

# Virtual Reality for Future Education: Systematic Literature Review

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**Abstract:** The development of information and communication technology is very rapid at this time contributed greatly to the development process of various kinds of learning media based on the application of technology as one of the innovations in education, Virtual Reality (VR) technology itself is a way in a way perform the appearance of learning pictures in the form of media three-dimensional or what is usually better known as 3D. Where the purpose of research is to explain Virtual Reality for Future Education. A review is conducted on the state-of-the-art methods using the preferred reporting items for reviews and meta-analyses (PRISMA) guidelines. Virtual Reality (VR) has the potential to enhance education by enabling greater learning potential than ever before, in addition to luring us into new realms. Learning can reach students' emotional core in novel and fascinating ways thanks to virtual reality. This study also states that learning subjects that can benefit the most from implementing Virtual Reality as learning media are science, social studies, and history. However, the potential is much greater.

**Keywords:** Artificial intelligence; digital learning media; virtual reality

## Introduction

The term "Virtual Reality" is a mix of the words "virtual," which means near, and "reality," which refers to the genuine things that we as humans encounter. One of the advantages of Virtual Reality is that it can help someone increase their skills and knowledge without having to do it for real. Usually, it is often used for training purposes. Now, VR has penetrated the world of education, especially so that it is easier for students to understand the lessons given. Encouraging students to think creatively and critically and Facilitating teachers in delivering learning material.

The term Virtual Reality (VR) was coined in 1987 by Jaron Lanier, whose research and engineering provided several products to the nascent VR industry. In an educational context, virtual reality can serve to gain practical knowledge that can be used in clinical practice (Zyoud & Zyoud, 2021). Learning activities are a method of educators that are given to students to achieve the

essence of learning processes, where various methods have been carried out in the process of learning activities such as reading, viewing, and listening to achieve these learning activities (Hwang et al., 2019). The very rapid development of information and communication technology is currently also having a major influence on the process of developing various kinds of learning media based on the application of technology as one of the innovations in the world of education (Abdulrahman et al., 2020). this is expected to advance quality education along with technological advances.

As for its function, it is said that virtual reality is a promising alternative media in the learning process (Ke & Xu, 2020). According to a report from the World Economic Forum (WEF) published in October 2020, the educational need for Virtual Reality technology will reach 70 percent by 2025. Virtual Reality is claimed to have an impact on student achievement, ranging from understanding the material and increasing positive emotions to critical thinking skills (Albus et al., 2021).

## How to Cite:

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This proof has been carried out in many countries in the form of university scientific research and independent research. The use of technology can support the learning process and help build student learning attention so that learning outcomes get better (Haleem et al., 2022). Therefore the Virtual Reality Study for Future Education: A review will be applied to the Information Technology Study Program, Labuhanbatu University, Rantauprapat, Indonesia

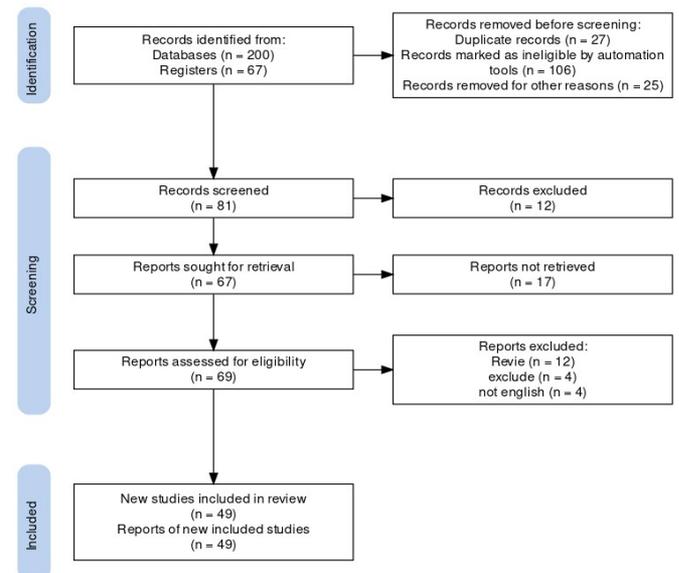
**Method**

We conducted this study as a systematic review following PRISMA guidelines. The PRISMA guidelines provide several things to consider when preparing a systematic review. In this study, we will mainly focus on several main items: namely Encouraging students to think creatively and critically and Facilitating teachers in delivering learning materials. According to a report from the World Economic Forum (WEF) published in October 2020, the educational need for Virtual Reality technology will reach 70 percent by 2025. This proof has been carried out in many countries in the form of university scientific research and independent research. Therefore, the Virtual Reality method for Future Education: Systematic literature review will also be carried out in this study.

