

DAFTAR PUSTAKA

- Abdul, L., Laliyo, R., Sumintono, B., & Panigoro, C. (2022). Heliyon Measuring changes in hydrolysis concept of students taught by inquiry model : stacking and racking analysis techniques in Rasch model. *Heliyon*, 8(March), e09126. <https://doi.org/10.1016/j.heliyon.2022.e09126>
- Adauyah, R., & Aznam, N. (2024). *Guided Inquiry Learning Model in Chemistry Education : A Systematic Review*. 10(3), 77–87. <https://doi.org/10.29303/jppipa.v10i3.6373>
- Aditomo, A., & Klieme, E. (2020). Forms of inquiry-based science instruction and their relations with learning outcomes : evidence from high and low-performing education systems. *International Journal of Science Education*, 0(0), 1–22. <https://doi.org/10.1080/09500693.2020.1716093>
- Ahmad, R., Mazhar, S., & Author, C. (2023). *Annals of Human and Social Sciences*. 4(2).
- Ahsa, A., & Arabia, S. (2024). *ENHANCING 21ST CENTURY SKILLS THROUGH INTEGRATED STEM EDUCATION USING PROJECT-ORIENTED PROBLEM-BASED LEARNING Rommel AlAli **. 53(2), 421–430. <https://doi.org/10.30892/gtg.53205-1217>
- Aiken, L. R. (1985). *Three Coefficients for Analyzing The Reliability and Validity of Ratings*. Educational and Psychological Measurement.
- Almira, A., & Rachmawati, A. (2023). Evaluasi penerapan model pembelajaran inkuiri terbimbing dalam pembelajaran kimia : Suatu tinjauan sistematis literatur. *Pendidikan Kimia*.
- Anda Juanda. (2016). *Kurikulum dan Pembelajaran, Teori dan Praktik KTSP dari Teori Hingga Implementasi Kurikulum*. CV.CONFIDENT.
- Anderson, L. W., & Krathwohl, D. R. (2001a). *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives: Complete Edition*. New York: Longman.
- Anderson, L. W., & Krathwohl, D. R. (2001b). *Taksonomi untuk pembelajaran, pengajaran, dan penilaian: Revisi taksonomi tujuan pendidikan Bloom*. Pustaka Pelajar.
- Ardianto, D., Firman, H., & Permanasari, A. (2019). *What is Science , Technology , Engineering , Mathematics (STEM) Literacy ?* 253(Aes 2018), 381–384.
- Arikunto, S. (2013). *Prosedur Penelitian: Suatu Pendekatan Praktik*. Rineka Cipta.
- Astuti, R. T. (2022). *Profil Kesulitan Belajar Peserta Didik dalam Memahami Materi Hidrolisis Garam*. 6, 250–261.
- Avargil, S., & Piorko, R. (2022). *High school students ' understanding of molecular representations in a context-based multi-model chemistry learning approach*. 0693. <https://doi.org/10.1080/09500693.2022.2095679>
- Azizah, A. N., & Kumala, F. Z. (2023). *The Influence of the Demonstration Method with the Help of Geogebra Software on the Ability to Understand Mathematical Concepts*. 9(May), 77–87.
- Azwar, S. (2012). *Reliabilitas dan Validitas (4th ed)*. Pustaka Pelajar.
- B, S. S., Sanjaya, I. M., Susantini, E., & Cahyono, E. (n.d.). *Improving Student ' s Critical Thinking Skills and Self Efficacy Through Implementation of Integrated Guided Inquiry Model with Science , Technology , Engineering and Mathematics (STEM)*. 65–74.

- Chand, S. P. (2023). *Constructivism in Education : Exploring the Contributions of Piaget , Vygotsky , and Bruner*. 12(7), 274–278. <https://doi.org/10.21275/SR23630021800>
- Chen, K.-F., Hwang, G.-J., & Chen, M.-R. A. (2024). Effects of a concept mapping-guided virtual laboratory learning approach on students' science process skills and behavioral patterns. *Educational Technology Research and Development*, 72(3), 1623–1651. <https://doi.org/10.1007/s11423-024-10348-y>
- Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (Eight).
