

DAFTAR PUSTAKA

- Abadie, M., Guette, C., Troubat, A., & Camos, V. (2024). The influence of working memory mechanisms on false memories in immediate and delayed tests. *Cognition*, 252(5), 1–20. <https://doi.org/10.1016/j.cognition.2024.105901>
- Abdusselam, M. S., & Kilis, S. (2021). Development and Evaluation of an Augmented Reality Microscope for Science Learning : A Design-Based Research. *International Journal of Technology in Education (IJTE)*, 4(4), 708–728. <https://doi.org/10.46328/ijte.88>
- Abhishek, A. D., & Natarajan, B. (2022). Challenges Confronted by Electron Microscopy in Microbe Detection. *Austin Journal of Biotechnology & Bioengineering*, 9(1), 1118.
- Adhiguna, B., & Yamtinah, S. (2025). *Augmented Reality Media Development on Human Excretory System Material to Improve Digital Literacy and HOTS*. 28(1), 135–151. <https://doi.org/10.20961/paedagogia.v28i1.99561>
- Adi, N. H., Nelmira, W., Novrita, S. Z., Gusnita, W., Lubis, A. L., & Riyanda, A. R. (2025). Augmented Reality as an Educational Tool : A Meta-Analysis of Its Impact on Student Performance. *TEM Journal*, 14(3), 2271–2284. <https://doi.org/10.18421/TEM143>
- Agustianda, S., Meilinda, Nazip, K., Genisa, M. U., Sumah, A. S. W., & Ismail, G. (2024). Pengaruh Direct Instruction Dan SQ3R Terhadap Retensi Siswa Dalam Pembelajaran Biologi. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, 10(3), 449–456. <https://doi.org/10.22437/biodik.v10i3.32679>
- Algerafi, M. A. M., Zhou, Y., & Oubibi, M. (2023). Unlocking the Potential : A Comprehensive Evaluation of Augmented Reality and Virtual Reality in Education. *Electronics*, 12(18), 3953. <https://doi.org/10.3390/electronics12183953>
- Almawaddah, W., Lusiana, & Suriadi, A. (2026). Penggunaan Model Make a Match pada Pembelajaran Materi Perkalian untuk Meningkatkan Hasil Belajar Siswa Kelas IV SD. *SCIENCE : Jurnal Inovasi Pendidikan Matematika Dan IPA*, 6(1), 391–400. <https://doi.org/10.51878/science.v6i1.8626>
- AlNajdi, S. M. (2022). The effectiveness of using augmented reality (AR) to enhance student performance: using quick response (QR) codes in student textbooks in the Saudi education system. *Educational Technology Research and Development*, 70(3), 1105–1124. <https://doi.org/10.1007/s11423-022-10100-4>
- Anderson, L. W., & Krathwohl, D. R. (2017). *Kerangka Landasan Untuk Pembelajaran Pengajaran Dan Asesmen*. Pustaka Pelajar.
- Anwar, M., Rahmawati, Y., Yuniarti, N., Hidayat, H., & Sabrina, E. (2024). *Leveraging Augmented Reality to Cultivate Higher-Order Thinking Skills and Enhance Students' Academic Performance*. 14(10), 1405–1413. <https://doi.org/10.18178/ijiet.2024.14.10.2171>
- Apriani, L., Wulandari, W., Hartatik, Bagus, R., & Wijaya, A. (2024). Teachers' Challenges In Implementing The Discovery Learning Model: A Qualitative Study In Secondary Schools. *Lentera Sriwijaya: Jurnal Ilmiah Pendidikan Matematika*, 6(2), 26–39.

- Apriyanto, S., Apriadi, E. A., Anum, A., & Bahari, A. (2025). Augmented Reality to Improve English Comprehension and Retention in Third- Grade Students. *Journal Corner of Education, Linguistic, and Literature*, 5(2), 258–269. <https://doi.org/10.54012/jcell.v5i2.611>
- Arisanti, R. (2025). The Role of Digital Technology in Improving Learning Outcomes : A Literature-Based Analysis. *PPSDP International Journal of Education*, 4(2), 574–581.
