

## DAFTAR PUSTAKA

- Achmad, S. R., & Susetyo, I. (2014). Pengaruh proses pencampuran dan cara aplikasi pupuk terhadap kehilangan unsur N. *Warta Perkaratan*, 33(1), 29–34.
- Adams, W. K., & Wieman, C. E. (2007). Problem solving skill evaluation instrument—validation studies. *AIP Conference Proceedings*, 883(1), 18–21.
- Apriliansa, M. R., Ridwan, A., Hadinugrahaningsih, T., & Rahmawati, Y. (2018). Pengembangan soft skills peserta didik melalui integrasi pendekatan science, technology, engineering, arts, and mathematics (STEAM) dalam pembelajaran asam basa. *Jurnal Riset Pendidikan Kimia (JRPK)*, 8(2), 101–110.
- Armağan, F. Ö., Sağır, Ş. U., & Çelik, A. Y. (2009). The effects of students' problem solving skills on their understanding of chemical rate and their achievement on this issue. *Procedia - Social and Behavioral Sciences*, 1(1), 2678–2684. <https://doi.org/10.1016/j.sbspro.2009.01.473>
- Bertrand, M. G., & Namukasa, I. K. (2020). STEAM education: student learning and transferable skills. *Journal of Research in Innovative Teaching & Learning*.
- Boy, G. A. (2013). From STEM to STEAM: toward a human-centred education, creativity & learning thinking. *Proceedings of the 31st European Conference on Cognitive Ergonomics*, 1–7.
- Butterworth, J., & Thwaites, G. (2013). *Thinking skills: Critical thinking and problem solving*. Cambridge University Press.
- Cahyono, B. (2003). *Budidaya Tanaman Holtikultura*. Penebar Swadaya. Jakarta.
- Carroll Ph D, M. P. (2014). Shoot for the moon! The mentors and the middle schoolers explore the intersection of design thinking and STEM. *Journal of Pre-College Engineering Education Research (J-PEER)*, 4(1), 3.
- Chang, R. (2003). *Kimia Dasar Konsep-Konsep Inti Jilid 2 Edisi Keenam*. Jakarta: Erlangga.
- Chang, R. (2005a). *Kimia dasar: konsep-konsep inti*. Jakarta: Erlangga, 689–691.
- Chang, R. (2005b). *Kimia Dasar: Konsep-konsep inti edisi ketiga jilid 2*.
- Chittleborough, G., & Treagust, D. F. (2007). The modelling ability of non-major chemistry students and their understanding of the sub-microscopic level. *Chemistry Education Research and Practice*, 8(3), 274–292.
- Chusinkunawut, K., Nugultham, K., Wannagatesiri, T., & Fakcharoenphol, W. (2018a). Problem solving ability assessment based on design for secondary school students. *International Journal of Innovation in Science and Mathematics Education*, 26(3), 1–20.
- Chusinkunawut, K., Nugultham, K., Wannagatesiri, T., & Fakcharoenphol, W. (2018b). Problem solving ability assessment based on design for secondary school students. *International Journal of Innovation in Science and Mathematics Education*, 26(3).
- Collins, A., & Smith, E. E. (1980). *Teaching the Process of Reading*