**Result and Discussion**

The preferred reporting method employed in this study is Preferred Reporting Items for Systematic Review (PRISMA) (Figure 1) (Haddaway et al., 2022). The required research phases were carried out carefully over the course of the study. The information is

complete, and objective, and makes an effort to incorporate relevant study findings. Creating research questions, searching the literature, screening and selecting articles that are pertinent, selecting the best research findings, filtering and analyzing the results, synthesizing qualitative results, and writing a research report are the steps in a systematic review of the literature. The systematic literature review research process includes writing background and study objectives, collecting research questions, scanning the literature, choosing articles, extracting articles, assessing the standard of basic studies, and synthesizing data.



**Figure 1.** PRISMA method

Complete articles published in international journals from 2017-2023, indexed in Scopus databases, and themed virtual Reality for future education.

**Table 1.** Artificial Intelligence

Sources	Fields of Artificial Intelligence
(Alkhayyat et al., 2022); (Guidara, 2021); (Averkin, 2019); (Chimatapu et al., 2018) (Nguyen Thi Phuong et al., 2021); (Gollapudi, 2019); (Khan et al., 2022); (Kanwal et al., 2022)	Fuzzy Logic Computer Vision
(Schijven & Kikkawa, 2022); (Dua et al., 2019); (Stallwood & Ranchhod, 2017); (Mi & Gao, 2022)	Artificial Intelligence in Games
(Bharali & Kalita, 2018); (Liu & Quan, 2022); (Manjunath & Sreenivasa Rao, 2018); (Alnuaim et al., 2022)	Speech Recognition
(Asemi et al., 2021); (Zyoud & Zyoud, 2021); (Jain et al., 2023); (Nahak et al., 2023)	Expert System

From Table 1 it can be explained about the fields of artificial intelligence Fuzzy logic is a method of multiple artificial intelligence found in electronic devices and robots where electronic devices and the robot can think and act like a human. Computer vision is an artificial intelligence method that allows a computer system to recognize images as input. Artificial intelligence in games is an artificial intelligence method that is useful

for imitating human thinking in playing games. Speech recognition is an artificial intelligence method useful for recognizing the human voice by way of being matched with pre-programmed references or patterns. Expert system is useful artificial intelligence methods for imitating the way of thinking and reasoning of an expert in taking a decision based on the situation.

**Table 2.** Digital Learning Media

Sources	Flipped learning model classroom
(Hwang et al., 2019); (Colomo-Magaña et al., 2020); (Poniatowski, 2019); (Playfoot, 2023)	Traditional Flipped
(Said & Zainal, 2017); (Putri et al., 2023); (Låg & Sæle, 2019); (Kazanidis et al., 2019)	Mastery Flipped
(Nerantzi, 2020); (Ruiz De Miras et al., 2021); (Nerantzi, 2020); (Akçayır & Akçayır, 2018)	Peer Instruction Flipped
(Bodagh et al., 2017); (Wang et al., 2022); (Damayanti et al., 2020); (Muyassaroh et al., 2022)	Problem-Based Learning Flipped

Table 2 provides the simplest flipped classroom learning model is traditional flipped. Traditional Flipped has evolved into Mastery Flipped. The phases of learning are essentially identical to those of Traditional Flipped; the only difference is that in this approach, the first lesson is a review of the previous meeting's lesson.

Instruction from peers Flipped Flipped Peer instruction is a type of learning where participants watch videos to review the fundamentals before class. Flipped problem-based learning involves giving students videos with solutions to issues that will come up in class.