- Assimi, E. (2023). *The integration of augmented and virtual reality in cell biology courses as a pedagogical innovation in the training of life and earth sciences teachers*. 14(5), 85–96. <https://doi.org/10.47750/jett.2023.14.05.013>
- Astiti, N. D., Mahadewi, L. P. P., & Suarjana, I. M. (2021). Faktor Yang Mempengaruhi Hasil Belajar IPA. *Mimbar Ilmu*, 26(2), 193. <https://doi.org/10.23887/mi.v26i2.35688>
- Ateş, H., & Polat, M. (2025). Leveraging augmented reality and gamification for enhanced self-regulation in science education. *Education and Information Technologies*, 30, 17079–17110. <https://doi.org/10.1007/s10639-025-13481-0>
- Athiyah, N., Maula, N. N., Khobir, A., & Rini, J. (2024). Augmented Reality (AR) Learning : Improving Students Memory in Science Learning at the Elementary School Level. *MADAKO ELEMENTARY SCHOOL*, 3(2), 152–164. <https://doi.org/10.56630/mes.v3i2.273>
- Awuah, F., & Siemoh, R. K. (2024). Improving Students ' Performance on the Use of the Microscope Through Demonstration Method. *Jurnal Pendidikan Matematika Dan Sains*, 12(2), 146–153. <https://doi.org/10.21831/jpms.v12i2.76695>
- Azzahra, F., & Putri, S. M. (2025). Penerapan Pendekatan STEAM dalam Meningkatkan Berpikir Kritis Siswa pada Pelajaran IPA. *Jurnal Kiprah Pendidikan*, 4(3), 262–269. <https://doi.org/10.33578/kpd.v4i3.p262-269>
- Baratz, G., Sridharan, P. S., Yong, V., Tatsuoka, C., Griswold, M. A., & Wish-baratz, S. (2022). *Comparing learning retention in medical students using mixed-reality to supplement dissection : a preliminary study*. 107–114. <https://doi.org/10.5116/ijme.6250.0af8>
- Batool, A., Sultan, S., & Shafiq, M. (2024). Analyzing the Effect of PQ4R Learning Intervention on Learning Outcomes and Retention of Slow Learner Students across the Reading Phase. *Journal of Excellence in Social Sciences*, 3(3), 61–70.
- Bondah, F. E., Francis, T. M., & Kimmons, R. (2023). Augmented Reality. *EdTechnica*, 31(June), 36–48. <https://doi.org/10.59668/371.13080>
- Braet, F., & Taatjes, D. J. (2024). What Are the Challenges Ahead for Training the Present and Next-Generation Microscopists in the Life Sciences (a . k . a. Structural Cell Biologists)? *Microscopy Today*, 27(9), 43–52. <https://doi.org/10.1093/mictod/qaae067>
- Brand, C., Loibl, K., & Rummel, N. (2025). Prior knowledge activation as preparation prior to instruction : does the coverage of relevant prior knowledge affect learning ? *Instructional Science*, 53(7), 1633–1661. <https://doi.org/10.1007/s11251-025-09727-6>
- Brod, G. (2021). Toward an understanding of when prior knowledge helps or hinders learning. *Npj Science of Learning*, 6(24), 2–4.

- <https://doi.org/10.1038/s41539-021-00103-w>
- Bruner, J. S. (1966). *Toward a Theory of Instruction*.
- Bush, R. R., & Guilford, J. P. (1956). Fundamental Statistics in Psychology and Education. *Journal of the American Statistical Association*, 51(276), 661. <https://doi.org/10.2307/2281499>
- Chow, A. K., & Sharmin, N. (2025). Zoom in on learning with a virtual microscope : A convergent parallel mixed-method study. 1–11. <https://doi.org/10.1371/journal.pone.0323412>
- Cooper, E. A. (2023). The Perceptual Science of Augmented Reality. *Annual Review of Vision Science*, 9, 455–478. <https://doi.org/10.1146/annurev-vision-111022-123758>
- Crogman, H. T., Cano, V. D., Pacheco, E., Sonawane, R. B., & Boroon, R. (2025). Virtual Reality , Augmented Reality , and Mixed Reality in Experiential Learning : Transforming Educational Paradigms. *Education Sciences*, 15(3), 1–23. <https://doi.org/10.3390/educsci15030303>
- Damayanti, T. D., & Sulisworo, D. (2022). Pengembangan LKPD Augmented Reality dengan model Discovery Learning sebagai media pembelajaran interaktif. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, 13(1), 40–55. <https://doi.org/10.24127/ajpm.v13i1.34942>
- Dari, S. W., Ulayya, S., Muhammadiyah, U., & Utara, S. (2025). Evaluasi Perbandingan Metode Pembelajaran Digital dan Konvensional: Strategi Meningkatkan Prestasi Siswa Dalam Pendidikan Kontemporer. *Proceeding Internasional Seminar on Islamic Studies*, 6(1), 2224–2233.
- Dean, D. A., & Rahmawati, L. (2025). Pengaruh Model Discovery Learning Berbantuan Media Augmented Reality terhadap Kemampuan HOTS Siswa. *JURNAL TPACK IPA*, 9(2), 62–69. <https://doi.org/10.21831/tpackipa.v9i2.55234>
- Dewanto, R., Pujianto, Wiyatno, Y., & Yani, A. D. G. (2025). Education Exploring The Role of Augmented Reality in Enhancing Student Engagement and Learning Outcomes Across Education Levels. *Jurnal Pendidikan MIPA*, 25(12), 1635–1647. <https://doi.org/10.23960/jpmipa/v25i3.pp1635-1647>
- Djunaid, U., & Bannang, A. (2025). Optimalisasi Pengamatan Mikroskopis: Panduan dan Teknik Penggunaan Mikroskop dalam Praktikum Laboratorium. *JBB: Jurnal Biologi Babasal*, 4(1), 77–86. <https://doi.org/10.32529/jbb.v4i01.4417>
- Eidesen, P. B., Bjune, A. E., & Lang, S. I. (2023). “ Show me how to use a microscope ” – - The development and evaluation of certification as direct assessment of practical lab skills. March, 1–14. <https://doi.org/10.1002/ece3.10592>
- Endrayanto, H. Y. S. (2021). *Strategi Menilai Keterampilan Berpikir Tingkat Tinggi (HOTS)*. PT Kanisius, Yogyakarta.