*Comprehension. Technical Report No. 182.*

- Cook, K. L., & Bush, S. B. (2018). Design thinking in integrated STEAM learning: Surveying the landscape and exploring exemplars in elementary grades. *School Science and Mathematics, 118*(3–4), 93–103.
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- Cuperman, D., & Verner, I. (2015). Fostering analogical reasoning and design skills through creating bio-inspired robotic models. *Procedia CIRP, 36*, 285–290.
- Dewi, I. S., & Mariana, N. (n.d.). *Literasi zakat pada pembelajaran matematika di sekolah dasar melalui dilemma story pedagogy*.
- Drechsler, M., & Schmidt, H.-J. (2005). Upper secondary school students' understanding of models used in chemistry to define acids and bases. *Science Education International, 16*(1), 39–54.
- Elfrida, E., Hadinugrahaningsih, T., & Rahmawati, Y. (2017). Studi Pendekatan Dilemmas Stories pada Materi Hidrolisis Garam dengan Metode Thinking Aloud Pair Problem Solving (TAPPS). *Jurnal Riset Pendidikan Kimia (JRPK), 7*(2), 91–100.
- Fahyuddin, F., & Sampradja, H. (2017). Eksplorasi Kemampuan Penalaran Mahasiswa melalui Pemecahan Masalah Kimia secara Terstruktur. *Jurnal Pendidikan Dan Pembelajaran (JPP), 22*(2), 151–161.
- Firmansyah, M. A. (2011). Peraturan tentang pupuk, klasifikasi pupuk alternatif dan peranan pupuk organik dalam peningkatan produksi pertanian. *Makalah Disampaikan Pada Apresiasi Pengembangan Pupuk Organik, Di Dinas Pertanian Dan Peternakan Provinsi Kalimantan Tengah, Palangka Raya, 2–4*.
- Fortus, D., Dershimer, R. C., Krajcik, J., Marx, R. W., & Mamlok-Naaman, R. (2004). Design-based science and student learning. *Journal of Research in Science Teaching, 41*(10), 1081–1110.
- Gabel, D. (1999). Improving teaching and learning through chemistry education research: A look to the future. *Journal of Chemical Education, 76*(4), 548.
- Gabel, D. L., Sherwood, R. D., & Enochs, L. (1984). Problem-solving skills of high school chemistry students. *Journal of Research in Science Teaching, 21*(2), 221–233.
- Ganiswarna, S. G. (1995). *Farmakologi dan terapi*. Bagian Farmakologi Fakultas Kedokteran-Universitas Indonesia.
- Hadinugrahaningsih, T., Rahmawati, Y., & Ridwan, A. (2017). *Developing 21st century skills in chemistry classrooms : Opportunities and challenges of STEAM integration* *Developing 21st Century Skills in Chemistry Classrooms : Opportunities and Challenges of STEAM Integration. 030008*(August). <https://doi.org/10.1063/1.4995107>
- Henriksen, D. (2014). Full STEAM ahead: Creativity in excellent STEM teaching practices. *The STEAM Journal, 1*(2), 15.

- Heppner, P. P., Baumgardner, A., & Jackson, J. (1985). Problem-solving self-appraisal, depression, and attributional style: Are they related? *Cognitive Therapy and Research*, 9(1), 105–113.
- Higa, T., & Parr, J. F. (1994). *Beneficial and effective microorganisms for a sustainable agriculture and environment* (Vol. 1). International Nature Farming Research Center Atami.
- Hudson, C. C., & Whisler, V. R. (2013). *Contextual teaching and learning for practitioners. Systemics, Cybernetics and Informatics*, 6 (4), 54–58.
- Johnstone, A. H. (2000). Teaching of chemistry-logical or psychological? *Chemistry Education Research and Practice*, 1(1), 9–15.
- Jonassen, D. H. (2006). Modeling with technology: Mindtools for conceptual change. (No Title).
- Kimmel, S. J., Kimmel, H. S., & Deek, F. P. (2003). The common skills of problem solving: From program development to engineering design. *International Journal of Engineering Education*, 19(6), 810–817.
- Kohlberg, L. (1984). *Essays on moral development/2 The psychology of moral development*. Harper & Row.
- Krajcik, J. S. (2012). Developing student's understanding of chemical concepts. In *The psychology of learning science* (pp. 117–148). Routledge.
- Krulik, S., Rudnick, J., & Milou, E. (2003). *Mathematic Teaching in Middle School a Practical Guide*. Boston: Allyn and Bacon.
- Lin, Y.-C., Lin, Y.-T., & Huang, Y.-M. (2011). Development of a diagnostic system using a testing-based approach for strengthening student prior knowledge. *Computers & Education*, 57(2), 1557–1570.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.
- Mehta, P. (2010). Science behind acid rain: analysis of its impacts and advantages on life and heritage structures. *South Asian Journal of Tourism and Heritage*, 3(2), 123–132.
- Miessler, G. L. (2008). *Inorganic chemistry*. Pearson Education India.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. sage.
- Noor, M., & Sabiham, I. H. S. (2010). Lahan Gambut. *Pengembangan, Konservasi Dan Perubahan Iklim*. Penerbit Gadjah Mada Univercity Press. Yogyakarta, 212.
- Nurhanurawati, N. (2019). *Berpikir Matematis dalam Pemecahan Masalah*.
- Ohlsson, S. (2012). The Problems with Problem Solving: Reflections on the Rise, Current Status, and Possible Future of a Cognitive Research Paradigm. *The Journal of Problem Solving*, 5. <https://doi.org/10.7771/1932-6246.1144>
- Oxtoby, D. W., Gillis, H. P., & Nachtrieb, N. H. (2001). Prinsip-prinsip kimia modern. Jakarta, Erlangga.

