

DAFTAR PUSTAKA

- A, S., Sarjan, M., Rokhmat, J., Arizona, K., Sucilestari, R., Syahidi, K., Syamsuddin, S., & Mertha, I. G. (2022). Fenomena Sains sebagai Alternatif Meningkatkan Kecakapan Hidup. *Kappa Journal*, 6(1), 38–49. <https://doi.org/10.29408/kpj.v6i1.5523>
- Abdul Razak, S., Makmor Bakry, M., Mohamed Said, M. S., Tan, C. E., & Md Redzuan, A. (2020). Development and Validation of Adherence Score for Subcutaneous Biologic Disease-Modifying Antirheumatic Drugs. *Frontiers in Pharmacology*, 11(November), 1–9. <https://doi.org/10.3389/fphar.2020.572260>
- Adawiyah, R., Yuli, S., Sa'diyah, S., Kurniawan, K., Amirullah, F., Alting, M. G., & Aroyandini, E. N. (2023). Pelatihan dan Pendampingan Manajemen Laboratorium Terpadu dan Perpustakaan Sekolah untuk Meningkatkan Literasi Sains Siswa. *Jurnal Inovasi Pengabdian Masyarakat Pendidikan*, 3(2), 105–117. <https://doi.org/10.33369/jurnalinovasi.v3i2.26762>
- Afkar, R., Afrida, J., & Nasir, M. (2024). Profil Literasi Sains Peserta Didik pada Materi Hukum Newton Tentang Gravitasi di Tingkat SMA/MA. *Intelektualita*, 13(1), 27–45. <https://doi.org/10.22373/ji.v13i1.24740>
- Agiakloglou, C., & Tsimpanos, A. (2023). Evaluating the performance of AIC and BIC for selecting spatial econometric models. In *Journal of Spatial Econometrics* (Vol. 4, Issue 1). Springer International Publishing. <https://doi.org/10.1007/s43071-022-00030-x>
- Ahmad, N. F. D., Jye, A. K. R., Zulkifli, Z., & Bujang, M. A. (2020). The development and validation of job satisfaction questionnaire for health workforce. *Malaysian Journal of Medical Sciences*, 27(6), 128–143. <https://doi.org/10.21315/mjms2020.27.6.12>
- Aiken, L. R. (1985). Three Coefficients for Analyzing the Reliability and Validity of Ratings, Educational and Psychological Measurement. *Educational and Psychological Measurement*, 45(1), 131–142.
- Alamer, A. (2022). Exploratory structural equation modeling (ESEM) and bifactor ESEM for construct validation purposes: Guidelines and applied example. *Research Methods in Applied Linguistics*, 1(1), 100005. <https://doi.org/10.1016/j.rmal.2022.100005>
- Aldridge, J. M., Fraser, B. J., Bell, L., & Dorman, J. (2012). Using a New Learning Environment Questionnaire for Reflection in Teacher Action Research. *Journal of Science Teacher Education*, 23(3), 259–290. <https://doi.org/10.1007/s10972-012-9268-1>
- Aldridge, J. M., Fraser, B. J., & Huang, T. C. I. (1999). Investigating Classroom Environments in Taiwan and Australia with Multiple Research Methods. *Journal of Educational Research*, 93(1), 48–62. <https://doi.org/10.1080/00220679909597628>
- Alqahtani, T. M., Yusop, F. D., & Halili, S. H. (2023). Content Validity of the Constructivist Learning in Higher Education Settings (CLHES) Scale in the Context of the Flipped Classroom in Higher Education. *Humanities and Social Sciences Communications*, 10(1), 1–12. <https://doi.org/10.1057/s41599-023-01754-3>

- Andrade, C. (2018). Learning Curve Internal , External , and Ecological Validity in. *Indian J Psychol Med*, 40(4), 498–499. <https://doi.org/10.4103/IJPSYM.IJPSYM>
- Annisa, A. R., & Putra, A. P. (2020). *Kepraktisan Media Pembelajaran Daya Anti Bakteri Ekstrak Buah Sawo Berbasis Macromedia Flash*. 11(1), 72–80.
- Antonietti, C., Schmitz, M. L., Consoli, T., Cattaneo, A., Gonon, P., & Petko, D. (2023). Development and validation of the ICAP Technology Scale to measure how teachers integrate technology into learning activities. *Computers and Education*, 192(October 2022), 1–14. <https://doi.org/10.1016/j.compedu.2022.104648>
- Areepattamannil, S., Cairns, D., & Dickson, M. (2020). Teacher Directed Versus Inquiry Based Science Instruction: Investigating Links to Adolescent Students' Science Dispositions Across 66 Countries. *Journal of Science Teacher Education*, 31(6), 675–704. <https://doi.org/10.1080/1046560X.2020.1753309>
- Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Rineka Cipta.
- Aryeh Lazar. (2021). The Spiritual Orientation Inventory (SOI): A multidimensional measure of humanistic spirituality. *Springer Nature Switzerland AG*.
- Audiwinanda, S., & Mahmudi, A. (2025). *Validity and reliability of students' mathematical communication instruments in class vii middle school statistics material*. 28(1), 1–12.
- Aziz. (2019). *Pengembangan Bahan Ajar Fisika Validitas, Reliabilitas, Praktikalitas, Dan Efektifitas Bahan Ajar Non Cetak (Meliputi Audio, Audio Visual, Video)*.
- Azwar, S. (2012). Reliabilitas dan Validitas. In *Pustaka Belajar*.
- Azwar, S. (2017). Penyusunan Skala Psikologi. In *Pustaka Belajar*.
- Bahtiar, Ibrahim, & Maimun. (2022). Analysis Of Student' Scientific Literacy Skill in Terms of Gender Using Science Teaching Materials Discovery Model Assisted by Phet Simulation. *Jurnal Pendidikan IPA Indonesia*, 11(3), 371–386. <https://doi.org/10.15294/jpii.v11i3.37279>
- Baker. (2001). *The Basic of Item Response Theory*.
- Basalama, R. A. (2024). Analisis Perbedaan Kemampuan Literasi Sains Peserta Didik di Sekolah Menengah Atas (SMA) dan Madrasah Aliyah (MA) di Kota Depok. *UIN Syarif Hidayatullah*, 464. <https://repository.uinjkt.ac.id/dspace/handle/123456789/61270>
- Bennett, J. (2001). The Relationship Between Classroom Climate and Student Achievement. *University of North Texas*, 3(1), 58–68.
- Bizimana, E., Mutangana, D., & Mwesigye, A. (2022). Students' Perceptions of the Classroom Learning Environment and Engagement in Cooperative Mastery Learning Based Biology Classroom Instruction. *Education Research International*, 2022. <https://doi.org/10.1155/2022/5793394>
- Brandisauskiene, A., Buksnyte Marmiene, L., & Cesnaviciene, J. (2023). Antecedents Predicting Students' Active Use of Learning Strategies in Schools of Low SES Context within the Framework of Self-Determination Theory. *European Journal of Investigation in Health, Psychology and Education*, 13(3), 568–579. <https://doi.org/10.3390/ejihpe13030044>
- Brunswik. (1947). *Systematic and Representative Designs of Psychological*