- Fahmi, M. T. N., Suwardi, Anwar, C., & Jalane, M. de F. (2025). The Effect of Discovery Learning Model Based on Augmented Reality Media on Students' Critical Thinking Skills. *DIDAKTIKA: Jurnal Pendidikan Sekolah Dasar*, 8(1), 77–88. <https://doi.org/10.21831/didaktika.v8i1.85598>

- Farmer, T. A., & Matlin, M. W. (2019). *Cognition*. Hoboken, NJ: Wiley.
- Fatmah, K. M., Bahrin, S. A., Wilujeng, I., & Rejeki, S. (2023). *The Use of Videoscribe Animation-Based Science E-Modules on Learning Retention of Junior High School*. 9(9), 6925–6931. <https://doi.org/10.29303/jppipa.v9i9.3368>
- Fatmawati, E., Munir, M., Riza, L. S., & Khoirunnisa, A. N. (2026). Enhancing Student Cognition in Science Lessons Through Augmented Reality (AR) and Discovery Learning. *Indonesia Journal of Educational*, 6(1), 1–10. <https://doi.org/10.17509/ijert.v6i1.88054>
- Fitriani, E., Candramila, W., & Mardiyanningsih, A. N. (2025). Unveiling Insights : Students ' Knowledge and Mastery of Microscopes at SMAN 1 Rasau. *Jurnal Penelitian Pendidikan IPA*, 11(6), 893–901. <https://doi.org/10.29303/jppipa.v11i6.9538>
- Fitriani, R., & Prasetyo, K. B. (2025). Pengaruh Media Pembelajaran Interaktif terhadap Retensi Siswa UPT SD Negeri Sinar Mulyo. *CJPE : Cokroaminoto Juornal of Primary Education*, 8(2), 479–490.
- Gagné, R. M. (1985). *The Conditions of Learning and Theory of Instruction*. Holt, Rinehart & Winston. https://archive.org/details/conditionsoflear0000gagn_p6d1
- Ge, S., Hai Leng, C., & Baharudin, S. M. (2022). The effect of multimedia and temporal contiguity principles on students' attitude and retention in learning Japanese language. *International Journal of Chinese Education*, 11(2), 1–13. <https://doi.org/10.1177/2212585X221099964>
- Grübel, J., Chatain, J., Schmid, C., & Fayolle, V. (2025). *Applying Augmented Reality to Convey Medical Knowledge on Osteoclasts to Users of a Serious Game : Vignette Experiment*. 13. <https://doi.org/10.2196/64751>
- Gupta, A. (2025). The Influence of Age and Learning Preferences on Memory Retention : A Comparative Study of Pictures Versus Words. *Intersect*, 18(2).
- Handayani, B. S., Lestari, T. A., & Setiadi, D. (2025). The Effect of the SrVER Learning Model Assisted by Augmented Reality Media on Biology Learning Outcomes. *Jurnal Pijar MIPA*, 20(2), 291–296. <https://doi.org/10.29303/jpm.v20i2.8629>
- Hardi, M., Husein, R., & Meisuri. (2021). The Design of Discovery Learning Model. *Proceedings of the 6th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL)*, 591, 576–578. <https://doi.org/10.2991/assehr.k.211223.120>
- Hariyanto, & Tiofani, S. (2025). Optimalisasi Hasil Belajar Melalui Pretest dan Posttest Menggunakan Gamifikasi pada Mata Kuliah Bahasa Indonesia. *Guridam: Jurnal Bahasa Dan Sastra*, 5(1), 48–60. <https://doi.org/10.54373/imeij.v7i2.5193>
- Haycocks, N. G., Hernandez-moreno, J., Bester, J. C., Hernandez, R., & Vida, T. A. (2022). Using Multiple Choice Questions to Evaluate the Difficulty and Long-Term Retention of Factual Versus Conceptual Knowledge. *Research Square*, 1–12. <https://doi.org/10.21203/rs.3.rs-1965172/v1>
- Hergenhahn, B. R., & Olson, M. H. (1976). Review of An introduction to theories of learning. *Contemporary Psychology: A Journal of Reviews*, 21(10), 760–

761. <https://doi.org/10.1037/014682>
- Heydemans, C. D., & Elmunyah, H. (2024). Systematic Literature Review: Use of Augmented Reality As A Learning Media: Trends, Applications, Challenges, and Future Potential. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, 13(3), 670–680. <https://doi.org/10.23887/janapati.v13i3.78825>
- Indahsari, L., & Sumirat. (2024). Implementasi Teknologi Augmented Reality dalam Pembelajaran Interaktif. *Cognoscere: Jurnal Komunikasi Dan Media Pendidikan*, 7–11.
- Indayana, S. A., & Indrapangastuti, D. (2025). Inovasi Penggunaan Media Pembelajaran Berbasis Augmented Reality AR) Untuk Meningkatkan Hasil Belajar IPAS Siswa Sekolah Dasar. *SHES: Conference Series*, 8(3), 1762–1772.