- Creswell, J. W. (2012). *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (fourth)*. Pearson Education.
- Diwakar, S., Kani, V., Francis, S. P., & Achuthan, K. (2023). *Computers & Education Intrinsic and extrinsic motivation among students for laboratory courses - Assessing the impact of virtual laboratories*. 198(February 2022).
- Doly, F. S. (2024). *Education and Literature Studies (IJEEL) Equipping Students for Future Jobs : The Essential Role of STEM Education*. 5, 81–92. <https://doi.org/10.22161/ijeel>
- Emad, M., & Omer, O. (2025). *Principals as STEM leaders : Insights from Qatar ' s government schools using Q methodology research*. 21(9).
- Febrita, Y., & Ulfah, M. (2019). Prosiding Diskusi Panel Nasional Pendidikan Matematika. *Peranan Media Pembelajaran Untuk Meningkatkan Motivasi Belajar Siswa, Vol. 5(2)*, 183.
- Foster, R. C. (2021). *KR20 and KR21 for Some Nondichotomous Data (It ' s Not Just Cronbach ' s Alpha)*. 1–31. <https://doi.org/10.1177/0013164421992535>
- Fraenkel, J. R., & Wallen, N. E. (2009). *How to Design and Evaluate Research in Education (7th ed)*. McGraw-Hill.
- Giannoukos, G. (2024). *Main Learning Theories in Education*. [https://doi.org/10.59324/ejceel.2024.2\(5\).06](https://doi.org/10.59324/ejceel.2024.2(5).06)
- Gillies, R. M. (2023). *education sciences Using Cooperative Learning to Enhance Students ' Learning and Engagement during Inquiry-Based Science*.
- Hairunnissa, R., Burhanuddin, & Junaidi, E. (2023). *Pengembangan Instrumen Evaluasi Two-Tier Multiple Choice Menggunakan Personal Computer Untuk Mengukur Pemahaman Konsep Siswa Pada Materi Larutan Penyangga*. <https://doi.org/10.29303/cep.v6i1.3372>
- Hamdayana, J. (2014). *Model dan Metode Pembelajaran Kreatif dan Berkarakter*. Ghalia Indonesia.
- Hamzanwadi, Selpia, D., Fathurrahman, M., Susilawati, M., & Pratiwi, N. (2024). *PENERAPAN UJI MANN-WHITNEY DALAM PERBANDINGAN PRESTASI AKADEMIK MAHASISWA STATISTIKA UNIVERSITAS*. 2(1), 19–28.
- Jegstad, K. M., & Jegstad, K. M. (2024). Studies in Science Education Inquiry-based chemistry education : a systematic review Inquiry-based chemistry education : a systematic review. *Studies in Science Education*, 60(2), 251–314. <https://doi.org/10.1080/03057267.2023.2248436>
- Jere, S., & Mpeti, M. (2024). Enhancing Learners ' Conceptual Understanding of Reaction Kinetics Using Computer Simulations – A Case Study Approach. *Research in Science Education*, 54(6), 999–1023. <https://doi.org/10.1007/s11165-024-10182-5>
- John D. Bransford, Ann L. Brown, and R. R. C. (2000). *How People Learn: Brain,*

- Mind, Experience, and School: Expanded Edition*. NATIONAL ACADEMY PRESS Washington, D.C. <https://doi.org/10.17226/9853>
- Kementerian Pendidikan, K. R. (2022). *Capaian Pembelajaran Mata Pelajaran Kimia Fase E-Fase F Untuk SMA/MA/Program Paket C2*.
- Kirschner, P., & Clark, R. E. (2004). *Why Discovery Learning, Problem-Based Learning, Experiential Learning and Inquiry-Based Learning Do Not Work*.