- Experiments. In Proceedings of The Berkeley Symposium on Mathematical Statistics and Probability.* Berkeley: Univ. Calif. Press.
- Cahaya, N., Fauziah, N., Ferazona, S., & Hidayati, N. (2024). *Vol 4 No 1 Tahun 2024 Hal 48-68 Lembar Praktikalitas : Instrumen yang Digunakan untuk Menilai Produk yang Dikembangkan pada Penelitian Pengembangan Bidang Pendidikan.* 4(1).
- Cai, J., Wen, Q., Lombaerts, K., Jaime, I., & Cai, L. (2022). Assessing Students' Perceptions About Classroom Learning Environments: The New What Is Happening In this Class (NWIHC) Instrument. *Learning Environments Research*, 25(2), 601–618. <https://doi.org/10.1007/s10984-021-09383-w>
- Campbell. (1957). *Factors Relevant to The Validity of Experiments in social Settings.* Psychol. Bull.
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56(2), 81–105. <https://doi.org/10.1037/h0046016>
- Campbell, T. D., & Stanley, J. C. (1963). *Experimental and Quasi Experimental Designs for Research.* IL:Rand McNally.
- Carmine, & Zeller. (1979). Reliability and Validity Assesment. In *Thousand Oaks.* CA: Sage Publications.
- Chan, C. K. Y., Zhao, Y., & Luk, L. Y. Y. (2017). A Validated and Reliable Instrument Investigating Engineering Students' Perceptions of Competency in Generic Skills. *Journal of Engineering Education*, 106(2), 299–325. <https://doi.org/10.1002/jee.20165>
- Chang, J., Faikhamta, C., Na, J., & Song, J. (2018). A comparison of science classroom environments between Korea and Thailand with a focus on their cultural features. *Asia-Pacific Science Education*, 4(1), 1–22. <https://doi.org/10.1186/s41029-018-0028-1>
- Che Lah, N. H., Tasir, Z., & Jumaat, N. F. (2022). An Evaluation of the Online Social Learning Environment Instrument (OSLEI) Using Rasch Model Analysis. *SAGE Open*, 12(2). <https://doi.org/10.1177/21582440221104083>
- Cheung, K. K. C., & Sonkqayi, G. (2023). Students' Science Achievement in Cognitive Domains: Effects of Practical Work and Clarity of Instruction. *Research in Science and Technological Education*, 00(00), 1–18. <https://doi.org/10.1080/02635143.2023.2261014>
- Chinn, C. A., Yoon, S. A., Hussain-Abidi, H., Hunkar, K., Noushad, N. F., Cottone, A. M., & Richman, T. (2023). Designing Learning Environments to Promote Competent Lay Engagement with Science. *European Journal of Education*, 58(3), 407–421. <https://doi.org/10.1111/ejed.12573>
- Clayson, P. E., Carbine, K. A., Baldwin, S. A., Olsen, J. A., & Larson, M. J. (2021). Using generalizability theory and the ERP Reliability Analysis (ERA) Toolbox for assessing test-retest reliability of ERP scores part 1 : Algorithms , framework , and implementation. *International Journal of Psychophysiology*, December 2020. <https://doi.org/10.1016/j.ijpsycho.2021.01.006>
- Cohen, R. J., Schneider, W. J., & Tobin, R. M. (2021). Psychological Testing and Assessment. In *McGraw Hill.*
- Cyril, M. (2019). *Promoting Educational Research Through Effective Instrument Development.* 3(3), 205–212. www.ijarp.org
- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013).

- Creative learning environments in education-A systematic literature review. *Thinking Skills and Creativity*, 8(1), 80–91. <https://doi.org/10.1016/j.tsc.2012.07.004>
- Davies, S. R. (2021). An Empirical and Conceptual Note on Science Communication's Role in Society. *Science Communication*, 43(1), 116–133. <https://doi.org/10.1177/1075547020971642>
- DeH Hurd, P. (1958). Science Literacy: Its Meaning for American Schools. *Educational Leadership*, 16, 13–16.
- Deng, L., & Chan, W. (2017). *Testing the Difference Between Reliability Coefficients Alpha and Omega*. <https://doi.org/10.1177/0013164416658325>
- Djiwandono, S. E. W. (2014). *Psikologi Pendidikan*.
- Dogan, N., Yurtcu, M., & Gundeger, C. (2023). The Effect of Option Differences on Psychometric Properties of Items in Likert-Type Scales. *Sakarya University Journal of Education*, 13(2), 207–237. <https://doi.org/10.19126/suje.1253876>
- Dragos, V., & Mih, V. (2015). Scientific Literacy in School. *Procedia - Social and Behavioral Sciences*, 209(July), 167–172. <https://doi.org/10.1016/j.sbspro.2015.11.273>
- Dweck, C. S. (2006). The New Psychology of Success. In *Random House*.
- Egami, N., & Hartman, E. (2023). Elements of External Validity: Framework, Design, and Analysis. *American Political Science Review*, 117(3), 1070–1088. <https://doi.org/10.1017/S0003055422000880>
- Ekolu, S. O., & Quainoo, H. (2019). *Reliability of assessments in engineering education using Cronbach ' s alpha , KR and split-half methods*. 21(1), 24–29.
- Elhai, J. (2023). Science Literacy : A More Fundamental Meaning. *Journal of Microbiology & Biology Education*, 24(1), 10–16.
- Embretson, S. E., & Raise, S. P. (2000). Item Response Theory for Psychologists. In *Sustainability (Switzerland)* (Vol. 11, Issue 1). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI
- Eser, M. T., & Aktan, D. C. (2021). Educational Data Mining: The Analysis of the Factors Affecting Science Instruction by Clustering Analysis. *International Journal of Educational Methodology*, 7(3), 487–500. <https://doi.org/10.12973/ijem.7.3.487>
- Esty Setyo Utaminingsih, & Ellianawati. (2025). *Development of STEAM Based E-Modules on Human Circulatory Topics Containing Critical Reasoning and Independent Characters*. 0(January), 48–84.
- Evagorou, M., Erduran, S., & Mantyla, T. (2015). The Role of Visual Representations in Scientific Practices: from Conceptual Understanding and Knowledge Generation to 'Seeing' How Science Works. *International Journal of STEM Education*, 2(1), 1–13. <https://doi.org/10.1186/s40594-015-0024-x>
- Fauzi, A., Saefi, M., Adi, W. C., Kristiana, E., & Lestariani, N. (2022). Instrument evaluation of conspiracy theory about COVID-19: Exploratory factor analysis and confirmatory factor analysis. *International Journal of Evaluation and*

