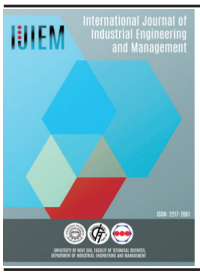

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Adapting EdTech for Developing Educational Contexts: A Comparative Usability Study of ALPA Kids and ChatGPT

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References

[1] S. Rakic, N. Tasic, U. Marjanovic, S. Softic, E. Lüftenegger, and I. Turcin, "Student performance on an e-learning platform: Mixed method approach," Int. J. Emerg. Technol. Learn., vol. 15, no. 2, p. 187, 2020, doi: 10.3991/ijet.v15i02.11646.
[2] H. G. Van De Werfhorst, E. Kessenich, and S. Geven, "The digital divide in online education: Inequality in digital readiness of students and schools," Comput. Educ. Open, vol. 3, Art. no. 100100, 2022, doi: 10.1016/j.caeo.2022.100100.
[3] F. Kilipiris, S. Avdimiotis, E. Christou, A. Tragouda, and I. Konstantinidis, "Bloom's taxonomy student persona responses to blended learning methods employing the metaverse and flipped classroom tools," Educ. Sci., vol. 14, no. 4, Art. no. 418, 2024, doi: 10.3390/educsci14040418.
[4] R. Cobo-Rendón, C. Bruna Jofre, K. Lobos, N. Cisternas San Martin, and E. Guzman, "Return to university classrooms with blended learning: A possible post-pandemic COVID-19 scenario," Front. Educ., vol. 7, Art. no. 957175, 2022, doi: 10.3389/feduc.2022.957175.
[5] V. Arioli et al., "Digital servitization business typologies in the manufacturing sector," Int. J. Ind. Eng. Manag., vol. 16, no. 1, pp. 1–23, 2025, doi: 10.24867/IJIEM-378.
[6] S. K. Howard and A. Mozejko, "Considering the history of digital technologies in education," in Teaching and Digital Technologies, 1st ed., M. Henderson and G. Romeo, Eds. Cambridge, U.K.: Cambridge Univ. Press, 2015, pp. 157–168, doi: 10.1017/CBO9781316091968.017.
[7] O. Zawacki-Richter, V. I. Marín, M. Bond, and F. Gouverneur, "Systematic review of research on artificial intelligence applications in higher education—Where are the educators?," Int. J. Educ. Technol. High. Educ., vol. 16, no. 1, Art. no. 39, 2019, doi: 10.1186/s41239-019-0171-0.
[8] Y. I. Alzoubi and A. Topcu, "Generative artificial intelligence technology for systems engineering research: Contribution and challenges," Int. J. Ind. Eng. Manag., vol. 15, no. 2, pp. 169–179, 2024, doi: 10.24867/IJIEM-2024-2-355.
[9] M. Kelley and T. Wenzel, "Advancing artificial intelligence literacy in teacher education through professional partnership inquiry," Educ. Sci., vol. 15, no. 6, Art. no. 659, 2025, doi: 10.3390/educsci15060659.
[10] C.-C. Lin, A. Y. Q. Huang, and O. H. T. Lu, "Artificial intelligence in intelligent tutoring systems toward sustainable education: A systematic review," Smart Learn. Environ., vol. 10, no. 1, Art. no. 41, 2023, doi: 10.1186/s40561-023-00260-y.
[11] F. Panagopoulou, C. Parpoula, and K. Karpouzis, "Legal and ethical considerations regarding the use of ChatGPT in education," SocArXiv, 2023, doi: 10.31235/osf.io/c5hf3.
[12] B. Memarian and T. Doleck, "ChatGPT in education: Methods, potentials, and limitations," Comput. Hum. Behav. Artif. Hum., vol. 1, no. 2, Art. no. 100022, 2023, doi: 10.1016/j.chbah.2023.100022.
[13] D. Hadar Shoval, "Artificial intelligence in higher education: Bridging or widening the gap for diverse student populations?," Educ. Sci., vol. 15, no. 5, Art. no. 637, 2025, doi: 10.3390/educsci15050637.