- Phibunwatthanawong, T., & Riddech, N. (2019). Liquid organic fertilizer production for growing vegetables under hydroponic condition. *International Journal of Recycling of Organic Waste in Agriculture*, 8, 369–380.
- Pólya, G., & Conway, J. H. (1957). *How to solve it: A new aspect of mathematical method*. Princeton University Press Princeton.
- Purba, L. M., Ashar, T., & Santi, D. N. (2013). Pola Pemupukan Dan Analisa Kandungan Nitrat Pada Sayur Brokoli (*Brassica oleracea* cv. brocolli) Di Pertanian Desa Merdeka Kecamatan Merdeka Kabupaten Karo Tahun 2012. *Lingkungan Dan Kesehatan Kerja*, 2(3).
- Quílez, J. (2019). A categorisation of the terminological sources of student difficulties when learning chemistry. *Studies in Science Education*, 55(2), 121–167. <https://doi.org/10.1080/03057267.2019.1694792>
- Rahmawati, Y., Agustin, M. A., Sihombing, S. N., Mardiah, A., & Iriyadi, D. (2020). Students empowerment in chemistry learning through the integration of dilemma teaching pedagogy in plastic waste. *Journal of Physics: Conference Series*, 1521(4), 42079.
- Rahmawati, Y., & Nurbaity, M. (2014). Engaging Students in Social Emotional Learning: The Role of Dilemma Stories In Chemistry Learning. *Proceeding of International Conference On Research, Implementation And Education Of Mathematics And Sciences*.
- Rahmawati, Y., Taylor, E., Taylor, P. C., & Koul, R. (2021a). Student empowerment in a constructivist values learning environment for a healthy and sustainable world. *Learning Environments Research*, 24, 451–468.
- Rahmawati, Y., Taylor, E., Taylor, P. C., & Koul, R. (2021b). Student empowerment in a constructivist values learning environment for a healthy and sustainable world. In *Learning Environments Research* (Vol. 24, Issue 3, pp. 451–468). Springer Science and Business Media B.V. <https://doi.org/10.1007/s10984-020-09336-9>
- Rahmawati, Y., Taylor, E., Taylor, P. C., Ridwan, A., & Mardiah, A. (2022). Students' Engagement in Education as Sustainability: Implementing an Ethical Dilemma-STEAM Teaching Model in Chemistry Learning. *Sustainability*, 14(6), 3554.
- Ratrinia, P. W., Ma'ruf, W. F., & Dewi, E. N. (2014). Pengaruh penggunaan bioaktivator EM4 dan penambahan daun lamtoro (*Leucaena leucocephala*) terhadap spesifikasi pupuk organik cair rumput laut *Eucaema spinosum*. *Jurnal Pengolahan Dan Bioteknologi Hasil Perikanan*, 3(3), 82–87.
- Razzouk, R., & Shute, V. (2012). What Is Design Thinking and Why Is It Important? *Review of Educational Research*, 82(3), 330–348. <https://doi.org/10.3102/0034654312457429>
- Richard, L., & Biffle, T. (2016). Introduction to STEAM (Science, Technology, Engineering, Arts, and Mathematics). *Thomas College*.
- Ridwan, A., Rahmawati, Y., Mardiah, A., & Rifai, A. (2020). Developing 22nd century skills through the integration of STEAM into smoke absorber project.