- Research in Education*, 11(2), 491–498.
<https://doi.org/10.11591/ijere.v11i2.22339>
- Findley, M., Kikuta, K., & Denly, M. (2015). External Validity. *Dictionary of Statistics & Methodology*. <https://doi.org/10.4135/9781412983907.n709>
- Fischhoff, B. (2013). The Sciences of Science Communication. *Proceedings of the National Academy of Sciences of the United States of America*, 110(SUPPL. 3), 14033–14039. <https://doi.org/10.1073/pnas.1213273110>
- Fraser, B. J. (1981). Learning environment in curriculum evaluation: A review. *Evaluation in Education*, 5(1), 1–93. [https://doi.org/10.1016/0191-765X\(81\)90014-8](https://doi.org/10.1016/0191-765X(81)90014-8)
- Fraser, B. J. (1998). Classroom Environment Instruments: Development, Validity AND Applications. *Psychology of Education*, 161–190. https://doi.org/10.4324/9780203455029_chapter_6
- Fraser, B. J. (2023). The Evolution of the Field of Learning Environments Research. *Education Sciences*, 13(3). <https://doi.org/10.3390/educsci13030257>
- Fraser, B. J., Anderson, G. J., & Walberg, H. J. (1982). Assessment of Learning Environments: Manual for Learning Environment Inventory (LEI) and My Class Inventory (MCI). *ERIC*, 11(1), 1–14. http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI
- Furr, R. M. (2022). Psychometrics: An introduction (Fourth). In *SAGE Publications Ltd.*
- Gable, R. K., & Wolf, M. B. (1993). *Instrument Development in the Affective Domain*. Springer Science Business Media, LLC.
- Gagne, & Bringgs. (1979). *Principles of Instructional Design*. New York.
- Garcia Rodriguez, M. P., Conde Velez, S., Delgado Garcia, M., & Carmona Marquez, J. (2024). Learning Environments in Compulsory Secondary Education (ESO): Validation of The Physical, Learning, Teaching and Motivational Scales. *Learning Environments Research*, 27(1), 53–75. <https://doi.org/10.1007/s10984-023-09464-y>
- Getzels, & Thelen. (1960). *The Classroom Group as a Unique Social System*.
- Goodwin, L. D., & Leech, N. L. (2003). The Meaning of Validity in the New Standards for Educational and Psychological Testing: Implications for Measurement Courses. *Measurement and Evaluation in Counseling and Development*, 36(3), 181–191. <https://doi.org/10.1080/07481756.2003.11909741>
- Guala, F., & Mittone, L. (2005). Experiments in economics: External validity and the robustness of phenomena. *Journal of Economic Methodology*, 12(4), 495–515. <https://doi.org/10.1080/13501780500342906>
- Guilford, J. P. (1965). *Fundamental Statistics in Psychology and Education*. In *New York: McGraw-Hill*.
- Gupta, A., & Sharma, P. (2023). An assessment of the learning environment and teacher interpersonal behaviour at the teacher education level. *Effective Teaching Around the World: Theoretical, Empirical, Methodological and Practical Insights*, 257–281. https://doi.org/10.1007/978-3-031-31678-4_12
- Gupta, S. (2020). *Science and its usage in daily life*. 8(1), 85–88.

- Hadi, S., & Retnawati, H. (2022). Analisis Instrumen Penelitian dengan Teori Tes Klasik dan Modern Menggunakan Program R. In *UNY Press*.
- Hair, J. F., Babin, B. J., Anderson, R. E., & Black, W. C. (2022). *Multivariate Data Analysis*. Cengage Learning.
- Hallez, J. E. (2008). *The Importance of Science in the Classroom and Implications for Teaching Science Effectively*.
- Hambleton, R. K., H. Swaminathan, & Rogers, H. J. (1991). *Fundamental of Item Response Theory*.
- Hambleton, R. K., & Jones, R. W. (1993). Comparison of Classical Test Theory and Item Response Theory and Their Applications to Test Development. *Educational Measurement: Issues and Practice*, 12(3), 38–47. http://solo.bodleian.ox.ac.uk/OXVU1:TN_ericEJ471935
- Hanfstingl, B., Gnambs, T., Porsch, R., & Jude, N. (2024). Exploring the association between non-specialised science teacher rates and student science literacy: an analysis of PISA data across 18 nations. *International Journal of Science Education*, 46(9), 874–892. <https://doi.org/10.1080/09500693.2023.2262729>
- Hanson, C. (2022). Developing scientific literacy to promote 21st century skills. In *Bethel University* (Vol. 20, Issue 1). <https://doi.org/10.26634/jsch.20.1.21018>
- Hardinata, A., Putri, R. E., & Permanasari, A. (2019). Gender difference and scientific literacy level of secondary student: A study on global warming theme. *Journal of Physics: Conference Series*, 1157(2). <https://doi.org/10.1088/1742-6596/1157/2/022016>
- Hartono, A., Djulia, E., Hasruddin, & Jayanti, U. N. A. D. (2023). Biology Students' Science Literacy Level on Genetic Concepts. *Jurnal Pendidikan IPA Indonesia*, 12(1), 146–152. <https://doi.org/10.15294/jpii.v12i1.39941>
- Haruna, M. F., Nurlia, N., & Levianti, S. (2023). Kemampuan Literasi Sains Siswa Pada Materi Virus Pandemi Covid-19 Di Sman 3 Luwuk. *Bio-Lectura : Jurnal Pendidikan Biologi*, 10(1), 18–26. <https://doi.org/10.31849/bl.v10i1.13330>
- Hasan, S., Halim, F., Abdullah, N. A., Hasan, S., Halim, F., & Abdullah, N. A. (2022). *Development and Practicability of The Performance Improvement Training Module (MLPP)* Development and Practicability of The Performance Improvement Training Module (MLPP). 1(10), 1764–1779. <https://doi.org/10.6007/IJARBSS/v12-i10/15384>
- Hasanah, N., & Zuhaida, A. (2018). Desain Madrasah Sains Integratif: Inategrasi Sains Agama dalam Pelaksanaan dan Perangkat Pembelajaran. *Edukasia: Jurnal Penelitian Pendidikan Islam*, 13(1), 155–180.
- Heliawati, L., Lidiawati, L., Adriansyah, P. N. A., & Herlina, E. (2022). Ethnochemistry-Based Adobe Flash Learning Media Using Indigenous Knowledge To Improve Students' Scientific Literacy. *Jurnal Pendidikan IPA Indonesia*, 11(2), 271–281. <https://doi.org/10.15294/jpii.v11i2.34859>
- Heliawati, L., Rubini, B., & Firmayanto, R. (2020). The effectiveness of content and language integrated learning-based teaching material in the topic of the nature of matter on scientific literacy. In *Journal for the Education of Gifted Young Scientists* (Vol. 8, Issue 3, pp. 1061–1070). <https://doi.org/10.17478/JEGYS.736654>
- Henkel, M. (2024). What Shapes Our Trust in Scientific Information? A Review of Factors Influencing Perceived Scientificness and Credibility. *Communications*

in Computer and Information Science.

- Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological Measurement*, 66(3), 393–416. <https://doi.org/10.1177/0013164405282485>
- Herianingtyas, N. L. R. (2022). Penguatan Literasi Sains Siswa MI/SD melalui Pengembangan E-Modul dengan Instrumen Asesmen berbasis Higher Order Thinking Skills. *Elementar: Jurnal Pendidikan Dasar*, 2(1), 15–26. <https://doi.org/10.15408/elementar.v2i1.28353>
- Hermana, M., Danawan, A., & Hidayat, A. (2025). *Design of Website-Based Learning Media to Enhance Critical Thinking Skills in Static Fluid Concepts*. 16(3), 261–271. <https://doi.org/10.26877/jp2f.v16i3.2258>
- Herskovitz, A., Elhija, mohamed A., & Zedan, D. (2019). Whatsapp, el mensaje: La comunicación fuera de clase, la relación alumno-profesor y el ambiente en el aula. *Journal of Information Technology Education: Research*, 18, 73–95.
- Hidayah, F. F., Imaduddin, M., Yuliyanto, E., Tantayanon, S., & Djunaidi, M. C. (2021). Depicting Chemistry Teachers' Perception of Laboratory Environment and Teaching Satisfaction. *Ilkogretim Online*, 20(1), 1340–1350. <https://doi.org/10.17051/ilkonline.2021.01.129>
- Higgins, S., Hall, E., Wall, K., Woolner, P., & McCaughey, C. (2005). The Impact of School Environments: A literature review. *Design Council, January*, 47. <http://128.240.233.197/cflat/news/DCReport.pdf>
- Holbrook, J., & Rannikmae, M. (2009). The Meaning of Scientific Literacy. *The Contributions of Alexander Hamilton Church to Accounting and Management*, 4(3), 17–21. <https://doi.org/10.4324/9781003056584-3>
- Holmefur, M., Sundberg, K., Wettergren, L., & Langius-Eklöf, A. (2015). Measurement properties of the 13-item sense of coherence scale using Rasch analysis. *Quality of Life Research*, 24(6), 1455–1463. <https://doi.org/10.1007/s11136-014-0866-6>
- Holton, G., Rutherford, F. J., & Watson, F. G. (1967). Harvard Project Physics. *New York*, 2.
- Hu, & Bentler. (1999). *Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives*. *Structural Equation Modeling: A Multidisciplinary Journal*.
- Hussain Malik, R., & Abbas Rizvi, A. (2018). Effect of Classroom Learning Environment on Students' Academic Achievement in Mathematics at Secondary Level. *Bulletin of Education and Research*, 40(2), 207–218.
- Hussain, S., Tadesse, T., & Sajid, S. (2015). Norm-Referenced and Criterion-Referenced Test in EFL Classroom. *International Journal of Humanities and Social Science Invention*, 4(10), 24–30. www.ijhssi.org
- Irawan, M. N. L., Yasir, A., Anita, & Hasan, S. (2022). Strategi Lembaga Pendidikan Islam Dalam Menjawab Tantangan Pendidikan Kontemporer. *Jurnal Pendidikan Dan Konseling*, 4, 1349–1358.
- Irianty, R., Selang, R. A. R., Ihsan, H., Supriyati, Y., & Falani, I. (2025). *Generalizability Theory Analysis of Local Curriculum Validation Instruments: Item Effects and Rater Consistency*. 17, 6963–6970. <https://doi.org/10.35445/alishlah.v17i4>
- ISO 9241-11. (2018). *Usability: Definitions and concepts*.

- Jawad, M. K., & Anggraini, F. (2024). *Aktualisasi Hasil AKMI dalam Meningkatkan Literasi Sains Menggunakan Handout Multimedia Berbantuan Games*. 1(1), 128–138.
- Jufrida, J., Basuki, F. R., Kurniawan, W., Pangestu, M. D., & Fitaloka, O. (2019). Scientific literacy and science learning achievement at junior high school. *International Journal of Evaluation and Research in Education*, 8(4), 630–636. <https://doi.org/10.11591/ijere.v8i4.20312>
- Kane, M. N. (2006). *Educational Measurement* (4th ed). American Council on Education and National Council on Measurement in Education.
- Kang, J. (2022). Interrelationship Between Inquiry-Based Learning and Instructional Quality in Predicting Science Literacy. *Research in Science Education*, 52(1), 339–355. <https://doi.org/10.1007/s11165-020-09946-6>
- Kasali, J., & Adeyemi, A. A. (2022). Model-Data Fit using Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and The Sample-Size-Adjusted BIC. *Square : Journal of Mathematics and Mathematics Education*, 4(1), 43–51. <https://doi.org/10.21580/square.2022.4.1.11297>
- Kemenag. (2024). Framework Asesmen Kompetensi Madrasah Indonesia (AKMI). In *Direktorat Jenderal Pendidikan Islam*.
- Khalil, N., & Aldridge, J. (2019). Assessing students' perceptions of their learning environment in science classes in the United Arab Emirates. *Learning Environments Research*, 22(3), 365–386. <https://doi.org/10.1007/s10984-019-09279-w>
- Khery, Y., Sarjan, M., Ahzan, S., & Efendi, I. (2022). Konseptualisasi Literasi Sains Mengacu pada Kerangka Sains Pisa Sejak Tahun 2000. *Educatioria : Jurnal Ilmiah Ilmu Pendidikan*, 2(4), 200–231. <https://doi.org/10.36312/ejiip.v2i4.117>
- Khine, M. S., Fraser, B. J., & Afari, E. (2020). Structural relationships between learning environments and students' non-cognitive outcomes: secondary analysis of PISA data. *Learning Environments Research*, 23(3), 395–412. <https://doi.org/10.1007/s10984-020-09313-2>
- Kline. (2016). Principles and Practices of Structural Equation Modelling (Fourth). In *The Guilford Press*.
- Klosterman, P., & Stein, S. (2023). A Comparison of The University Mathematics Learning Environment With Its High School Equivalent. *Learning Environments Research*, 26(2), 361–378. <https://doi.org/10.1007/s10984-022-09435-9>
- KMA Nomor 1503 Tahun 2025 (2025).
- Kusaeri, Ridho, A., & Wahyudi, N. (2024). The Use of Stocking-Lord and Haebara Methods in Horizontal Equating: A Case of Indonesian Madrasah Competence Assessment. *Jurnal Pengukuran Psikologi Dan Pendidikan Indonesia*, 13(1), 57–79. <https://doi.org/10.15408/jp3i.v13i1.38300>
- Kwan, Y. W. (2020). Psychometric properties of a Chinese version of the Constructivist Learning Environment Survey among secondary-school students in Hong Kong. *Learning Environments Research*, 23(2), 167–184. <https://doi.org/10.1007/s10984-019-09301-1>
- Kyriazos, T. A. (2018). Applied Psychometrics: Writing-Up a Factor Analysis Construct Validation Study with Examples. *Psychology*, 09(11), 2503–2530. <https://doi.org/10.4236/psych.2018.911144>

- Latief, A. (2023). Peranan Pentingnya Lingkungan Belajar Bagi Anak. *Jurnal Kependidikan*, 13(1), 104–116.
- Laugsch, R. C. (1999). Scientific Literacy: A Conceptual Overview. *Science Education*, 85(1), 71–73. [https://doi.org/10.1002/\(SICI\)1098-237X\(200001\)84](https://doi.org/10.1002/(SICI)1098-237X(200001)84)
- Lawshe, C. H. (1975). a Quantitative Approach To Content Validity. *Personnel Psychology*, 28(4), 563–575. <https://doi.org/10.1111/j.1744-6570.1975.tb01393.x>
- Lee, A. (2023). The Importance of Cultivating Awareness of Environmental Matters in Science Classrooms: A Cross Regional Study. *Australian Journal of Environmental Education*, 39(4), 467–491. <https://doi.org/10.1017/ae.2023.7>
- Leon, A. C., Davis, L. L., & Kraemer, H. C. (2011). The role and interpretation of pilot studies in clinical research. *Journal of Psychiatric Research*, 45(5), 626–629. <https://doi.org/10.1016/j.jpsychires.2010.10.008>
- Lertsakulbunlue, S., & Kantiwong, A. (2025). Evaluating the dependability of peer assessment in project - based learning for pre - clinical students: a generalizability theory approach. *BMC Medical Education*. <https://doi.org/10.1186/s12909-025-06772-0>
- Lewin. (1936). *Principles of Topological Psychology*. New York: McGraw-Hill Book Company, Inc.
- Li, S., Liu, X., Yang, Y., & Tripp, J. (2022). Effects of Teacher Professional Development and Science Classroom Learning Environment on Students' Science Achievement. *Research in Science Education*, 52(4), 1031–1053. <https://doi.org/10.1007/s11165-020-09979-x>
- Liang, T., & Wells, C. S. (2009). A model fit statistic for generalized partial credit model. *Educational and Psychological Measurement*, 69(6), 913–928. <https://doi.org/10.1177/0013164409332222>
- Long, C. S., Sinclair, B. B., Fraser, B. J., Larson, T. R., & Harrell, P. E. (2022). Preservice teachers' perceptions of learning environments before and after pandemic-related course disruption. In *Learning Environments Research* (Vol. 25, Issue 2, pp. 343–357). <https://doi.org/10.1007/s10984-021-09376-9>
- Ma, S., Wang, Y., Shu, Z., Duan, Z., & Sun, L. (2024). Development and validation of internet literacy scale for high school students. *Education and Information Technologies*, 29(2), 1427–1454. <https://doi.org/10.1007/s10639-023-11641-8>
- Maimunah, S., Hidayati, Z., Kusaeri, K., Suparto, S., & Malyuna, S. I. (2025). Comparison of GRM and GPCM in the Development of Higher Education Practice Assessment Instruments. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, 7(2), 286–303. <https://doi.org/10.37680/scaffolding.v7i2.7281>
- Majid, Z. A. (2017). Pendidikan Sains Berbasis Spiritualitas Dalam Perspektif Al-Qur'an. *Al Marhalah*, 7(2), 1–8.
- Manzi. (2012). *Uncontrolled: The surprising payoff of trial and error for business, politics, and society*. Baisc Books.
- Mardapi, D. (2008). *Teknik Penyusunan Instrumen Tes dan Non Tes*. Mitra Cendekia Press.
- Mardapi, D., Kholis, N., & Kartowagiran, B. (2020). Development and validation