- Krab-hu, L. E., Pei, L., Vries, P. G. De, Lindhoud, S., Paulusse, J. M. J., Jonkheijm, P., & Wong, A. S. Y. (2023). *Conceptual Modeling Enables Systems Thinking in Sustainable Chemistry and Chemical Engineering*. <https://doi.org/10.1021/acs.jchemed.3c00337>
- Lafifa, F., Rosana, D., Suyanta, S., Nurohman, S., Rejeki, S., Astuti, D., Sciences, N., Yogyakarta, U. N., Sciences, N., & Yogyakarta, U. N. (2023). *Integrated STEM Approach to Improve 21st Century Skills in Indonesia: A Systematic Review*. 3(2), 252–267.
- Lukum, A., Karongkong, N., Pikoli, M., Tangio, J. S., & Mohamad, E. (2023). *Analysis of Student ' s Conceptual Understanding Using Two-Tier Multiple Choice Diagnostic Test on Acid-Base Topic*. 04003, 1–4.
- Malik, A. (2018). *Pengantar Statistika Pendidikan (Cetakan pertama)*. Deepublish Publisher.
- Mamun, A., Mamun, A. Al, & Lawrie, G. (2023). Student - content interactions : Exploring behavioural engagement with self - regulated inquiry - based online learning modules. *Smart Learning Environments*, 1–31. <https://doi.org/10.1186/s40561-022-00221-x>
- Mashuri, A. (2022). *BUKU AJAR STATISTIKA NON PARAMETRIK*. Inara Publisher.
- McComas, W. F. (2013). *The language of science education: An expanded glossary of key terms and concepts in science teaching and learning*. Springer Science & Business Media.
- Morris, D. L. (2025). *Rethinking Science Education Practices : Shifting from Investigation- Centric to Comprehensive Inquiry-Based Instruction*.
- Mulyadi. (2022). *Teori Belajar Konstruktivisme Dengan Model Pembelajaran (Inquiry)*. 07(36), 174–187.
- Musengimana, J. (2021). *Investigation of Most Commonly Used Instructional Methods in Teaching Chemistry : Rwandan Lower Secondary Schools*. 20(7), 241–261.
- Musil, F., Grisa, A., Bart, A. P., Ortner, C., & Ceriotti, M. (2021). *Physics-Inspired Structural Representations for Molecules and Materials*. <https://doi.org/10.1021/acs.chemrev.1c00021>
- Nardito, J. L. M., Funa, A. A., Dio, R. V., & Learning, R. V. E. I. (2025). *Effectiveness of Inquiry-based Learning (IbL) on Improving Students ' Conceptual Understanding in Science and Mathematics : A Meta-Analysis To cite this article : Effectiveness of Inquiry-based Learning (IbL) o n Improving Students ' Conceptual Unders*.
- Nasir, M., & Cari, C. (2022). *The effect of STEM-based guided inquiry on light concept understanding and scientific explanation*. 18(11).
- Net, W. W. W. P., Suparman, A. R., Rohaeti, E., & Wening, S. (2024). *Student Misconception In Chemistry : A Systematic Literature Review*. 14(2), 238–252. <https://doi.org/10.47750/pegegog.14>

- Nkosi, N. W., & Motlhabane, A. (2025). *THE IMPACT OF INQUIRY-BASED LEARNING ON LEARNERS' UNDERSTANDING OF CHEMICAL CHANGE: A QUASI-EXPERIMENTAL STUDY*. 14(2), 127–138.
- Nugroho, S. (2008). *Metode Statistika Nonparametrika (pertama)*. UNIB Press.
- Ojo, O. T. (2025). *Effectiveness of Open Inquiry Instructional Strategy on Secondary School Chemistry Students' Conceptual Knowledge*. 2(2), 120–130. <https://doi.org/10.70232/jrese.v2i2.20>
- Peperkorn, Y., Buschmann, J., & Schwedler, S. (2024). Research and Practice Comparing drawing tasks and elaborate single-choice questions in simulation-based learning: how do they facilitate students' conceptual. *Royal Society of Chemistry, 2018*, 1030–1051. <https://doi.org/10.1039/d3rp00113j>
- Putri, J. K., Gunawan, C. W., & Wiyatmo, Y. (2024). *Implementation of Guided Inquiry to Increase Students' Interest in Learning Physics and Critical Thinking Skills*. 10(2).
