

DAFTAR PUSTAKA

- Abdinejad, M., Talaie, B., Qorbani, H. S., & Dalili, S. (2021). Student perceptions using augmented reality and 3D visualization technologies in chemistry education. *Journal of Science Education and Technology*, 30(1), 87–96. <https://doi.org/10.1007/s10956-020-09880-2>
- Abdul Hanid, M. F., Mohamad Said, M. N. H., Yahaya, N., & Abdullah, Z. (2022). Effects of augmented reality application integration with computational thinking in geometry topics. *Education and Information Technologies*, 27(7), 9485–9521. <https://doi.org/10.1007/s10639-022-10994-w>
- Ahmad, S., Gunarhadi, & Peduk, R. (2019). Development of augmented reality-based interactive multimedia to improve critical thinking skills in science learning. *International Journal of Instruction*, 12(4), 331–344.
- Aiken. (1985). Three coefficients for analyzing the reliability and validity of ratings. *Educational and Psychological Measurement*, 45(1), 131–142. <https://doi.org/10.1177/0013164485451012>.
- Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalifah, A. (2021). Technology integration in higher education during COVID-19: An assessment of online teaching competencies through technological pedagogical content knowledge model. *Frontiers in Psychology*, 12, 736522. <https://doi.org/https://doi.org/10.3389/fpsyg.2021.736522>
- Alakärppä, I., Jaakkola, E., Väyrynen, J., & Häkkinen, J. (2017). Using nature elements in mobile AR for education with children. *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*, 1–13. <https://doi.org/10.1145/3098279.3098547>
- Alkhabra, Y. A., Ibrahim, U. M., & Alkhabra, S. A. (2023). Augmented reality technology in enhancing learning retention and critical thinking according to STEAM program. *HUMANITIES AND SOCIAL SCIENCES COMMUNICATIONS*, 1–10. <https://doi.org/10.1057/s41599-023-01650-w>
- Alper, A., Şengün Öztaş, E., Atun, H., Çınar, D., & Moyenga, M. (2021). A systematic literature review towards the research of game-based learning with augmented reality. *International Journal of Technology in Education and Science*, 5(2), 224–244. <https://doi.org/10.46328/ijtes.176>
- Álvarez-Huerta, P., Muela, A., & Larrea, I. (2022). Disposition toward critical thinking and creative confidence beliefs in higher education students: The mediating role of openness to diversity and challenge. *Thinking Skills and Creativity*, 43, 1–9. <https://doi.org/10.1016/j.tsc.2022.101003>
- Anastas, P., & Warner, J. (1998). *Green chemistry. Theory and practice*. Oxford

University Press.

- Armstrong, L. B., Rivas, M. C., Douskey, M. C., & Baranger, A. M. (2018). Teaching students the complexity of green chemistry and assessing growth in attitudes and understanding. *Current Opinion in Green and Sustainable Chemistry*, *13*, 61–67. <https://doi.org/10.1016/j.cogsc.2018.04.003>
- Ary, D., Jacobs, L. C., Sorensen, C., & Razavieh, A. (2010). *Introduction to research in education* (8th ed.). Cengage Learning.
- Atlas, D. (1995). Critical thinking as problem solving. In *USA: Department of Education, Montana State University-Bozeman*. Citeseer.
- Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators & Virtual Environments*, *6*(4), 355–385. <https://doi.org/10.1162/pres.1997.6.4.355>
- Bailey, F., & Pransky, K. (2005). Are "other people's children" constructivist learners too? *Theory into Practice*, *44*(1), 19–26. https://doi.org/10.1207/s15430421tip4401_4
- Belayneh, K. D., & Belachew, W. (2023). TSPCK-Based instruction and academic achievement of grade 11 students on chemical kinetics and equilibrium. *Cogent Education*, *11*(1). <https://doi.org/10.1080/2331186X.2023.2292873>
- Brady, M. (2008). Cover the material-or teach students to think? *Educational Leadership*, *65*(5), 64–74.
- Caffarella, R. S., & Merriam, S. B. (1999). *Perspectives on adult learning: Framing our research*.
- Calderón, A., Ruiz, M., & O'Connor, R. V. (2018). A serious game to support the ISO 21500 standard education in the context of software project management. *Computer Standards & Interfaces*, *60*, 80–92. <https://doi.org/10.1016/j.csi.2018.04.012>
- Carroll, R. T. (2005). *Becoming a critical thinker: A guide for the new millennium*. Pearson Learning Solutions.
- Çelik İskifoğlu, Tubanur, Çerkez, Y., & İskifoğlu, G. (2022). Thinking culture and critical thinking dispositions of high school students in Turkish Republic of Northern Cyprus. *Frontiers in Psychology*, *13*, 1–12. <https://doi.org/10.3389/fpsyg.2022.1017747>
- Çetin, H., & Türkan, A. (2022). The effect of augmented reality based applications on achievement and attitude towards science course in distance education process. *Education and Information Technologies*, *27*(2), 1397–1415. <https://doi.org/10.1007/s10639-021-10625-w>
- Çetin, M., & Özgiden, H. (2013). A research on digital natives and digital