- of an instrument to measure a performance of vocational high school. *European Journal of Educational Research*, 9(3), 955–966. <https://doi.org/10.12973/EU-JER.9.3.955>
- Mariyana, R., & Setiasih, O. (2018). Penataan Lingkungan Belajar Terpadu Untuk Meningkatkan Potensi Kecerdasan Jamak Anak. *Pedagogia*, 15(3), 241. <https://doi.org/10.17509/pdgia.v15i3.11020>
- Maroco, J., Harju Lukkainen, H., & Rautopuro, J. (2024). Worldwide Predictors of Science Literacy in Lower Secondary Students: A TIMSS 2019 Analysis. *International Journal of Science Education*, 1–19. <https://doi.org/10.1080/09500693.2024.2394239>
- Masuwai, A., Zulkifli, H., & Hamzah, M. I. (2025). Social Sciences & Humanities Open Exploratory factor analysis of secondary school Islamic Education Teacher self-assessment Instrument: A pilot study. *Social Sciences & Humanities Open*, 11(July 2024), 101573. <https://doi.org/10.1016/j.ssaho.2025.101573>
- Mazlini, A., Mohd Faizal Nizam, L. A., Marzita, P., Che Nidzam, C. A., & Siti Mistima, M. (2014). The Learning Environment and Mathematics Achievement of Students of High Performance Schools (HPS). *Jurnal Pendidikan Matematik*, 2(1), 1–15.
- McChesney, K., & Cross, J. (2023). How School Culture Affects Teachers' Classroom Implementation of Learning From Professional Development. *Learning Environments Research*, 26(3), 785–801. <https://doi.org/10.1007/s10984-023-09454-0>
- Medvedev, O. N. (2020). *Applying Generalizability Theory to the Self-Compassion Scale to Examine State and Trait Aspects and Generalizability of Assessment Scores*.
- Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of Cardiac Anaesthesia*, 22(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18
- Moeed, A. (2015). *Science Laboratory Learning Environment, and Learning*. 11–23. https://doi.org/10.1007/978-981-287-384-2_2
- Mohammed, S. H., & Kinyo, L. (2022). The cross-cultural validation of the technology-enhanced social constructivist learning environment questionnaire in the Iraqi Kurdistan Region. In *Research and Practice in Technology Enhanced Learning* (Vol. 17, Issue 1). <https://doi.org/10.1186/s41039-022-00199-7>
- Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), 192–222. <https://doi.org/10.1287/isre.2.3.192>
- Morgado, F. F. R., Meireles, J. F. F., Neves, C. M., Amarala, A. C. S., & Ferreira, M. E. C. (2017). Scale Development: Ten Main Limitations and Recommendations to Improve Future Research Practices. *Psicologia: Reflexao e Critica*, 30(1), 1–20. <https://doi.org/10.1186/s41155-016-0057-1>
- Mujtaba, T., & Reiss, M. (2022). The Development of an 'Attitudes to Science and Religion' Instrument for Secondary School Students: How Are the Attitudes of Students to Science and Religion Associated with Student Religion and Other Characteristics? *Education Sciences*, 12(12). <https://doi.org/10.3390/educsci12120937>

- Muljono, P. (2002). *Penyusunan dan Pengembangan Instrumen Penelitian*.
- Murray. (1938). *Explorations in Personality*. Oxford Univ. Press.
- Mustakim, R. I., & Nasrudin. (2024). Integrasi Hasil AKMI untuk Pemilihan Mata Pelajaran Pilihan Fase F Madrasah Aliyah. *Journal of Madrasah Studies*, 1(1), 189–202.
- Naga, D. S. (2022). *Teori Sekor pada Pengukuran Mental*. Nagrani Citrayasa.
- Natalya, L., & Purwanto, C. V. (2018). Exploratory and Confirmatory Factor Analysis of the Academic Motivation Scale (AMS)—Bahasa Indonesia. *Makara Human Behavior Studies in Asia*, 22(1), 29. <https://doi.org/10.7454/hubs.asia.2130118>
- Nieveen. (1999). *Design Approaches and Tools in Education and Training*. Dordrecht: Kluwer Academic Publishers.
- Nofiana, M., & Julianto, T. (2018). Upaya Peningkatan Literasi Sains Siswa Melalui Pembelajaran Berbasis Keunggulan Lokal. *Biosfer : Jurnal Tadris Biologi*, 9(1), 24–35.
- Norambuena Melendez, M., Guerrero, G. R., & Gonzalez Weil, C. (2023). What is Meant by Scientific Literacy in The Curriculum? A Comparative Analysis Between Bolivia and Chile. *Cultural Studies of Science Education*, 18(3), 937–958. <https://doi.org/10.1007/s11422-023-10190-3>
- NRC. (1996). *National Science Education Standards*. National Academies Press.
- Nugraeni, M. H., & Paidi. (2021). Instructional designs to promote scientific literacy on students and teachers: A review study. *Journal of Physics: Conference Series*, 1788(1). <https://doi.org/10.1088/1742-6596/1788/1/012042>
- Nunnally, & Bernstein. (2006). *Psychometric Theory* 3rd ed. In Ventura. CA: Cram 101 Incorporated.
- Nurdiyanti, Saugi, W., & Nurhikmah. (2024). Kemampuan Literasi Sains Siswa Pada Mata Pelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS) Di Madrasah Ibtidaiyah. *BJSME: Borneo Journal of Science and Mathematics Education*, 4(June), 96–112.
- Nurjanah, E. (2021). Kesiapan Calon Guru SD dalam Implementasi Asesmen Nasional. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*, 3(2), 76–85. <https://doi.org/10.36232/jurnalpendidikandasar.v3i2.1120>
- O'Connor. (2002). *How to Grade for Learning*. In Corwin Press.
- Ocy, D. R., & Sarifah, I. (2025). *EFA and CFA analysis : Development and validation of a test instrument for mathematical abstraction skills*. 10(2), 101–119.
- OECD. (2019). *PISA 2018 Assessment and Analytical Framework*.
- OECD. (2023a). PISA 2022 Results. In *Perfiles Educativos* (Vol. 46, Issue 183). <https://doi.org/10.22201/iissue.24486167e.2024.183.61714>
- OECD. (2023b). PISA 2025 Science Framework. *OECD*, May 2023, 1–93.
- Oo, C. Z., Khine, M. S., & San, N. M. H. (2022). A Reliability Generalization Meta-Analysis of “What Is Happening in This Class?” (WIHIC) Questionnaire. *Education Sciences*, 12(12). <https://doi.org/10.3390/educsci12120929>
- Orcan, F. (2023). *Comparison of cronbach ' s alpha and McDonald ' s omega for ordinal data : Are they different ?* 10(4), 709–722.
- Paneiva Pompa, J. P., Bakker, L., & Rubiales, J. (2021). Classroom Climate In The Secondary School Of Mar Del Plata. *Psicologia Escolar e Educacional*, 25,