- Indriyani, D., Muhfahroyin, M., & Santoso, H. (2023). Pengaruh Discovery Learning Berbasis Augmented Reality terhadap Hasil Belajar Siswa. *BioloVA*, 4(2), 107–113. <https://doi.org/10.24127/bioloVA.v4i2.4032>
- Irianto, K. (2017). *Biologi Molekuler : Teori, Praktikum, Glosarium*. CV. Alfabeta.
- Kemendikbud. (2014). *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 103 Tahun 2014 tentang Pembelajaran pada Pendidikan Dasar dan Menengah*.
- Khadijah, I., Nurhamidah, N., Mulyani, L., Amanah, S. N., & Sukmanawati, N. (2025). Improving Learning Outcomes through Innovative Pedagogical Approaches in Modern Education. *Journal of English Language and Education (JELE)*, 10(1), 423–433. <https://doi.org/10.31004/jele.v10i1.661>
- Khasinah, S. (2021). Discovery Learning: Definisi, Sintaksis, Keunggulan dan Kelemahan. *Jurnal MUDARRISUNA: Media Kajian Pendidikan Agama Islam*, 11(3), 402. <https://doi.org/10.22373/jm.v11i3.5821>
- Koç, A., & Kanadlı, S. (2025). Effect of Interactive Learning Environments on Learning Outcomes in Science Education : A Network Meta - Analysis. *Journal of Science Education and Technology*, 34(4), 681–703. <https://doi.org/10.1007/s10956-025-10202-7>
- Koumpouros, Y. (2024). Revealing the true potential and prospects of augmented reality in education. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-023-00288-0>
- Lampropoulos, G. (2025). Combining Artificial Intelligence with Augmented Reality and Virtual Reality in Education : Current Trends and Future Perspectives. *Multimodal Technologies and Interaction*, 9(2), 11. <https://doi.org/10.3390/mti9020011>
- Lenaini, I. (2021). Teknik Pengambilan Sampel Purposive Dan Snowball Sampling. *HISTORIS: Jurnal Kajian, Penelitian & Pengembangan Pendidikan Sejarah*, 6(1), 33–39. <http://journal.ummat.ac.id/index.php/historis>
- Li, G., Luo, H., Chen, D., Wang, P., Yin, X., & Zhang, J. (2025). Augmented Reality in Higher Education : A Systematic Review and Meta-Analysis of the Literature from 2000 to 2023. *Education Sciences (MDPI)*, 15(6), 678. <https://doi.org/10.3390/educsci15060678>

- Lidiastuti, A. E., Suwono, H., Sueb, S., & Sulisetijono, S. (2024). Science Education : Current And Future Perspective. *Pakistan Journal of Life and Social Sciences (PJLSS)*, 22(2), 20267–20288. <https://doi.org/10.57239/PJLSS-2024-22.2.001486>
- Lidiastuti, A. E., Suwono, H., Sueb, S., & Sulisetijono Sulisetijono. (2024). Trend Augmented Reality in Education : Systematic Literature Review. *Prosiding Konferensi Internasional (ICRES 2024) - International Conference on Research in Education and Science*, 77–93.
- Luthfyanti, J., Lutfi, A., Sari, I. J., & Aberilla, O. (2024). High School Students' Interests, Difficulties, and Conceptual Understanding of Cell Concepts. *Biodidaktika: Jurnal Biologi Dan Pembelajarannya*, 19(1), 29–36. <https://doi.org/10.30870/biodidaktika.v19i1.24180>
- M, N. N., & Helendra. (2025). Model Pembelajaran Discovery Learning dalam Meningkatkan Kemampuan Berpikir Kritis Peserta Didik Tingkat SMA : Literature Review. *Jurnal Jendela Pendidikan*, 5(3), 629–636. <https://www.ejournal.jendelaedukasi.id/index.php/JJP>
- Malok, J. H., & Valdez, A. G. (2025). Students' Lived Experiences in Manipulating a Compound Microscope in Selected Public Secondary School. *Psychology and Education: A Multidisciplinary Journal*, 39(2), 189–199. <https://doi.org/10.70838/pemj.390207>
- Mansour, N., Aras, C., Kleine, J., & Sarah, S. (2025). Embodied learning of science concepts through augmented reality technology. In *Education and Information Technologies* (Vol. 30, Issue 6). Springer US. <https://doi.org/10.1007/s10639-024-13120-0>
- Maulidah, S., Setyosari, P., Kuswandi, D., & Ulfa, S. (2023). The Effect of Direct Instructions Strategy Integrated Computational Thinking and Prior Knowledge on Critical Thinking and Problem-solving. *Jurnal Teknologi Pendidikan*, 25(12), 663–677. <https://doi.org/10.21009/jtp.v25i3.49845>
- Morgan, C. T., King, R. A., & Wetsz, J. R. (1986). *Introduction to Psychology*. Tata McGraw-Hill Publishing Company Limited.