[14] S. Rakic, S. Softic, Y. Andriichenko, I. Turcin, B. Markoski, and J. Leoste, "Usability platform test: Evaluating the effectiveness of educational technology applications," in Futureproofing Engineering Education for Global Responsibility, M. E. Auer and T. Rüütmann, Eds., Lecture Notes in Networks and Systems, vol. 1280. Cham, Switzerland: Springer Nature Switzerland, 2025, pp. 250–258, doi: 10.1007/978-3-031-83523-0_23.
[15] D. Rodriguez-Segura, "EdTech in developing countries: A review of the evidence," World Bank Res. Obs., vol. 37, no. 2, 2022, doi: 10.1093/wbro/lkab011.
[16] A. Norman, "Educational technology for reading instruction in developing countries: A systematic literature review," Rev. Educ., vol. 11, no. 3, 2023, doi: 10.1002/rev3.3423.
[17] P. Lynch, N. Singal, and G. A. Francis, "Educational technology for learners with disabilities in primary school settings in low- and middle-income countries: A systematic literature review," Educ. Rev., vol. 76, no. 2, 2024, doi: 10.1080/00131911.2022.2035685.
[18] A. Bozkurt, "Educational technology research patterns in the realm of the digital knowledge age," J. Interact. Media Educ., vol. 2020, no. 1, Art. no. 1, 2020, doi: 10.5334/jime.570.
[19] B. D. Nye, "Intelligent tutoring systems by and for the developing world: A review of trends and approaches for educational technology in a global context," Int. J. Artif. Intell. Educ., vol. 25, no. 2, 2015, doi: 10.1007/s40593-014-0028-6.
[20] P. Goswami and V. Parekh, "The impact of screen time on child and adolescent development: A review," Int. J. Contemp. Pediatr., vol. 10, no. 7, 2023, doi: 10.18203/2349-3291.ijcp20231865.
[21] J. Cullen et al., "Impacts of digital technologies on child and adolescent health: Recommendations for safer screen use in educational settings," N. Z. Med. J., vol. 137, no. 1598, 2024, doi: 10.26635/6965.6565.
[22] D. R. Wulan, D. M. Nainggolan, Y. Hidayat, T. Rohman, and A. Y. Fiyul, "Exploring the benefits and challenges of gamification in enhancing student learning outcomes," Glob. Int. J. Innov. Res., vol. 2, no. 7, 2024, doi: 10.59613/global.v2i7.238.
[23] K. E. Gael and D. S. Elmiana, "Mobile-assisted language learning (MALL) in English language acquisition: A critical literature review," J. Engl. Lang. Teach. Innov. Mater., vol. 3, no. 2, 2021, doi: 10.26418/jeltim.v3i2.49813.
[24] C. Kalyan Chakravarthy and V. Sunitha, "The use of mobile apps to enhance reading skills of language learners: A review," J. Hum. Res. Rehabil., vol. 13, no. 1, 2023, doi: 10.21554/hrr.042303.
[25] M. D. Tadjiyeva, "The use of educational apps as didactic tools in teaching English as a second language," Eur. J. High. Educ. Acad. Adv., vol. 1, no. 1, 2023, doi: 10.61796/ejheaa.v1i1.184.
[26] S. A. Booton, A. Hodgkiss, and V. A. Murphy, "The impact of mobile application features on children's language and literacy learning: A systematic review," Comput. Assist. Lang. Learn., vol. 36, no. 3, 2023, doi: 10.1080/09588221.2021.1930057.
[27] S. S. Sukor and Z. Ali, "Smartphone applications for young English language learners," J. Phys. Conf. Ser., vol. 1529, no. 5, Art. no. 052079, 2020, doi: 10.1088/1742-6596/1529/5/052079.
[28] A. Megahed, "Impact of language learning games for preschool children based on the case study of Alpa Kids application," Master's thesis, Tallinn Univ., Tallinn, Estonia, 2021.
[29] E.-M. Kippar, "Personalized learning in early childhood education in Estonia and opportunities to support it through technology: Using ALPA Kids application," Master's thesis, Tallinn Univ., Tallinn, Estonia, 2022. [Online]. Available: https://www.etera.ee/zoom/198893/view?page=1&p=separate&search=alpa&tool=search&view=807,1087,1320,560. [Accessed: Oct. 12, 2024].
[30] H. Yaremenko, "The uncertainties of digital learning games use in teaching young children (by the immersion method): The case of ALPA Kids," Master's thesis, Univ. Tartu, Tartu, Estonia, 2023.
[31] L. Ints, "Ukraina sõjapõgenike laste eesti keele õppimise toetamine ALPA Kids hariduslike mängude keskkonna kaudu," Master's thesis, Tallinn Univ., Tallinn, Estonia, 2024. [Online]. Available: https://www.etera.ee/zoom/201297/view?page=1&p=separate&search=alpa&tool=search&view=0,992,2176,2516. [Accessed: Oct. 12, 2024].
[32] M. Kummer, "Eestikeelsete ekraanipõhiste haridusrakenduste kasutamise võimalused lasteaias," Master's thesis, Tallinn Univ., Tallinn, Estonia, 2024.
[33] Y. Albadarin, M. Saqr, N. Pope, and M. Tukiainen, "A systematic literature review of empirical research on ChatGPT in education," Discov. Educ., vol. 3, no. 1, Art. no. 60, 2024, doi: 10.1007/s44217-024-00138-2.
[34] N. Nainggolan, B. Mahmoud AlWadi, M. Kosov, and W. Putra, "Advancements in optimization for automotive manufacturing: Hybrid approaches and machine learning," Int. J. Ind. Eng. Manag., vol. 15, no. 3, pp. 254–263, 2024, doi: 10.24867/IJIEM-2024-3-361.
[35] A. Maynard, "AI in education: Comparing China and U.S. strategies," Future of Being Human Initiative, Arizona State Univ., 2025.
[36] W. Holmes, M. Bialik, and C. Fadel, Artificial Intelligence in Education: Promise and Implications for Teaching and Learning. Boston, MA, USA: Center for Curriculum Redesign, 2019.
[37] R. Luckin, W. Holmes, M. Griffiths, and L. B. Forcier, Intelligence Unleashed: An Argument for AI in Education. London, U.K.: Pearson Education, 2016.
[38] E. Kasneci et al., "ChatGPT for good? On opportunities and challenges of large language models for education," Learn. Individ. Differ., vol. 103, Art. no. 102274, 2023, doi: 10.1016/j.lindif.2023.102274.
[39] V. M. Freires, A. M. Lucas, R. H. P. da Silva, and E. S. de Almeida, "Development of a didactic solution for teaching concepts related to digital twins using educational robot," Int. J. Ind. Eng. Manag., vol. 16, no. 4, pp. 444–458, 2025, doi: 10.24867/IJIEM-398.
[40] M. Bond, S. Bedenlier, V. I. Marín, and M. Händel, "Emergency remote teaching in higher education: Mapping the first global online semester," Int. J. Educ. Technol. High. Educ., vol. 18, no. 1, Art. no. 50, 2021, doi: 10.1186/s41239-021-00282-x.