- 1–9. <https://doi.org/10.1590/2175-35392021221999>
- Paola, C., Schwall, P., Meesters, C., & Hardt, J. (2023). Social Sciences & Humanities Open Estimating reliability: A comparison of Cronbach's α , McDonald's ω and the greatest lower bound. *Social Sciences & Humanities Open*, 7(1), 100368. <https://doi.org/10.1016/j.ssaho.2022.100368>
- Parsons. (2007). *Structural Functional Analysis*. Blackwell Publishing.
- Pearl, & Mackenzie. (2018). *The book of why*. Penguin.
- Peeters, M. J., Cor, M. K., Petite, S. E., & Schroeder, M. N. (2021). *Note Validation Evidence using Generalizability Theory for an Objective Structured Clinical Examination*. 12(1), 1–5.
- Permatasari, P., & Fitriza, Z. (2019). Analisis Literasi Sains Siswa Madrasah Aliyah pada Aspek Konten, Konteks, dan Kompetensi Materi Larutan Penyangga. *EduKimia*, 1(1), 53–59. <https://doi.org/10.24036/ekj.v1i1.104087>
- Pertiwi, U. D., Atanti, R. D., & Ismawati, R. (2018). Pentingnya Literasi Sains pada Pembelajaran IPA SMP Abad 21. *Indonesian Journal of Natural Science Education (IJNSE)*, 1(1), 24–29. <https://doi.org/10.31002/nse.v1i1.173>
- Peters, E., Hibbard, J., Slovic, P., & Dieckmann, N. (2007). Numeracy skill and the communication, comprehension, and use of risk-benefit information. *Health Affairs*, 26(3), 741–748. <https://doi.org/10.1377/hlthaff.26.3.741>
- Petrik, S., & Vasasova, Z. (2022). Relationship Between Interaction Style-Built Teacher Authority and Classroom Climate Dimensions. *New Educational Review*, 68, 107–118. <https://doi.org/10.15804/ner.22.68.2.08>
- Pfledderer, C. D., von Klingraeff, L., Burkart, S., da Silva Bandeira, A., Lubans, D. R., Jago, R., Okely, A. D., van Sluijs, E. M., Ioannidis, J. P., Thrasher, J. F., Li, X., & Beets, M. W. (2023). Expert Perspectives on Pilot and Feasibility Studies: A Delphi Study and Consolidation of Considerations for Behavioral Interventions. In *Research square*. <https://doi.org/10.21203/rs.3.rs-3370077/v1>
- Piaget, J. (1997). Development and Learning. In *The Routledge Companion to Philosophy of Psychology* (pp. 485–504). <https://doi.org/10.4324/9780429244629-30>
- Plomp. (2013). *Educational Design Research*. Netherlands Institute for Curriculum Development (SLO).
- Polat, H., Turan, G. B., & Tan, M. (2020). Determination of the relationship of the spiritual orientation of nurses with compassion fatigue, burnout, and compassion satisfaction. *Perspectives in Psychiatric Care*, 56(4), 920–925. <https://doi.org/10.1111/ppc.12513>
- Pratama, R., Alamsyah, M., Siburian, M. F., Marhento, G., Jonathan, G. L., & Susanti, W. (2024). Analisis Kemampuan Literasi Sains Peserta Didik pada Mata Pelajaran IPA. *Jurnal Pendidikan MIPA*, 14(02), 576–581. <https://ejournal.tsb.ac.id/index.php/jpm/article/download/1619/864/>
- Pusbelina, A. R., & Sutrisno, H. (2025). *Development Instrument Independence Study in Chemistry Learning Using Exploratory Factor Analysis (EFA) and Factor Analysis Confirmatory (CFA)*. 11(5), 869–876. <https://doi.org/10.29303/jppipa.v11i5.9790>
- Rahayu, P., & Adityarini, E. (2024). Inovasi Pembelajaran STEAM Berbasis Hasil AKMI untuk Meningkatkan Kompetensi Siswa Madrasah di Era Digital. *Journal of Madrasah Studies*, 1(1), 1–10.

- Rahayu, W., & Harjono, D. (2015). *Estimation Comparison of Multidimensional Reliability Coefficients Measurement of Senior High School Students' Affection towards Mathematics*. 3(11), 1444–1449. <https://doi.org/10.12691/education-3-11-15>
- Rahayu, W., Putra, M. D. K., Rahmawati, Y., Hayat, B., & Koul, R. B. (2021). Validating an Indonesian version of the what is happening in this class? (wihic) questionnaire using a multidimensional Rasch model. *International Journal of Instruction*, 14(2), 919–934. <https://doi.org/10.29333/iji.2021.14252a>
- Rahmawati, Y., Taylor, E., Taylor, P. C., & Koul, R. (2021). Student empowerment in a constructivist values learning environment for a healthy and sustainable world. *Learning Environments Research*, 24(3), 451–468. <https://doi.org/10.1007/s10984-020-09336-9>
- Ravinder, E. B., & Saraswathi, A. B. (2020). *Literature Review Of Cronbach's Alpha Coefficient (α) And McDonald's Omega Coefficient (Ω)*. 07(06), 2943–2949.
- Recker, J., & Rosemann, M. (2010). A Measurement Instrument for Process Modeling Research. *Scandinavian Journal of Information Systems*, 22(2), 3–30.
- RI, K. A. (2024). *Prosedur Operasional Standar Penyelenggaraan Asesmen Kompetensi Madrasah Indonesia*. Direktorat Jenderal Pendidikan Islam.
- Ringel, M. D., Sosa, J. A., Baloch, Z., Bischoff, L., Bloom, G., Brent, G. A., Brock, P. L., Chou, R., Flavell, R. R., Goldner, W., Grubbs, E. G., Haymart, M., Larson, S. M., Leung, A. M., Osborne, J., Ridge, J. A., Robinson, B., Steward, D. L., Tufano, R. P., & Wirth, L. J. (2025). *2025 American Thyroid Association Management Guidelines for Adult Patients with Differentiated Thyroid Cancer*. 35(8), 841–985. <https://doi.org/10.1177/10507256251363120>
- Robbia, A. Z., & Fuadi, H. (2020). Pengembangan Keterampilan Multimedia Interaktif Pembelajaran IPA Untuk Meningkatkan Literasi Sains Peserta Didik di Abad 21. *Jurnal Ilmiah Profesi Pendidikan*, 5(2), 117–123. <https://doi.org/10.29303/jipp.v5i2.125>
- Robert L. Brennan. (2001). *Generalizability Theory*. University of Iowa.
- Rogers, J. R., & Fraser, B. J. (2022). Sex and frequency of practical work as determinants of middle-school science students' learning environment perceptions and attitudes. *Learning Environments Research*, 26(2), 315–336. <https://doi.org/10.1007/s10984-022-09426-w>
- Romaliana, H. (2024). *Kementerian Agama Merilis Hasil Asesmen Kompetensi Madrasah 2024*. Kemenag. <https://kemenag.go.id/nasional/kementerian-agama-merilis-hasil-asesmen-kompetensi-madrasah-2024-bmN7I>
- Rosyid, H. Al, Rakhmadani, D. P., & Alika, S. D. (2022). *Evaluasi Usability pada Aplikasi OVO Menggunakan Metode System Usability Scale (SUS)*. 9(6), 1808–1815. <https://doi.org/10.30865/jurikom.v9i6.5073>
- Rusticus, S. A., Pashootan, T., & Mah, A. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, 26(1), 161–175. <https://doi.org/10.1007/s10984-022-09410-4>
- Ryan, E., & Poole, C. (2019). Impact of Virtual Learning Environment on Students' Satisfaction, Engagement, Recall, and Retention. *Journal of Medical Imaging*

