th ed.). New York: Pearson Education Inc.
- Guzey, S. S., Harwell, M., & Moore, T. (2014). Development Of An Instrument To Assess Attitudes Toward Science, Technology, Engineering, And Mathematics (STEM). *School Science and Mathematics*, 114(6), 271-279.
- Handayani, E. (2019). Implementasi Pembelajaran Fisika Materi Gelombang Cahaya Berpendekatan Science, Technology, Engineering, And Mathematics (STEM) Untuk Mengembangkan Keterampilan Belajar Abad 21 (Doctoral dissertation, Universitas Negeri Semarang).
- Hadiati, S., Kuswanto, H., Rosana, D., & Pramuda, A. (2019). The Effect of Laboratory Work Style and Reasoning with Arduino to Improve Scientific Attitude. *International Journal of Instruction*, 12(2), 321-336.

- Ismail, I., Permanasari, A., & Setiawan, W. (2016). Stem Virtual Lab: an Alternative Practical Media to Enhance Student's Scientific Literacy. *Jurnal Pendidikan IPA Indonesia*, 5(2), 239-246.
- İnce, E., Kırbaşlar, F. G., Güneş, Z. Ö., Yaman, Y., Yolcu, Ö., & Yolcu, E. (2015). An Innovative Approach In Virtual Laboratory Education: The Case Of “IUVIRLAB” And Relationships Between Communication Skills With The Usage of IUVIRLAB. *Procedia-Social and Behavioral Sciences*, 195, 1768-1777.
- Irma Rahma Suwarma, Ida Kaniawati, Lilik Hasanah. (2016). Model Petunjuk *Engineering Class Kelas VIII Semester I*, terdaftar hak cipta C002016009847.
- Karisan, D., Macalalag, A., & Johnson, J. (2019). The Effect of Methods Course on Preservice Teachers' Awareness and Intentions of Teaching Science, Technology, Engineering, and Mathematics (STEM) Subject. *International Journal of Research in Education and Science*, 5(1), 22-35.
- Katehi L., Pearson, G., & Feder, M. (Eds.) (2009). Engineering In K-12 Education: Understanding The Status And Improving The Prospects. *Report from the Committee on K-12 Education for the National Academies*. Washington DC: The National Academies Press.
- Kelley, T.R. & J.Geoff.K.(2016). A conceptual For Integrated STEM Education. *International of STEM Education*, 3(11):1-11.
- Kemendikbud. (2014). Konsep dan Implementasi Kurikulum 2013. Jakarta: Kementrian Pendidikan dan Kebudayaan.
- Kim, Y. & Park, N. (2012). The Effect of STEAM Education on Elementary School Student's Creativity Improvement. CCIS 339: 115–121. DOI: 10.1007/978-3-642-35264-5\_16
- Kompas.com. 11 Maret, 2017. Pengaruh Globalisasi bagi Negara, <https://www.kompas.com/skola/read/2020/03/12/170000569/pengaruh-globalisasi-bagi-negara?page=all>
- Koretsky, M., Kelly, C., & Gummer, E. (2011). Student Perceptions Of Learning In The Laboratory: Comparison Of Industrially Situated Virtual Laboratories To Capstone Physical Laboratories. *Journal of Engineering Education*, 100(3), 540-573.
- Kranzfelder, P., Lo, A. T., Melloy, M. P., Walker, L. E., & Warfa, A. R. M. (2019). Instructional Practices In Reformed Undergraduate STEM Learning Environments: A Study Of Instructor And Student Behaviors In Biology Courses. *International Journal of Science Education*, 41(14), 1944-1961.