- Muhibbuddin, Rahmi, N., & Safrida. (2021). The Effect of Implementing Preview Question Read Reflect Recite Read and Read (PD4R) Learning Model Integrates Mnemonic Module to Learning Outcomes and Retention of Students. *IJASOS – International E-Journal of Advances in Social Sciences*, VII(19), 65–71. <http://ijasos.ocerintjournals.org>
- Munawaroh, I., Rusmalinda, R., Hikmah, P. N., & Afifah, F. N. (2022). *Bimbingan Teknis Pengenalan Mikroskop Dan Penggunaanya Pada Pembelajaran Biologi Kelas X Di MA Darul Amal Kota Metro Lampung*.
- Nasution, Y. A., Pane, A. S., Simbolon, H., Putra, R. H., Khairani, B., & Mtd, N.A. (2023). Identifikasi Pemahaman Siswa Terhadap Materi Struktur Sel di SMA Negeri 3 Panyabungan. *Jurnal Cakrawala Inspirasi Edukatif*, 01(1), 128–139.
- Nathan, M., & Alipour, A. (2024). Utilizing Augmented Reality and 3D Models to Enhance Conceptual Knowledge and Visualization of 3D Problems in Engineering Mechanics Courses Case Study of Statics. *Journal Article, Metadata Provided*. <https://doi.org/https://doi.org/10.18260/1-2--48246>

- Nauko, Y. S., & Amali, L. N. (2021). Pengenalan Anatomi Tubuh Menggunakan Teknologi Augmented Reality Berbasis Android. *Jambura Journal of Informatics*, 3(2), 66–76. <https://doi.org/10.37905/jji.v3i2.11720>
- Niman, E. M., Edison, A. Y., & Momang, B. (2024). The Effectiveness of the Discovery Learning Model on Student Learning Outcomes. *International Journal of Multidisciplinary Research and Analysis*, 07(07), 3454–3458. <https://doi.org/10.47191/ijmra/v7-i07-49>
- Noor, N. M., Yunus, K., Yusoff, A. M. H., Nasir, N. A. M., & Yaacob, N. H. (2021). Spaced learning : A review on the use of spaced learning in language teaching and learning. *Journal of Language and Linguistic Studies*, 17(2), 1023–1031. <https://doi.org/10.52462/jlls.71>
- Nurtamara, L., Amintarti, S., Ajizah, A., Irianti, R., & Widiyastuti, D. A. (2024). Pelatihan Penggunaan Mikroskop Cahaya bagi Mahasiswa Pendidikan Biologi FKIP ULM dengan Menggunakan Preparat Segar. *Kayuh Baimbai: Jurnal Pengabdian Masyarakat*, 01(02), 46–50.
- Nurul, F., Nordin, A., Azim, A., Isa, M., Zaidi, M., Zakaria, B., Yahya, H., Zhafri Bin, M., & Nazmi, M. (2022). AR-Learn Model: Model Pembinaan Aplikasi Pembelajaran berteraskan Augmented Reality (AR). *The Sultan Alauddin Sulaiman Shah Journal (JSASS)*, 9(1), 31–43. <https://jsass.kuis.edu.my/index.php/jsass/article/view/186>
- Oktaviani, I., Triana, T., & Purwanto, E. (2024). Penerapan Multimedia Pembelajaran Interaktif Sebagai Upaya Peningkatan Kemampuan Belajar Siswa. *Duta Abdimas*, 3(1), 26–31. <https://doi.org/10.47701/abdimas.v3i1.3765>
- Patty, Y., Matdoan, M. N., Liline, S., & Kurnia, T. S. (2019). Penerapan Model Pembelajaran Reciprocal Teaching Dipadu Dengan Reading, Questioning, and Answering Untuk Meningkatkan Hasil Belajar Dan Retensi Siswa Kelas Xi Sma Negeri 7 Ambon Pada Materi Sistem Ekskresi. *Science Map Journal*, 1(1), 9–15. <https://doi.org/10.30598/jmsvol1issue1pp9-15>
- Polem, M., Cahya, A. D., Hasibuan, I. M., Karman, & Hermawan, A. H. (2023). Analisis Kemampuan Mengingat Hafalan Juz'amma Siswa Sekolah Dasar. *Jurnal Edukasi: Jurnal Bimbingan Konseling*, 9(2), 229–244. <https://doi.org/10.22373/je.v9i2.16671>
- Pranoto, E. (2022). Penerapan Model Discovery Learning Dengan Media Blog Pembelajaran Dapat Meningkatkan Hasil Belajar Peserta Didik Terhadap Materi Mutasi Pada Kelas Xii Mipa 4 Sma Negeri 1 Pati. *ACTION : Jurnal Inovasi Penelitian Tindakan Kelas Dan Sekolah*, 2(4), 366–377. <https://doi.org/10.51878/action.v2i4.1714>
- Prasetya, F., Fortuna, A., Dwinggo, A., Rawas, S., Mystakidis, S., & Ema, R. (2024). Social Sciences & Humanities Open The impact of augmented reality learning experiences based on the motivational design model : A meta-analysis. *Social Sciences & Humanities Open*, 10(February), 100926. <https://doi.org/10.1016/j.ssaho.2024.100926>
- Rabha, B., Biswas, K. K., Sarangsa, H. C., Das, G. C., & Pal, S. (2025). *The Impact of Traditional and Virtual Microscopy on Students ' Learning of Histology : A Comparative Study*. 17(7), 1–11. <https://doi.org/10.7759/cureus.87668>

- Rahmawati, A. J., Gunahardi, & Muchtaron, M. (2022). Augmented Reality for Teaching Cell Materials in Biologu for Undergraduate Students. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, 6(3), 479–481.