immigrants twitter user behaviour in the process of digital culture. *Gumushane University E-Journal of Faculty of Communication*, 2(1), 172–189.

- Chang, G., Morreale, P., & Medicherla, P. (2010). Applications of augmented reality systems in education. *Society for Information Technology & Teacher Education International Conference*, 1380–1385.
- Chen, S.-Y., Hung, C.-Y., Chang, Y.-C., Lin, Y.-S., & Lai, Y.-H. (2018). A study on integrating augmented reality technology and game-based learning model to improve motivation and effectiveness of learning English vocabulary. *2018 1st International Cognitive Cities Conference (IC3)*, 24–27. <https://doi.org/10.1109/IC3.2018.00015>
- Cheong, C. W.-L., Guan, X., & Hu, X. (2022). Augmented reality (AR) for biology learning: A quasi-experiment study with high school students. In Y. “Elle” Wang, S. Joksimović, M. O. Z. San Pedro, J. D. Way, & J. Whitmer (Eds.), *Social and Emotional Learning and Complex Skills Assessment* (pp. 167–185). Springer International Publishing. https://doi.org/10.1007/978-3-031-06333-6_9
- Chiang, T. H. C., Yang, S. J. H., & Hwang, G.-J. (2014). An augmented reality-based mobile learning system to improve students’ learning achievements and motivations in natural science inquiry activities. *Journal of Educational Technology & Society*, 17(4), 352–365.
- Cohen, L., Manion, L., & Keith, M. (2018). *Research methods in education* (8th ed.). Routledge.
- Cooper, P. A. (1993). Paradigm shifts in designed instruction: From behaviorism to cognitivism to constructivism. *Educational Technology*, 33(5), 12–19.
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Education, Inc.
- Dahlstrom, E., & Brooks, D. C. (2014). With a foreword by Diana Oblinger. *ECAR Study of Faculty and Information Technology*, 1–29.
- Demircioglu, T., Karakus, M., & Ucar, S. (2023). Developing students’ critical thinking skills and argumentation abilities through augmented reality – based argumentation activities in science classes. In *Science & Education* (Vol. 32, Issue 4). Springer Netherlands. <https://doi.org/10.1007/s11191-022-00369-5>
- Demirel, Ö., Seferoğlu, S. S., & Yağcı, E. (2003). *Instructional technologies and material development*. Pegem A Publications.
- Deng, Z., & Neumann, U. (2008). *Data-driven 3D facial animation* (Vol. 5). Springer.
- Dutta, R., Mantri, A., Singh, G., & Singh, N. P. (2023). Measuring the impact of