- Lee, M. H., Hsu, C. Y., & Chang, C. Y. (2019). Identifying Taiwanese Teachers' Perceived Self-efficacy for Science, Technology, Engineering, and Mathematics (STEM) Knowledge. *The Asia-Pacific Education Researcher*, 28(1), 15-23
- Loertscher, J., & Minderhout, V. (2019). Implementing Guided Inquiry in Biochemistry: Challenges and Opportunities. In *Biochemistry Education: From Theory to Practice* (pp. 111-126). American Chemical Society.
- Luthfia Ulva Irmita. 2018. Pengembangan Modul Pembelajaran Kimia Menggunakan Pendekatan Science, Technology, Engineering And Mathematic (Stem) Pada Materi Kesetimbangan Kimia Orbital: *Jurnal Pendidikan Kimia* Volum 2, Nomor 2.
- Laboy-Rush, D. (2010). Integrated STEM Education Through Project-Based Learning. (Online), ([www.learning.com/stem/whitepaper/integrated-STEM-throughProject-basedLearning](http://www.learning.com/stem/whitepaper/integrated-STEM-throughProject-basedLearning)), diakses pada 10 Maret 2017.
- Ministry of Education (MEB) (2018a). Science Course Curriculum. Retrieved from <http://mufredat.meb.gov.tr/dosyalar/201812312311937fen%20b%c4%b0l%c4%b0mler%c4%b0%20c3%96%c4%9eret%c4%b0m%20programi2018.pdf>.
- Ministry of Education (MEB) (2018b). STEM Training Teacer Hand book retrieved from [http://scientix.meb.gov.tr/images/upload/event\\_35/gallery/stem%20e%c4%9fitimi%20c3%96%c4%9fretmen%20el%20kitab%c4%b1.pdf](http://scientix.meb.gov.tr/images/upload/event_35/gallery/stem%20e%c4%9fitimi%20c3%96%c4%9fretmen%20el%20kitab%c4%b1.pdf).
- Ministry of Education (MEB) (2016). STEM Training Report. Retrieved from [http://yegitek.meb.gov.tr/STEM\\_Egitimi\\_Raporu.pdf](http://yegitek.meb.gov.tr/STEM_Egitimi_Raporu.pdf).
- Maretha Saputri, C. H. E. S. I. L. I. A., & Nasruddin, H. (2018). Melatihkan Keterampilan Proses Sains Siswa Melalui Penerapan Model Pembelajaran Inkuiri Terbimbing Pada Materi Kesetimbangan Kimia Untuk Kelas Xi Ipa 44di Man Kota Mojokerto. *Unesa Journal Of Chemical Education*, 7(3).
- Mulyasa, E. 2007. Kurikulum tingkat satuan pendidikan. Bandung: Remaja Rosdakarya.
- Mitcham, C. (1994). Thinking through technology: The path between engineering and philosophy. University of Chicago Press.
- Moore, T. J., Stohlmann, M. S., Wang, H. H., Tank, K. M., Glancy, A. W., & Roehrig, G. H. (2014). Implementation And Integration Of Engineering In K-12 STEM Education. In *Engineering in pre-college settings: Synthesizing research, policy, and practices* (pp. 35-60). Purdue University Press.
- Morrison, J. (2006), STEM Education Monograph Series: Attributes of STEM Education Teaching Institute for Essential Science, Baltimore, MD.

- National Research Council. (2010, Draft under review). *Framework For Science Education*. Washington, DC: National Academy Press.
- Nurussaniah, N., & Nurhayati, N. (2016). Pengembangan Penuntun Praktikum Fisika Dasar 1 Berbasis Guided Inquiry untuk Meningkatkan Kemampuan Berpikir Kritis Mahasiswa. In *Prosiding Seminar Nasional Fisika (E-Journal)* (Vol. 5, pp. SNF2016-RND).
- Nursari, N. (2019). Pengembangan KIT Praktikum Termodinamika Berbasis STEM (Science, Technology, Engineering and Mathematics) untuk Siswa Kelas XI SMA Negeri 1 Turi (Doctoral dissertation, Universitas Ahmad Dahlan).
- Plattner, H. (2018). *An Introduction to Design Thinking Process Guide*. Institute of Design at Stanford : USA.
- Ridwan. (2007). *Skala Pengukuran Variabel-variabel Penelitian*. Bandung: Alfabeta.
- Riduwan. (2012). *Belajar Mudah Penelitian: untuk Guru-Karyawan dan Peneliti Pemula*. CV Alfabeta. Bandung
- Roberts, A. & D. Cantu. (2012). Applying Stem Instructional Strategies To Design And Technology Curriculum. *Technology Education in the 21st Century, Proceeding of the PATT 26 Conference*. Linkoping University, Stockhol.
- Rossouw, A., Hacker, M., & de Vries, M. J. (2011). Concepts And Contexts In Engineering And Technology Education: An International And Interdisciplinary Delphi Study. *International Journal of Technology and Design Education*, 21(4), 409-424.
- Sadeh, I and Zion, M. (2009). The Development of Dynamic Inquiry Performance Within an Open Inquiry Setting : A Comparison to Guided Inquiry Setting. *Journal of Research In Science Teaching*. Vol 46 (10): 137-160.
- Safitri, E., Handayani, S., & Mujdalipah, S. (2018). Pembelajaran Praktikum Dengan Modul Berbasis Science, Technology, Engineering And Mathematics (STEM) Untuk Meningkatkan Hasil Belajar Siswa Pada Kompetensi Dasar Melakukan Dasar Pengawetan. *Edufortech*, 3(2).
- Sakinah, K. (2020). Development of Ispring Learning Media to Improve Student's Curiosity Character in STEM-Based Science Learning/Pengembangan Media Pembelajaran Ispring untuk Meningkatkan Karakter Rasa Ingin Tahu Siswa Pada Pembelajaran IPA Berbasis STEM. *Al-Mudarris: Journal Of Education*, 3(2), 118-131.
- Sanjaya, I. P. H. (2012). Pengaruh Model Pembelajaran Inkuiri Laboratorium terhadap Keterampilan Berpikir Kreatif dan Keterampilan Proses Sains Siswa Ditinjau dari Kemandirian Belajar Siswa. *Jurnal Pendidikan dan Pembelajaran IPA Indonesia*, 2(2).