- Rahmi, S. N., Megawati, Alberida, H., & Fadilah, M. (2025). Assessment of biology learning outcomes in education: A systematic literature review. *Biosfer : Jurnal Pendidikan Biologi*, 18(1), 10–25. <https://doi.org/10.21009/biosferjpb.47179>
- Ramadhan, F. (2014). *Sel Bio2* 4. 1–8.
- Rea, S. D., Wang, L., Muenks, K., & Yan, V. X. (2022). Students Can (Mostly) Recognize Effective Learning, So Why Do They Not Do It? *Journal of Intelligence*, 10(4), 1–28. <https://doi.org/10.3390/jintelligence10040127>
- Ritter, F. E. (2021). *Factors affecting learning and retention: A unified list*. Riyanti, Y., Wahyudi, W., & Suhartono, S. (2021). Pengaruh Kemandirian Belajar Terhadap Hasil Belajar Matematika Siswa Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, 3(4), 1309–1317. <https://doi.org/10.31004/edukatif.v3i4.554>
- Rodriguez-saavedra, M. O., Benavides, L. G. B., Galindo, I. C., Ascuna, L. M. C., Gonzales, A. V. M., Lopez, J. W. M., & Arguendas-Catasi, R. W. (2025). Augmented Reality as an Educational Tool : Transforming Teaching in the Digital Age. *Information (MDPI)*, 16(5), 372. <https://doi.org/10.3390/info16050372>
- Rogaya, Mursid, R., & Baharuddin. (2023). Augmented Reality Based on Discovery Learning: The Human Circulatory System to Improve Biological Literacy. *International Journal of Computer Applications Technology and Research*, 12(04), 47–54. <https://doi.org/10.7753/ijcatr1204.1011>
- Rosita, D., Dewanti, S. S., & Ibrahim. (2025). The Impact of Augmented Reality-based Learning Media on Primary Students ' Retention of Human Sensory System Concepts. *Journal of Integrated Elementary Education*, 5(2), 407–420. <https://doi.org/10.21580/jieed.v5i2.25276> Keywords:
- Rozanah, H. K., Margana, Winantaka, B., Andika, J. D., Syafruddin, Suni, F. M., Subekti, M. A. O., & Shawal, B. R. M. (2026). Classroom Evaluation of Deep Learning: Effects on Reading Comprehension among Seventh Graders in Indonesia. *Jurnal Wahana Pendidikan*, 13(1), 33–50. <https://doi.org/10.25157/jwp.v%vi%i.22149>
- Rozi, F., & Anwar, M. (2024). Perancangan Media Pembelajaran Interaktif Berbasis Teknologi Augmented Reality pada Mata Pelajaran Dasar Elektronika. *Voteteknika (Vocational Teknik Elektronika Dan Informatika)*, 12(1), 52. <https://doi.org/10.24036/voteteknika.v12i1.124683>
- Sa, M. Y., Bunga, Y. N., & Tematan, Y. B. (2025). Penerapan Teknologi Augmented Reality (AR) berbasis Asseblr Edu sebagai Medi Pembelajaran Materi Pembelahan Sel Kelas XII SMA Negeri Kangae. *Biogenerasi: Jurnal Pendidikan Biologi*, 10(2), 1631–1638. <https://doi.org/10.30605/biogenerasi.v10i2.6672>
- Sahrawati, F., Muharram, M., & Sulastry, T. (2023). Pengembangan Media Interaktif Berbasis Augmented Reality dalam Model Discovery Learning untuk Meningkatkan Hasil Belajar Peserta Didik SMAN 16 Makassar.

- Chemistry Education Review (CER)*, 7(1), 70.
<https://doi.org/10.26858/cer.v7i1.53801>
- Sainab, S. (2022). Pengaruh Model Pembelajaran Picture And Picture Terhadap Motivasi Belajar dan Retensi Biologi Peserta Didik Kelas X MIA SMA Negeri 2 Majene. *Oryza (Jurnal Pendidikan Biologi)*, 11(1), 36–42.
<https://doi.org/10.33627/oz.v11i1.710>
- Samranchai, C., & Samat, C. (2022). The Development of Augmented Reality Book to Promote Analytical Thinking for Grade 7 Students on the Basic of Life Units. *EasyChair Preprint*, 1–9.
- Samuel, K. (2025). Augmented Reality in Education : Enhancing Learning Experiences. *IAA Journal of Arts and Humanities*, 12(1), 23–28.