- and *Radiation Sciences*, 50(3), 408–415.
<https://doi.org/10.1016/j.jmir.2019.04.005>
- Sahyar, Bunawan, W., & Yanti, J. (2020). Analysis of competency level for wave science in general physics-based on literacy science in pisa. *Journal of Physics: Conference Series*, 1485(1). <https://doi.org/10.1088/1742-6596/1485/1/012012>
- Saihong, P., Chanthala, C., & Santiboon, T. T. (2022). *Language And Cultural For Being Teacher Class Inventory For Enhancing Creative Thinking Abilities Of Graduate Students In*. 6(6), 8143–8149.
- Sangkala, N. R., & Doorman, L. M. (2019). The influence of inquiry-based learning on Indonesian students' attitude towards science. *Journal of Physics: Conference Series*, 1321(3). <https://doi.org/10.1088/1742-6596/1321/3/032123>
- Sanjiartha, I. G. D., Suwindia, I. G., & Winangun, I. M. A. (2024). Peran literasi sains dalam membentuk generasi berfikir kritis dan inovatif : kajian literature review. *Education and Social Science Review*, 5(2), 120–128.
- Santoso. (2017). Statistik Multivariat dengan SPSS. In *Elex Media Komputindo*.
- Sappaile, B. I. (2007). Konsep Instrumen Penelitian Pendidikan. *Jurnal Pendidikan Dan Kebudayaan*.
- Saputri, E., & Khoirul, M. (2024). Implementasi Literasi Sains dalam Pembelajaran IPA Fase E dengan model Literasi , Orientasi , Kolaborasi , Refleksi (LOK-R). *Journal of Madrasah Studies*, 1(1), 47–56.
- Sari, C. M., Ridwan, A., & Sastrawijaya, Y. (2023). Developing Students' Numeracy Skills Through Numeracy Learning Environment. *Djuanda International Conference*, 261–270.
- Sarioglan, A. B. (2021). Development of Inquiry-Based Learning Environment Scale: A Validity and Reliability Study. *Malaysian Online Journal of Educational Sciences*, 9(4), 27–40. https://www.proquest.com/scholarly-journals/development-inquiry-based-learning-environment/docview/2608792431/se-2?accountid=13042%0Ahttp://oxfordsfx.hosted.exlibrisgroup.com/oxford?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=artikel
- Sarwono, S. W. (2010). *Teori-Teori Psikologi Sosial*. Raja Grafindo Persada.
- Schreiber, J. B., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research*, 99(6), 323–338. <https://doi.org/10.3200/JOER.99.6.323-338>
- Sen, A. I., Ertas-Kılıc, H., Oktay, O., Ekinci, S., & Kadirhan, Z. (2021). Learning science outside the classroom: development and validation of the out-of-school learning environments perception scale. *Journal of Outdoor and Environmental Education*, 24(1), 19–36. <https://doi.org/10.1007/s42322-020-00070-7>
- Sharkey, M., & Gash, H. (2020). Teachers' Constructivist and Ethical Beliefs. *Behavioral Sciences*, 10(6), 1–13. <https://doi.org/10.3390/BS10060096>
- Shrestha, N. (2021). Factor Analysis as a Tool for Survey Analysis. *American Journal of Applied Mathematics and Statistics*, 9(1), 4–11. <https://doi.org/10.12691/ajams-9-1-2>
- Sinyanyuri, S., Utomo, E., Sumantri, M. S., & Iasha, V. (2022). Literasi Sains dan

- Asesmen Kompetensi Minimum (AKM): Integrasi Bahasa dalam Pendidikan Sains. *Jurnal Basicedu*, 6(1), 1331–1340. <https://doi.org/10.31004/basicedu.v6i1.2286>
- Skogen, J. C., Thørrisen, M. M., Knudsen, A. K. S., Reneflot, A., & Sivertsen, B. (2024). Screening student drinking behaviors: examining AUDIT criterion validity using CIDI-based alcohol use disorder as the ‘gold standard.’ *Frontiers in Public Health*, 12(April), 1–10. <https://doi.org/10.3389/fpubh.2024.1328819>
- Sriyanti. (2011). *Psikologi Belajar*.
- Stefana, A., Damiani, S., Granzio, U., Provenzani, U., Solmi, M., & Fusar-poli, P. (2025). *Behavioral sciences measurement scales : best practice guidelines for their development and validation*. January. <https://doi.org/10.3389/fpsyg.2024.1494261>
- Stein, S., & Klosterman, P. (2020). Nature of Learning Environment in Concurrent Enrollment Mathematics Classrooms: a Cluster Analysis. *Learning Environments Research*, 23(2), 217–234. <https://doi.org/10.1007/s10984-019-09295-w>
- Sturrock, G., & Zandvliet, D. (2023). Effective teaching: Linking outcomes of active citizenship to learning environments. *Effective Teaching Around the World: Theoretical, Empirical, Methodological and Practical Insights*, 97–117. https://doi.org/10.1007/978-3-031-31678-4_5
- Suarez-Mesa, A. M., & Gomez, R. L. (2024). Does teachers’ motivation have an impact on students’ scientific literacy and motivation? An empirical study in Colombia with data from PISA 2015. *Large-Scale Assessments in Education*, 12(1), 1–28. <https://doi.org/10.1186/s40536-023-00190-8>
- Subiantoro, A. W., & Treagust, D. F. (2021). Development and validation of an instrument for assessing high-school students’ perceptions of socio-scientific issues-based learning in biology. *Learning Environments Research*, 24(2), 223–237. <https://doi.org/10.1007/s10984-020-09332-z>
- Sugiyono. (2015). *Metode Penelitian Kuantitatif*. Alfabeta.
- Suharya, R. (2019). Fenomena Perjudian Dikalangan Remaja Kecamatan Samarinda Seberang. *Jurnal Sosiatri-Sosiologi*, 7(3), 326–340. ejournal.sos.fisip-unmul.ac.id
- Sukmadinata, N. S. (2009). *Metode Penelitian Pendidikan*. Remaja Rosdakarya.
- Sukmawati, Sudarmin, & Salmia. (2023). *Development of Quality Instruments and Data Collection Techniques*. 6(1), 119–124.
- Sumintono, B., & Widhiarso, W. (2015). *Aplikasi Pemodelan Rasch pada Assesment Pendidikan* (Issue October). Trim Komunikata.
- Sunday Dorathy, Dr. A. Amadioha, D. G. W. O. (2021). *Application of Generalizability Theory in the Estimation Dependability of Critical*. 8056(9), 171–178. <https://doi.org/10.36347/sjpms.2021.v08i09.002>
- Supardan, D. (2015). Teori-Teori Belajar dan Pembelajaran. In *Yayasan Rahardja*.
- Suryadi, B., & Hayat, B. (2021). *Religiusitas*. bibliosmia.
- Sutrisna, N. (2021). Mixed Method Writing. *Jurnal Inovasi Penelitian*, 1(12), 2683–2694. <https://www.chegg.com/writing/guides/research/mixed-methods-research/>
- Szpytma, C., & Szpytma, M. (2019). Model of 21st century physical learning environment (MoPLE21). *Thinking Skills and Creativity*, 34(April), 100591.