- augmented reality in flipped learning mode on critical thinking, learning motivation, and knowledge of engineering students. *Journal of Science Education and Technology*, 32(6), 912–930. <https://doi.org/10.1007/s10956-023-10051-2>
- Erdem, E. (2001). *Program gelistirmede yapilandirmacilik yaklasum. (Constructivist approach in curriculum development)*. Hacettepe University.
- Faridi, H., Tuli, N., Mantri, A., Singh, G., & Gargrish, S. (2020). A framework utilizing augmented reality to improve critical thinking ability and learning gain of the students in Physics. *Computer Applications in Engineering Education*, 29(1), 258–273. <https://doi.org/10.1002/cae.22342>
- Fauziah, A. N. M., Purnomo, A. R., Fathonah, N., & Khusaini. (2018). The use of monopoly-like game (MLG) to promote qualified scores for three student competencies. *Jurnal Pendidikan IPA Indonesia*, 7(3), 280–285. <https://doi.org/10.15294/jpii.v6i2.8183>
- Figueiredo, M., Gomes, J., Gomes, C., & Lopes, J. (2014). Augmented reality tools and learning practice in mobile-learning. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 8514 LNCS(PART 2), 301–312. https://doi.org/10.1007/978-3-319-07440-5_28
- Fotaris, P., Pellas, N., Kazanidis, I., & Smith, P. (2017). A systematic review of augmented reality game-based applications in primary education. *Memorias Del Xi Congreso Europeo En Aprendizaje Basado En El Juego Graz*, 181–191.
- Gay, L. R., M., G. E., & A., P. W. (2012). *Educational research: Competencies for analysis and applications* (10th ed.). Pearson Education Inc.
- Geiger, H. C., & Donohoe, J. S. (2012). Green oxidation of menthol enantiomers and analysis by circular dichroism spectroscopy: An advanced organic chemistry laboratory. *Journal of Chemical Education*, 89(12), 1572–1574. <https://doi.org/10.1021/ed2008608>
- Grove, N. P., Hershberger, J. W., & Bretz, S. L. (2008). Impact of a spiral organic curriculum on student attrition and learning. *Chemistry Education Research and Practice*, 9(2), 157–162. <https://doi.org/10.1039/B806232N>
- Hairida, H., Benó, C., Soeharto, S., Charalambos, C., Rasmawan, R., Martono, M., Arifiyanti, F., Winarti, A., & Enawaty, E. (2023). Evaluating digital literacy of pre-service chemistry teachers: Multidimensional rasch analysis. *Journal of Science Education and Technology*, 32(5), 643–654. <https://doi.org/10.1007/s10956-023-10070-z>
- Hanggara, Y., Qoha, A., & Sukoriyanto. (2024). The impact of augmented reality-based mathematics learning games on students' critical thinking skills.

International Journal of Interactive Mobile Technologies, 18(7), 173–187.
<https://doi.org/10.3991/ijim.v18i07.48067>

- Hsiao, H.-S., Chang, C.-S., Lin, C.-Y., & Wang, Y.-Z. (2016). Weather observers: A manipulative augmented reality system for weather simulations at home, in the classroom, and at a museum. *Interactive Learning Environments*, 24(1), 205–223. <https://doi.org/10.1080/10494820.2013.834829>
- Hsu, Y. S., Lin, Y. H., & Yang, B. (2017). Impact of augmented reality lessons on students' STEM interest. *Research and Practice in Technology Enhanced Learning*, 12(1). <https://doi.org/10.1186/s41039-016-0039-z>
- Huang, T.-C., Chen, C.-C., & Chou, Y.-W. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. *Computers & Education*, 96, 72–82. <https://doi.org/10.1016/j.compedu.2016.02.008>
- Hung, Y., Chen, C., & Huang, S. (2017). Applying augmented reality to enhance learning: A study of different teaching materials. *Journal of Computer Assisted Learning*, 33(3), 252–266. <https://doi.org/10.1016/j.compedu.2016.02.008>
- Hwang, G. J., Wu, P. H., Chen, C. C., & Tu, N. T. (2016). Effects of an augmented reality-based educational game on students' learning achievements and attitudes in real-world observations. *Interactive Learning Environments*, 24(8), 1895–1906. <https://doi.org/10.1080/10494820.2015.1057747>
- Jääskä, E., & Aaltonen, K. (2022). Teachers' experiences of using game-based learning methods in project management higher education. *Project Leadership and Society*, 3, 1–12. <https://doi.org/10.1016/j.plas.2022.100041>
- Jafari Amineh, R., & Davatgari Asl, H. (2015). Review of constructivism and social constructivism. *Journal of Social Sciences, Literature and Languages*, 1(1), 9–16.
- Jean, P. (2007). *Play, dreams and imitation in childhood, reported*. *Developmental Psychology*. Routledge.
- Jhonstone, M. S. (2009). Animation: the fundamental, essential, and properly descriptive concept. *Continental Philosophy Review*, 42, 375–400. <https://doi.org/10.1007/s11007-009-9109-x>
- Jones, L. L., & Kelly, R. M. (2015). Visualization: The key to understanding chemistry concepts. In *Sputnik to Smartphones: A Half-Century of Chemistry Education* (pp. 121–140). ACS Publications.
- Juan M, C., Furió, D., Alem, L., Ashworth, P., & Cano, J. (2011). *ARGreenet and basicgreenet: Two mobile games for learning how to recycle*. Václav Skala-UNION Agency.
- Justi, R. (2002). Teaching and learning chemical kinetics. In J. K. Gilbert, O. De