*Journal of Physics: Conference Series*, 1521(4). <https://doi.org/10.1088/1742-6596/1521/4/042077>

- Rogers, R. R. (2001). Reflection in higher education: A concept analysis. *Innovative Higher Education*, 26, 37–57.
- Sant, W., Pourciel, M. L., Launay, J., Do Conto, T., Martinez, A., & Temple-Boyer, P. (2003). Development of chemical field effect transistors for the detection of urea. *Sensors and Actuators B: Chemical*, 95(1–3), 309–314.
- Setiawan, C., & Sriwijaya, F. (2011). Pembuatan Video Materi Ajar dengan Camtasia. *Fakultas Ilmu Komputer Universitas Sriwijaya: Universitas Sriwijaya*.
- Settelmaier, E. (2003). *Dilemmas with Dilemmas... Exploring the Suitability of Dilemma Stories as a Way of Addressing Ethical Issues in Science Education*.
- Sheppard, K. (2006). High school students' understanding of titrations and related acid-base phenomena. *Chemistry Education Research and Practice*, 7(1), 32–45.
- Shriver, D. F., Atkins, P. W., & Langford, C. H. (1990). *Inorganic Chemistry*, W. H. Freeman: New York.
- Sunarya, Y. (2012). *Kimia Dasar 2 Berdasarkan Prinsip-Prinsip Kimia Terkini*. Bandung: CV. Yarma Widya.
- Sunyono, S. (2017). *Model Pembelajaran Kimia Berbasis Lingkungan dan Keterampilan Generik–Solusi Alternatif dalam Memecahkan Masalah Pembelajaran Kimia*.
- Suryaningsih, S., & Nisa, F. A. (2021). Kontribusi STEAM Project Based Learning dalam Mengukur Keterampilan Proses Sains dan Berpikir Kreatif Siswa. *Jurnal Pendidikan Indonesia*, 2(6), 1097–1111.
- Suryawati, E., & Osman, K. (2017). Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(1), 61–76.
- Taber, K. S. (2013). Revisiting the chemistry triplet: drawing upon the nature of chemical knowledge and the psychology of learning to inform chemistry education. *Chemistry Education Research and Practice*, 14(2), 156–168.
- Tarnoff, J. (2010). STEM to STEAM—Recognizing the value of creative skills in the competitiveness debate. *The Huffington Post*.
- Taylor, E. L., Taylor, P. C., & Chow, M. (2013). Diverse, disengaged and reactive: A teacher's adaptation of ethical dilemma story pedagogy as a strategy to re-engage learners in education for sustainability. In *Science Education for Diversity* (pp. 97–117). Springer.
- Taylor, E., Taylor, P. C., & Hill, J. (2019). Ethical dilemma story pedagogy—a constructivist approach to values learning and ethical understanding. In *Empowering science and mathematics for global competitiveness* (pp. 118–124). CRC Press.

- Telaumbanua, D. O. (2018). *Pengaruh Pemberian Dolomit dan Pupuk NPK terhadap Pertumbuhan dan Produksi Tanaman Sawi (Brassica juncea L)*".
- Tisdale, S. L., Nelson, W. L., & Beaton, J. D. (1985). *Soil fertility and fertilizers*. Collier Macmillan Publishers.
- Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. John Wiley & Sons.
- Vaio, N. (2006). *Ammonia volatilization and N-uptake from urea, urea ammonium nitrate (UAN) and Nitamin®(urea-polymer) applied to tall fescue in Georgia*. University of Georgia.
- Van Wijngaarden, W. K., Vermolen, F. J., Van Meurs, G. A. M., & Vuik, C. (2011). Modelling biogrowth: a new ground improvement method based on microbial-induced carbonate precipitation. *Transport in Porous Media*, 87(2), 397–420.
- Werth, J. C. (2016). *Teaching a dilemma story in my science classroom: enabling students to make ethically aware decisions*. Curtin University.
- Widjaja-Adhi, I. P. G. (1997). Developing tropical peatlands for agriculture. *JO Rieley and SE Page*, 45–54.
- Wurdinger, S., Haar, J., Hugg, R., & Bezon, J. (2007). A qualitative study using project-based learning in a mainstream middle school. *Improving Schools*, 10(2), 150–161.
- Zulkifli, T. B. H., & Putra, I. A. (2019). Kajian Variasi Jarak Tanam dan Dosis Pupuk Dolomit terhadap Pertumbuhan Kacang Tanah (*Arachis hypogaea L*) di Lahan Pasang Surut. *Agrinula: Jurnal Agroteknologi Dan Perkebunan*, 2(1), 5–8.