<https://doi.org/10.59298/IAAJAH/2025/1212328>
- Saputra, H. D., Purwanto, W., Setiawan, D., Fernandez, D., & Putra, R. (2022). Hasil Belajar Mahasiswa: Analisis Butir Soal Tes. *Edukasi: Jurnal Pendidikan*, 20(1), 15–27. <https://doi.org/10.31571/EDUKASI.V20I1.3432>
- Saputri, R. P., Yulastri, A., Giatman, M., Irfan, D., & Effendi, H. (2025). Impact of Interactive Media Utilization on Enhancing Learning Outcomes : Meta-Analysis. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*, 11(3), 40–49.
<https://doi.org/10.29303/jppipa.v11i3.10438>
- Sartika, S. B. (2022). Buku Ajar Belajar Dan Pembelajaran. In *Buku Ajar Belajar Dan Pembelajaran*. <https://doi.org/10.21070/2022/978-623-464-043-4>
- Sartunut. (2022). *Discovery Learning Solusi Jitu Ketuntasan Belajar*. Pusat Pengembangan Pendidikan dan Penelitian Indonesia.
- Sattar, M. A., Maqbool, M. U., Zakir, F., & Billah, M. (2025). Enhancing student engagement through augmented reality in secondary biology education. *Fronties in Education*, 26(9), 1–11.
<https://doi.org/10.3389/feduc.2025.1628004>
- Sekarsari, F. D. F. P., Wicaksono, A. G., & Sarafuddin. (2023). Analisis Model Pembelajaran Discovery Learning Pada Pembelajaran Matematika Sekolah Dasar. *Journal of Educational Learning and Innovation (ELIA)*, 3(1), 213–225. <https://doi.org/10.46229/elia.v3i1.648>
- Sharif, W. R., Narain, L., & Ogowewo, A. A. (2025). Impact of virtual reality and augmented reality technologies on biology education : A review. *GSC Advanced Research and Review*, 22(03), 159–167.
<https://doi.org/10.30574/gscarr.2025.22.3.0078>
- Sobandi, A., & Nurlatifah, N. (2019). *Teaching Skills and Learning Discipline as Factors Affecting Students' Learning Outcomes*. 65(Icebef 2018), 216–219.
<https://doi.org/10.2991/icebef-18.2019.51>
- Sofia, C., Kristoffersen, M., Elise, C., Ziesler, Ø., Thune, N. H., Kristensen, A. T., Sehic, A., Utheim, T. P., & Khan, Q. (2025). Towards a Modernized Framework of Histology Teaching to Integrate Genetics : Pedagogical Perspectives for Oral Histology. *Genes (MDPI)*, 16(5), 512.
<https://doi.org/10.3390/genes16050512>
- Solehat, S., Purwanti, W., Rahman, A., Murni, D., Sultan, U., & Tirtayasa, A. (2025). The Effect of Practicum-Integrated Discovery Learning Model on Students' Procedural Knowledge of Microscope Use and Cell Structure

- Observation. *Jurnal Pendidikan Abad Ke-21*, 3(1), 8–19. <https://doi.org/10.53889/jpak.v3i1.662>
- Spitzer, H. F. (1939). Studies In Retention. *The Journal of Educational Psychology*, XXX. <https://doi.org/10.1037/h0066306>
- Srdanovi, P., Skala, T., & Maricevic, M. (2025). Neurocognitive Foundations of Memory Retention in AR and VR Cultural Heritage Experiences. *Electronics*, 14(15), 2920. <https://doi.org/10.3390/electronics14152920>
- Stanić, K., & Spernjak, A. (2025). Augmented Reality in Biology Education : A Literature Review. *Multimodal Technologies and Interaction (MDPI)*, 9(12), 10-.
- Strauning, H. (2023). *Model Pembelajaran Discovery Learning Sukses Pembelajaran IPA*. Penerbit Adab.
- Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Suharsono, & Nuryadin, E. (2017). *Biologi Sel*. LPPM Universitas Siliwangi. Sujinem. (2025). Understanding the Implementation of Deep Learning Approach in English Teaching for SMA. *Jurnal REVORMA*, 5(1), 988–997. <https://doi.org/10.62825/revorma.v5i1.130>
- Sukadiono, P. :, Kunsah, B., Rohmayani, V., Riesti, A., & Arimurti, R. (2023). *Bahan Ajar Biologi Sel Buku Ajar Biologi Sel*.
- Sulistyowati, E., Omegawati, W. H., Sukoco, T., & Hidayah, S. N. (2016). *Biologi untuk SMA/MA Kelas XI Peminatan Matematika dan Ilmu-Ilmu Alam*. PT Intan Pariwara.
- Suminar, T. (2019). Tinjauan Filsafati (Ontologi, Epistemologi Dan Aksiologi Manajemen Pembelajaran Berbasis Teori Siberetik. *Edukasi*, 1(2).
- Sundari, E. (2024). Pemanfaatan Media Pembelajaran Augmented Reality Terhadap Minat Belajar Siswa Sekolah Dasar. *Cendekia Pendidikan*, 4(4), 50–54. <https://doi.org/10.8734/CAUSA.v1i2.365>
- Syahbani, N., Nisa, K., Jalal, M., Nurhasanah, A., Junaidi, M., & Ansori, A. (2024). Implementasi Model Pembelajaran Discovery Learning untuk Meningkatkan Hasil Belajar Siswa Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 6(2), 1160–1167. <https://doi.org/10.31004/edukatif.v6i2.6462>
- Syamsidah, Juniar, Ratnawati, & Muhiddin, A. (2023). *Model Discovery Learning*. Deepublish Digital.