- Ramadhan, M. F., Siroj, R. A., & Afgani, M. W. (2024). *Validitas and Reliabilitas*. 06(02), 10967–10975.
- Raymond Chang; Kenneth Goldsby. (2015). *Chemistry (Twelfth)*. McGraw-Hill Education.
- Sam, R. (2025). *Systematic review of inquiry-based learning: assessing impact and best practices in education*. 1–12.
- Sari, M. U. (2022). *Development of a Guided Inquiry-Based Moodle E-Learning System on the Topic of Salt Hydrolysis*. 23(April), 244–255.
- Solikah, M., & Novita, D. (2022). *THE EFFECTIVENESS OF THE GUIDED INQUIRIES LEARNING MODEL ON THE CRITICAL*. 17(2), 184–191. <https://doi.org/10.29303/jpm.v17i2.3276>
- Sugiyono. (2021). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.
- Suh, N. (1985). *Development of the science base for the manufacturing field through the axiomatic approach*. Pergamon Press Ltd. [https://doi.org/https://doi.org/10.1016/0736-5845\(84\)90030-9](https://doi.org/https://doi.org/10.1016/0736-5845(84)90030-9)
- Sulastris, Rasul, M. S., Juliana, Syahrial, & Zatyia, I. (2025). STEM-BASED GUIDED INQUIRY IN COLLOID PRACTICUMS AND ITS INFLUENCE ON STUDENTS' CONCEPT MASTERY. *Jurnal Pendidikan IPA Indonesia*, 14(2), 296–303. <https://doi.org/10.15294/jpii.v14i2.23967>
- Suryani, E., Prasetyo, Z. K., & Yogyakarta, U. N. (2023). *The Implementation of STEM Approach (Science , Technology , Engineering , and Mathematics) on Science Learning at Elementary School*. 12. <https://doi.org/10.30595/pssh.v12i.814>
- Teng, J., Pang, J., Sun, Y., & Wang, J. (2022). *A new approach to the determination of pK_a and pK_b of Brønsted – Lowry weak acid and weak base in aprotic solvent*. 910(September 2021). <https://doi.org/10.1016/j.jelechem.2022.116172>
- Tohari, B., & Rahman, A. (2024). *Konstruktivisme Lev Semonovich Vygotsky dan Jerome Bruner: Model Pembelajaran Aktif dalam Pengembangan Kemampuan Kognitif Anak*. 4(1).
- Torry, A., Kaminsky, R., & Klotz, R. (1992). *The Effect of Salts on Hydrolysis in Supercritical and Near-Critical Water: Reactivity and Availability?* 163–168.
- Uliyandari, M., Candrawati, E., Ayu, A., & Latipah, N. (2021). *Problem-Based Learning . To . Improve Concept Understanding and Critical Thinking Ability*

- of Science Education Undergraduate Students*. 2(1), 65–72.
- Wang, X. (2024). *Use of proper sampling techniques to research studies*. 0, 141–145. <https://doi.org/10.54254/2755-2721/57/20241324>
- Wayan, I. D., Setiawan, W., & Ertikanto, C. (2022). *Building physics concept understanding and problem-solving ability in online learning through the concept attainment model*. 11(1), 141–150. <https://doi.org/10.24042/jipfalbiruni.v11i1.11775>
- Wibowo, S., Wangid, M. N., Firdaus, F. M., & Info, A. (2025). *The relevance of Vygotsky ' s constructivism learning theory with the differentiated learning primary schools*. 19(1). <https://doi.org/10.11591/edulearn.v19i1.21197>
- Xiao, Y., Han, J., Koenig, K., Xiong, J., & Bao, L. (2018). Multilevel Rasch modeling of two-tier multiple choice test : A case study using Lawson ' s classroom test of scientific reasoning. *Physical Review Physics Education Research*, 14(2), 20104. <https://doi.org/10.1103/PhysRevPhysEducRes.14.020104>