- Sanders, M. (2009). STEM, STEM Education, STEMmania. *The Technology Teacher*, 68(4), 20–26.
- Sarwi, S., Sutardi, S., & Prayitno, W. W. (2016). Implementation Of Guided Inquiry Physics Instruction To Increase An Understanding Concept And To Develop The Students'character Conservation. *Jurnal Pendidikan Fisika Indonesia*, 12(1), 1-7.
- Savage, J., & Healy, J. (2019). Creative Teaching Design in STEM: Using Graduate Learning Outcomes to Distribute Students' Existing Knowledge in First-Year Biology Practical Work Groups. *Journal of University Teaching and Learning Practice*, 16(3), 2.
- Setyosari, P. (2012). *Metode Penelitian Pendidikan dan Pengembangan Kencana*. Prenada Media Group: Jakarta.
- Shahali, E. M., Halim, L., Rasul, S., Osman, K., Ikhsan, Z., & Rahim, F. (2015). Bitara-STEMTM Training Of Trainers' Programme: Impact On Trainers' Knowledge, Beliefs, Attitudes And Efficacy Towards Integrated Stem Teaching. *Journal of Baltic Science Education*, 14(1), 85.
- Sibuea, G. V., Suyanti, R. D., & Silaban, S. (2019). The Development Of Chemistry Lab Guide Book For High School Based On Guided Inquiry To Measure Scientific Attitudes And Science Process Skill. <http://aisteel2019.unimed.ac.id/wp-content/uploads/2020/02/ABS-321.pdf>.
- Siew, N. M., & Ambo, N. (2018). Development And Evaluation Of An Integrated Project-Based And Stem Teaching And Learning Module On Enhancing Scientific Creativity Among Fifth Graders. *Journal of Baltic Science Education*, 17(6), 1017.
- Silaban, R., Mahmud, Atmaja G. Adawiyah, R. (2018). Analysis Of Teaching Materials And Learning Science Based On Curriculum 2013, *IOSR Journal of Research and Method in Education*, 8 (3), pp 70-76
- Silaban, R., Pasaribu, M., Sitompul SMF, Simanullang, TW. (2016). Inovasi Lembar Kerja Siswa Reaksi Redoks Berbasis Pemecahan Masalah untuk Siswa SMA; *Jurnal Pendidikan Kimia*, 8 (1), 65-70.
- Siregar, M. (2016). Analisis Dan Pengembangan Penuntun Praktikum Kimia Sma Kelas X Pada Materi Larutan Elektrolit Dan Non Elektrolit (Doctoral dissertation, UNIMED).
- Subana, M., Sudrajat. (2011). *Dasar – Dasar Penelitian Ilmiah*, Bandung: Pustaka Setia
- Sugiyono. (2012). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: Alfabeta.
- Sumintono, Bambang. (2010). Pembelajaran Sains, Pengembangan Keterampilan Sains dan Sikap Ilmiah dalam Meningkatkan Kompetensi Guru. *Jurnal Albidayah* Vol. 2 No. 1 hal (63-85).

- Sunarno, W. (2019). Pembelajaran IPA di Era Revolusi Industri 4.0. In *Prosiding SNPF (Seminar Nasional Pendidikan Fisika)*.
- Sudjana. (2005). *Metode Statistik*. Bandung: Tarsito.
- Tahir, S. D. W., & Anwar, S. (2018). How To Develop Student Creativity Through Teaching Materials Of Reaction Rate STEM-Based?. In *International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia* (Vol. 3, pp. 384-389).
- Tsupros, N., R. Kohler, and J. Hallinen. (2009). *STEM Education: A Project to Identify the Missing Components*. Pennsylvania: Intermediate Unit 1 and Carnegie Mellon.
- Utomo, A. P., Hasanah, L., Hariyadi, S., & Narulita, E. (2020). The Effectiveness of STEAM-Based Biotechnology Module Equipped with Flash Animation for Biology Learning in High School. *International Journal of Instruction*, 13(2), 463-476.
- Wang, H., Moore, T. J., Roehrig, G. H., Park, M. S., Wang, H., Moore, T. J., Park, M. S. (2011). STEM Integration : Teacher Perceptions and Practice. *Journal of Pre-College Engineering Education Research (J-PEER)*, 1(2), 1–13. <https://doi.org/10.5703/1288284314636>
- Yulianti, D., Rusilowati, A., Nugroho, S. E., & Supardi, K. I. (2019). Problem Based Learning Models Based On Science Technology Engineering And Mathematics For Developing Student Character. In *Journal of Physics: Conference Series* (Vol. 1170, No. 1, p. 012032). IOP Publishing.
- Wibowo, T. H., Rudibyani, R. B., & Efkar, T. (2015). Penerapan Model Inkuiri Terbimbing Dalam Meningkatkan Efikasi Diri Dan Penguasaan Konsepsiiswa. *Jurnal Pendidikan dan Pembelajaran Kimia*, 4(3), 947-959.
- World Economic Forum (WEF). (2016). *Competitive Cities and Their Connections to Global Value Chains*. Switzerland: WEF.