<https://doi.org/10.1016/j.tsc.2019.100591>

- Taylor, S. P. (2023). Students' Perceptions of Their First Experiences of Secondary-School Science in New Zealand. In *Learning Environments Research* (Vol. 26, Issue 1, pp. 291–310). <https://doi.org/10.1007/s10984-022-09427-9>
- Tirado-Morueta, R., García-Ruíz, R., Hernando-Gómez, Á., Contreras-Pulido, P., & Aguaded-Gómez, J. I. (2023). The role of teacher support in the acquisition of digital skills associated with technology-based learning activities: the moderation of the educational level. *Research and Practice in Technology Enhanced Learning*, 18. <https://doi.org/10.58459/rptel.2023.18010>
- Trickett, E. J., & Moos, R. H. (1973). Social environment of junior high and high school classrooms. *Journal of Educational Psychology*, 65(1), 93–102. <https://doi.org/10.1037/h0034823>
- UNESCO. (2013). Unesco 2012. *UNESCO*, 1–124. <http://unesdoc.unesco.org/images/0022/002204/220416f.pdf>
- Uno, H. B. (2021). *Teori Motivasi dan Pengukurannya*. Bumi Aksara.
- Uslu, S., & Körükcü, M. (2020). The Outcomes of Constructivist Learning Environments from the Perspectives of Secondary School Students. In *International Education Studies* (Vol. 13, Issue 8, p. 16). <https://doi.org/10.5539/ies.v13n8p16>
- Vitikka, E., Krokfors, L., & Hurmerinta, E. (2012). The Finnish national core curriculum structure and development. *Miracle of Education: The Principles and Practices of Teaching and Learning in Finnish Schools*, 9789460918, 83–96. https://doi.org/10.1007/978-94-6091-811-7_6
- Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.
- Wahyuni, T. (2025). Pengembangan Model Instrumen untuk Profil Pelajar Pancasila dengan Metode Tes Pertimbangan Situasional. In *Disertasi UNJ*.
- Wahyuningsih, H. (2009). Validitas Konstruksi Alat Ukur Spirituality Orientation Inventory (SOI). *Jurnal Psikologi*, 36(2), 116–129.
- Walberg, H. J. (1968). *Teacher Personality and Classroom Climate*. Harvard University, C.
- Wallmark, J., Ramsay, J. O., Li, J., & Wiberg, M. (2024). Analyzing Polytomous Test Data: A Comparison Between an Information-Based IRT Model and the Generalized Partial Credit Model. *Journal of Educational and Behavioral Statistics*, 49(5), 753–779. <https://doi.org/10.3102/10769986231207879>
- Wang, H., Li, L., Wu, J., & Gao, H. (2023). Scientific Information Literacy: Adaption of Concepts and an Investigation Into the Chinese Public. *Media and Communication*, 11(1), 335–348. <https://doi.org/10.17645/mac.v11i1.6077>
- Wang, Y. S., Tseng, T. H., Wang, Y. M., & Chu, C. W. (2020). Development and validation of an internet entrepreneurial self-efficacy scale. *Internet Research*, 30(2), 653–675. <https://doi.org/10.1108/INTR-07-2018-0294>
- Wind, S. A. (2023). Detecting Rating Scale Malfunctioning With the Partial Credit Model and Generalized Partial Credit Model. In *Educational and Psychological Measurement* (Vol. 83, Issue 5). <https://doi.org/10.1177/00131644221116292>
- Worthington, R. L., & Whittaker, T. A. (2006). Scale Development Research: A Content Analysis and Recommendations for Best Practices. *The Counseling Psychologist*, 34(6), 806–838. <https://doi.org/10.1177/0011000006288127>

- Wu, L. Y., Wu, S. P., & Chang, C. Y. (2019). Merging science education into communication: Developing and validating a scale for Science Edu-Communication utilizing awareness, enjoyment, interest, opinion formation, and understanding dimensions (SEC-AEIOU). *Sustainability (Switzerland)*, *11*(17). <https://doi.org/10.3390/su11174551>
- Wulandari, F., Setiyawati, E., & Su'Udiyah, F. (2021). An Analysis of Teacher Candidates Scientific Literacy through Nature of Science (NoS) in Inquiry-Based Learning. *Journal of Physics: Conference Series*, *1764*(1). <https://doi.org/10.1088/1742-6596/1764/1/012102>
- Yandi, A., Nathania Kani Putri, A., & Syaza Kani Putri, Y. (2023). Faktor-Faktor Yang Mempengaruhi Hasil Belajar Peserta Didik (Literature Review). *Jurnal Pendidikan Siber Nusantara*, *1*(1), 13–24. <https://doi.org/10.38035/jpsn.v1i1.14>
- Yang, S., Liu, L., & Hunt, N. (2022). Exploring the influence of perceived classroom environment on learner autonomy in a Chinese EFL learning context. *Frontiers in Psychology*, *13*(November), 1–11. <https://doi.org/10.3389/fpsyg.2022.1063473>
- Yuliati, Y. (2017). Literasi Sains Dalam Pembelajaran Ipa. In *Jurnal Cakrawala Pendas* (Vol. 3, Issue 2). <https://doi.org/10.31949/jcp.v3i2.592>
- Yusmar, F., & Fadilah, R. E. (2023). Analisis Rendahnya Literasi Sains Peserta Didik Indonesia: Hasil Pisa Dan Faktor Penyebab. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, *13*(1), 11–19. <https://doi.org/10.24929/lensa.v13i1.283>
- Zamanzadeh, V., Rassouli, M., Abbaszadeh, A., Majd, H. A., Nikanfar, A., & Ghahramanian, A. (2014). Details of Content Validity and Objectifying it in Instrument Development. *Nursing Practice Today*, *1*(3), 163–171.
- Zaturrahmi. (2019). Lingkungan Belajar Sebagai Pengelolaan Kelas: Sebuah Kajian Literatur. *E-Tech*, *00*(00), XX–XX. <https://doi.org/10.1007/XXXXXX-XX-0000-00>
- Zhang, S. (2006). *Investigating the relative effects of persons , items , sections , and languages on TOEIC score dependability*. *23*(1999), 351–369.
- Zheng, Q., Yuan, Z., & Pan, X. (2024). Examining the influencing effect of EFL students' digital literacy on their online learning power: the mediating role of perceived teacher support. *Asia Pacific Journal of Education*, *00*(00), 1–15. <https://doi.org/10.1080/02188791.2024.2404669>
- Zubaidah, S. (2019). STEAM (science, technology, engineering, arts, and mathematics): Pembelajaran untuk memberdayakan keterampilan abad ke-21 [STEAM (Science, Technology, Engineering, Arts, and Mathematics): Learning to Empower 21st Century Skills]. *Seminar Nasional Matematika Dan Sains, September*, 1–18.
- Zumbo, B. D. (2007). *Handbook of Statistisc*. The Netherlands: Elsevier Science B.V.