- Jong, R. Justi, D. F. Treagust, & J. H. Van Driel (Eds.), *Chemical Education: Towards Research-based Practice* (pp. 293–315). Springer. https://doi.org/10.1007/0-306-47977-X_13
- Kamphuis, C., Barsom, E., Schijven, M., & Christoph, N. (2014). Augmented reality in medical education? *Perspectives on Medical Education*, 3(4), 300–311. <https://doi.org/10.1007/s40037-013-0107-7>
- Kanselaar, G. (2002). Constructivism and socio-constructivism. *Constructivism and Socio-Constructivism*, 1–7.
- Kapp, K. M. (2013). *The gamification of learning and instruction fieldbook: Ideas into practice*. John Wiley & Sons.
- Karpudewan, M., Ismail, Z., & Roth, W.-M. (2012). Promoting pro-environmental attitudes and reported behaviors of Malaysian pre-service teachers using green chemistry experiments. *Environmental Education Research*, 18(3), 375–389. <https://doi.org/10.1080/13504622.2011.622841>
- Kennedy, G., Dalgarno, B., Bennett, S., Judd, T., Gray, K., & Chang, R. (2008). Immigrants and natives: Investigating differences between staff and students' use of technology. *Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*, 484–492.
- Kennedy, M., Fisher, M. B., & Ennis, R. H. (1991). Critical thinking: Literature review and needed research. *Educational Values and Cognitive Instruction: Implications for Reform*, 2, 11–40.
- Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). "Making it real": Exploring the potential of augmented reality for teaching primary school science. *Virtual Reality*, 10(3–4), 163–174. <https://doi.org/10.1007/s10055-006-0036-4>
- Khairuddin, Masrun, Baktiar, S., & Syahrudin. (2023). Analysis of the impact of game-based physical education learning on physical fitness of junior high school students. *Cakrawala Pendidikan*, 42(1), 241–253. <https://doi.org/10.21831/cp.v42i1.54605>
- Kim, S., Yoon, M., Whang, S., Tversky, B., & Morrison, J. B. (2007). The effect of animation on comprehension and interest. *Journal of Computer Assisted Learning*, 23(3), 260–270. <https://doi.org/10.1111/j.1365-2729.2006.00219.x>
- Kirriemuir, J., & McFarlane, A. (2004). *Literature review in games and learning*.
- Koskinen, A., McMullen, J., Hannula-Sormunen, M., Ninaus, M., & Kiili, K. (2023). The strength and direction of the difficulty adaptation affect situational interest in game-based learning. *Computers & Education*, 194, 104694. <https://doi.org/10.1016/j.compedu.2022.104694>
- Kuhn, D. (1999). A developmental model of critical thinking. *Educational*