- Tamam, B., & Qomaria, N. (2023). Implementation of Augmented Reality In Biology Learning : Its Effect on Learning Motivation and Retention. *Journal of Educational Research and Evaluation*, 7(1), 17–22. <https://doi.org/10.23887/jere.v7i1.59038>
- Tarigan, H. (2024). Designing Augmented Reality-based Tele-Education Management Systems : Improving Access and Interactivity in Remote Learning. *International Journal of Social Learning*, 5(1), 247–263. <https://doi.org/10.47134/ijsl.v5i1.346>
- Thabvithorn, C., & Samat, C. (2022). Development of Web-Based Learning with Augmented Reality (AR) to Promote Analytical Thinking on Computational Thinking for Secondary Schools. *EasyChair Preprint*, 125–133. https://doi.org/10.1007/978-3-031-14463-9_12

- Thahir, R., & Kamaruddin, R. (2021). Pengaruh Media Pembelajaran Berbasis Augmented Reality (Ar) Terhadap Hasil Belajar Biologi Siswa Sma. *Jurnal Riset Dan Inovasi Pembelajaran*, 1(2), 24–35. <https://doi.org/10.51574/jrip.v1i2.26>
- Tian, X., & Ironsi, C. S. (2025). Examining the impact of augmented reality on students ' learning outcomes. *Scientific Reports*, 15(1), 1–13. <https://doi.org/10.1038/s41598-025-20833-w 1>
- Total, Ö. (2023). Does Context-Based Learning Increase Academic Achievement and Learning Retention ?: A Review based on Meta-Analysis. *Journal of Practical Studies in Education*, 4(5), 1–16. <https://doi.org/10.46809/jpse.v4i5.71>
- Umami, T. S., Agustini, K., & Suartama, I. K. (2025). Discovery Learning Widely Applied at Junior Level with Positive Learning Outcome : Pembelajaran Penemuan Diterapkan Secara Luas di Tingkat Sekolah Menengah Pertama dengan Hasil Belajar yang Positif. *Indonesian Journal of Innovation Studies*, 26(3), 1–15. <https://doi.org/10.21070/ijins.v26i3.1450>
- Vinod, D., Charles, A. S., Meriel, T., Ruban, A., Premkumar, P. S., & Rabi, S. (2023). Virtual microscopy as a teaching e learning tool for histology in a competency-based medical curriculum. *Medical Journal Armed Forces India*, 79, S156–S164. <https://doi.org/10.1016/j.mjafi.2022.02.002>
- Vukic, D., Martincic-Ipsic, S., & Mestrovic, A. (2020). *Structural Analysis of Factual , Conceptual , Procedural , and Metacognitive Knowledge in a Multidimensional*. 2020. <https://doi.org/10.1155/2020/9407162>
- Walgito, B. (2004). *Pengantar Psikologi Umum* (Vol. 16, Issue 1).
- Walsh, M. M., Krusmark, M. A., Jastremski, T., Hansen, D. A., Honn, K. A., & Gunzelmann, G. (2023). Enhancing learning and retention through the distribution of practice repetitions across multiple sessions. *Memory and Cognition*, 51(2), 455–472. <https://doi.org/10.3758/s13421-022-01361-8>
- Yeremia, D. A., & Chang, J. C. T. (2025). Analisis Implementasi Augmented Reality Pada Bidang Pendidikan : Systematic Literature Review. *Socius: Jurnal Penelitian Ilmu-Ilmu Sosial*, 2(10), 343–348. <https://doi.org/10.5281/zenodo.115463789>
- Yildirim, I., & Seckin-kapucu, M. (2021). The Effect of Augmented Reality Applications in Science Education on Academic Achievement and Retention of 6th Grade Students. *Journal of Educations in Science, Environment and Health*, 7(1). <https://doi.org/10.21891/jeseh.744351>
- Yun, M., Jeon, S., & Crippen, K. J. (2025). Augmenting Microscopes with Smartphones: Relationships Among Academic Emotions and Learning Outcomes in 7th Grade Cell Observation Classes. *Journal of Science Education and Technology*. <https://doi.org/https://doi.org/10.1007/s10956-024-10172-2>
- Zekeik, H., Chahbi, M., Sefian, M. L., & Bakkali, I. (2025). Augmented reality and virtual reality in education : A systematic narrative review on benefits , challenges , and applications. *EURASIA Journal of Mathematics, Science and Technology Education*, 21(9), 1–21. <https://doi.org/10.29333/ejmste/16830>

Zulfikar, A. R. L., Rahayu, S., & Savitri, E. N. (2023). Peningkatan Kemampuan Retensi dan Motivasi Siswa Melalui Penerapan Model Guided Context-PBL pada Materi Ekologi di Kelas VII H SMP Negeri 3 Semarang. *Seminar Nasional IPA XIII: Kecemerlangan Pendidikan IPA Untuk Konservasi Sumber Daya Alam*, 758–769.