- Researcher*, 28(2), 16–46. <https://doi.org/10.2307/1177186>
- L.Turner, J. (2014). *Using statistics in small-scale language education research: Focus on non-parametric data* (1st ed.). Routledge.
- Lai, E. R. (2011). *Critical thinking: A literature review*. Pearson's Research Reports; Citeseer.
- Landers, R. N. (2014). Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming*, 45(6), 752–768. <https://doi.org/10.1177/1046878114563660>
- Law, K. M. Y. (2019). Teaching project management using project-action learning (PAL) games: A case involving engineering management students in Hong Kong. *International Journal of Engineering Business Management*, 11, 1847979019828570. <https://doi.org/10.1177/1847979019828570>
- Lee, K. (2012a). Augmented reality in education and training. *TechTrends*, 56(2), 13–21. <https://doi.org/10.1007/s11528-012-0559-3>
- Lee, K. (2012b). Augmented reality in education and training. *TechTrends*, 56(2), 13–21. <https://doi.org/10.1007/s11528-012-0559-3>
- Leitão, R., Rodrigues, J. M. F., & Marcos, A. F. (2014). Game-based learning: Augmented reality in the teaching of geometric solids. *International Journal of Art, Culture, Design, and Technology (IJACDT)*, 4(1), 63–75. <https://doi.org/10.4018/ijacdt.2014010105>
- Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory into Practice*, 32(3), 131–137. <https://doi.org/10.1080/00405849309543588>
- Liu, T.-Y., Tan, T.-H., & Chu, Y.-L. (2007). 2D barcode and augmented reality supported English learning system. *6th IEEE/ACIS International Conference on Computer and Information Science (ICIS 2007)*, 5–10. <https://doi.org/10.1109/ICIS.2007.1>
- Markina, E., & Mollá, A. G. (2022). The effect of a teacher-centred and learner-centred approach on students' participation in the English classroom. *Bellaterra Journal of Teaching and Learning Language and Literature*, 15(3). <https://doi.org/10.5565/rev/jtl3.1007>
- Maulana, R., Helms-Lorenz, M., Irnidayanti, Y., & van de Grift, W. (2016). Autonomous Motivation in the Indonesian Classroom: Relationship with Teacher Support Through the Lens of Self-Determination Theory. *Asia-Pacific Education Researcher*, 25(3), 441–451. <https://doi.org/10.1007/s40299-016-0282-5>
- McFarlane, A., Sparrowhawk, A., & Heald, Y. (2002). *Report on the educational use of games*. TEEM (Teachers evaluating educational multimedia), Cambridge.

- Mellor, K. E., Coish, P., Brooks, B. W., Gallagher, E. P., Mills, M., Kavanagh, T. J., Simcox, N., Lasker, G. A., Botta, D., Voutchkova-Kostal, A., Kostal, J., Mullins, M. L., Nesmith, S. M., Corrales, J., Kristofco, L., Saari, G., Steele, W. B., Melnikov, F., Zimmerman, J. B., & Anastas, P. T. (2018). The safer chemical design game. Gamification of green chemistry and safer chemical design concepts for high school and undergraduate students. *Green Chemistry Letters and Reviews*, *11*(2), 103–110. <https://doi.org/10.1080/17518253.2018.1434566>
- Mota, J. M., Ruiz-Rube, I., Doderó, J. M., & Arnedillo-Sánchez, I. (2018). Augmented reality mobile app development for all. *Computers and Electrical Engineering*, *65*, 250–260. <https://doi.org/10.1016/j.compeleceng.2017.08.025>
- Mvududu, N., & Thiel-Burgess, J. (2012). Constructivism in practice: The case for English language learners. *International Journal of Education*, *4*(3), 108–118.
- Nielsen, B. L., Brandt, H., & Swensen, H. (2016). Augmented Reality in science education—affordances for student learning. *NorDiNa*, *12*(2), 157–174.
- Nisbett, R. (2004). *The geography of thought: How Asians and Westerners think differently... and why*. Simon and Schuster.
- O'Neill, M. E., & Mathews, K. L. (2002). Levene tests of homogeneity of variance for general block and treatment designs. *Biometrics*, *58*(1), 216–224. <https://doi.org/10.1111/j.0006-341X.2002.00216.x>
- OECD. (2023). PISA 2022 Results Factsheets Indonesia. *The Language of Science Education*, *1*, 1–9. <https://oecdch.art/a40de1dbaf/C108>.
- Paul, R. (2005). The state of critical thinking today. *New Directions for Community Colleges*, *2005*(130), 27–38.
- Pellas, N., Fotaris, P., Kazanidis, I., & Wells, D. (2019). Augmenting the learning experience in primary and secondary school education: a systematic review of recent trends in augmented reality game-based learning. *Virtual Reality*, *23*(4), 329–346. <https://doi.org/10.1007/s10055-018-0347-2>
- Phan, H. P. (2010). Critical thinking as a self-regulatory process component in teaching and learning. *Psicothema*, 284–292.
- Phillips, D. C. (2000). *Constructivism in education: Opinions and second opinions on controversial issues*. *Ninety-Ninth Yearbook of the National Society for the Study of Education*. ERIC.
- Piaget, J., & Inhelder, B. (1969). *The psychology of the child*. New York: Basic Books.
- Pithers, R. T., & Soden, R. (2000). Critical thinking in education: A review. *Educational Research*, *42*(3), 237–249.

- Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist*, 50(4), 258–283.
- Plass, J. L., Homer, B. D., Mayer, R. E., & Kinzer, C. K. (2020). *Theoretical foundations of game-based and playful learning*.
- Prensky, M. (2003). Digital game-based learning. *Computers in Entertainment (CIE)*, 1(1), 21.
- Razali, M., Nornadiah, Wah, B., & Yap. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics*, 2(1), 13–14.
- Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). *Generation M [superscript 2]: Media in the Lives of 8-to 18-Year-Olds*. ERIC Clearinghouse.
- Rivas, S. F., & Saiz, C. (2010). Es posible evaluar la capacidad de pensar críticamente en la vida cotidiana. *O Lugar Da Lógica e Da Argumentação No Ensino Da Filosofia*, 53–74.
- Rumeser, D., & Emsley, M. (2019). Can serious games improve project management decision making under complexity? *Project Management Journal*, 50(1), 23–39.
- Saidin, N. F., Yahaya, N., & Zulkifli, N. N. (2024). Enhancing students' critical thinking and visualisation skills through mobile augmented reality. *Knowledge Management & E-Learning*, 16(1), 1–41. <https://doi.org/10.34105/j.kmel.2024.16.001>
- Saiz, C., & Rivas, S. F. (2010). Mejorar el pensamiento crítico contribuye al desarrollo personal de los jóvenes. *O Lugar Da Lógica e Da Argumentação No Ensino Da Filosofia*, 39–52.
- Sari, R. I., Karyanto, P., & Muzzazinah. (2019). Analysis of critical thinking skills of senior high school students in biological learning. *Journal of Physics: Conference Series*, 1338(1). <https://doi.org/10.1088/1742-6596/1338/1/012031>
- Shaffer, D. W., Squire, K. R., Halverson, R., & Gee, J. P. (2005). Video games and the future of learning. *Phi Delta Kappan*, 87(2), 105–111.
- Singh. (2006). *Fundamental of research methodology and statistics*. New Age International.
- Smirnov, N. (1948). Table for estimating the goodness of fit of empirical distributions. *The Annals of Mathematical Statistics*. 19(2), 279–281. <https://doi.org/http://dx.doi.org/10.1214/aoms/1177730256>.
- Sosu, E. M. (2013). The development and psychometric validation of a Critical Thinking Disposition Scale. *Thinking Skills and Creativity*, 9, 107–119.

<https://doi.org/10.1016/j.tsc.2012.09.002>

- Stehle, S. M., & Peters-Burton, E. E. (2019). Developing student 21st Century skills in selected exemplary inclusive STEM high schools. *International Journal of STEM Education*, 6(1), 1–15. <https://doi.org/10.1186/s40594-019-0192-1>
- Suryanti, S., Arifani, Y., & Sutaji, D. (2020). Augmented reality for integer learning : Investigating its potential on students ' critical thinking. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/1613/1/012041>
- Suyamto, J., Masykuri, M., & Sarwanto, S. (2018). An analysis of the initial profile of students' critical thinking skills in learning circulator system at XI grader of SMA N 1 Gondang Sragen. *Advances in Social Science, Education and Humanities Research (ASSEHR)*, 267(Aecon), 53–57. <https://doi.org/10.2991/aecon-18.2018.12>
- Teo, T. W., Goh, M. T., & Yeo, L. W. (2014). Chemistry education research trends: 2004–2013. *Chemistry Education Research Practice*, 15(4), 479–487. <https://doi.org/10.1039/C4RP00104D>
- Tobar-Muñoz, H., Baldiris, S., & Fabregat, R. (2017). Augmented reality game-based learning: Enriching students' experience during reading comprehension activities. *Journal of Educational Computing Research*, 55(7), 901–936.
- Tweed, R. G., & Lehman, D. R. (2002). Learning considered within a cultural context: Confucian and Socratic approaches. *American Psychologist*, 57(2), 89.
- Utami, B., Saputro, S., Ashadi, A., Masykuri, M., Probosari, R., & Sutanto, A. (2018). Students' critical thinking skills profile: Constructing best strategy in teaching chemistry. *International Journal of Pedagogy and Teacher Education*, 2(January), 71–76. <https://doi.org/https://doi.org/10.20961/IJPTE.V2I0.19768>
- Vygotsky, L. S. (1962). *Thought and language* (M. P. Cambridge, MA (ed.)).
- Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard university press.
- Wardencki, W., Curyło, J., & Namiesńnik, J. (2005). Green chemistry-current and future issues. *Polish Journal of Environmental Studies*, 14(4).
- Wardoyo, C., Satrio, Y. D., Narmaditya, B. S., & Wibowo, A. (2021). Do technological knowledge and game-based learning promote students achievement: lesson from Indonesia. *Heliyon*, 7(11).
- Ware, S. A., Haack, J. A., Hutchison, J. E., Kirchhoff, M. M., & Levy, I. J. (2005). Association report : ACS education going green : Lecture assignments and lab experiences for the college curriculum 1. *Journal of Chemical Education*,

82(7), 1–3.

- Wei, X., Weng, D., Liu, Y., & Wang, Y. (2015). Teaching based on augmented reality for a technical creative design course. *Computers & Education*, *81*, 221–234.
- Wen, Y., Wu, L., He, S., Ng, N. H. E., Teo, B. C., Looi, C. K., & Cai, Y. (2023). Integrating augmented reality into inquiry-based learning approach in primary science classrooms. *Educational Technology Research and Development*, *71*(4), 1631–1651. <https://doi.org/10.1007/s11423-023-10235-y>
- Wenno, I. H., Esomar, K., & Sopacua, V. (2016). Analisis kesulitan belajar dan pencapaian hasil belajar siswa melalui strategi pembelajaran inkuiri. *Jurnal Cakrawala Pendidikan*, *35*(3), 378–385. <https://doi.org/10.21831/cp.v35i3.10706>
- Wiggins, B. E. (2016). An overview and study on the use of games, simulations, and gamification in higher education. *International Journal of Game-Based Learning (IJGBL)*, *6*(1), 18–29.
- Wijisman, L. A., Warrens, M. J., Saab, N., van Driel, J. H., & Westenberg, P. M. (2016). Declining trends in student performance in lower secondary education. *European Journal of Psychology of Education*, *31*(4), 595–612. <https://doi.org/10.1007/s10212-015-0277-2>
- Woolfolk, A. E. (1993). *Educational psychology* (A. and B. Boston (ed.)).
- Wu, H.-K., Lee, S. W.-Y., Chang, H.-Y., & Liang, J.-C. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & Education*, *62*, 41–49. <https://doi.org/https://doi.org/10.1016/j.compedu.2012.10.024>
- Yakinci, Z. D., Gurbuz, P., & Yetis, G. (2018). Internet usage habits and internet usage in educational studies of vocational school students. *Journal of Computer and Education Research*, *6*(11), 33–46. <https://doi.org/10.18009/jcer.330925>
- Yalçinkaya, E., & Boz, Y. (2015). The effect of case-based instruction on 10th grade students' understanding of gas concepts. *Chemistry Education Research and Practice*, *16*(1), 104–120. <https://doi.org/10.1039/c4rp00156g>
- Zhang, J., Sung, Y.-T., Hou, H.-T., & Chang, K.-E. (2014). The development and evaluation of an augmented reality-based armillary sphere for astronomical observation instruction. *Computers & Education*, *73*, 178–188. <https://doi.org/https://doi.org/10.1016/j.compedu.2014.01.003>
- Zhang, Z., & Zhang, Y. (2022). Research on effective strategies of college physical education interactive teaching based on machine learning. *Applied Bionics and Biomechanics*, *2022*, 8. <https://doi.org/10.1155/2022/1843514>