**Table 3.** Virtual Reality

Sources	The main Virtual reality cyber community
(Schiavo, 2021); (Capizzo & Madden, 2022); (Cumbers et al., 2018); (Alnuaim et al., 2022)	Community as place
(Kholiq et al., 2022); (Widayati et al., 2021); (A Kinseng, 2021); (Garcia, 2018)	Community as symbol
(Widyaningrum, 2021); (Agostini & Mechant, 2019); (Jurova, 2017); (Walker et al., 2019)	Community as virtual

From Tabel 3 Community as Place, this is based on the notion that cyberspace is a place where communities are built and maintained, where new socio-economic relations are formed, and where new horizons can be reached. Community as Symbol, like the community in general, the cyber community also has certain symbols where the existing symbols can be interpreted. The scope of the symbol here emphasizes the "formed substance". Community as Virtual means that this community is virtual in cyberspace by leaving the physical identity of its users.

**Conclusion**

Virtual Reality (VR) not only can pull us into new worlds but also can improve the quality of education by unlocking more learning potential than ever before. Virtual Reality enables learning to tap into students' emotional core in new and exciting ways. This study also states that learning subjects that can benefit the most from implementing Virtual Reality as learning media are science, social studies, and history. However, the potential is much greater.

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**Author Contributions**

Conceptualization, R.R.P.M.S, I.P., M.M., N.W. P.; methodology, M. M.; validation, N.W. P and R.R.P.M.S.; formal analysis, I.P.; investigation, I. P and N. W. P.; resources, N. W. P and R.R.P.M.S.; data curation, R.R.P.M.S.; writing – original draft preparation, I.P and M.M.; writing – review and editing, N.W. P.; visualization, R.R.P.M.S and I.P.; supervision, M.M.; project administration, N.W. P.; funding acquisition, R.R.P.M.S and M.M. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest**

The authors declare no conflict of interest.

**References**

A Kinseng, R. (2021). Socio-cultural Change and Conflict in the Coastal and Small Island Community in Indonesia. *Sodality: Jurnal Sosiologi Pedesaan*, 9(1), 1-17. <https://doi.org/10.22500/9202134928>

Abdulrahman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, 6(11), e05312. <https://doi.org/10.1016/j.heliyon.2020.e05312>

- Agostini, S., & Mechant, P. (2019). Towards a Definition of Virtual Community. *Signo y Pensamiento*, 38(74). <https://doi.org/10.11144/Javeriana.syp38-74.tdvc>
- Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. *Computers & Education*, 126, 334–345. <https://doi.org/10.1016/j.compedu.2018.07.021>
- Albus, P., Vogt, A., & Seufert, T. (2021). Signaling in virtual reality influences learning outcome and cognitive load. *Computers & Education*, 166, 104154. <https://doi.org/10.1016/j.compedu.2021.104154>
- Alkhayyat, A., Abedi, F., Bagwari, A., Joshi, P., Jawad, H. M., Mahmood, S. N., & Yousif, Y. K. (2022). Fuzzy logic, genetic algorithms, and artificial neural networks applied to cognitive radio networks: A review. *International Journal of Distributed Sensor Networks*, 18(7), 155013292211135. <https://doi.org/10.1177/15501329221113508>
- Alnuaim, A. A., Zakariah, M., Shukla, P. K., Alhadlaq, A., Hatamleh, W. A., Tarazi, H., Sureshbabu, R., & Ratna, R. (2022). Human-Computer Interaction for Recognizing Speech Emotions Using Multilayer Perceptron Classifier. *Journal of Healthcare Engineering*, 2022, 1–12. <https://doi.org/10.1155/2022/6005446>
- Asemi, A., Ko, A., & Nowkarizi, M. (2021). Intelligent libraries: A review on expert systems, artificial intelligence, and robot. *Library Hi Tech*, 39(2), 412–434. <https://doi.org/10.1108/LHT-02-2020-0038>
- Averkin, A. (2019). Hybrid Intelligent Systems Based on Fuzzy Logic and Deep Learning. In *Artificial Intelligence*, 11866, 3–12. [https://doi.org/10.1007/978-3-030-33274-7\\_1](https://doi.org/10.1007/978-3-030-33274-7_1)
- Bharali, S. S., & Kalita, S. Kr. (2018). Speech recognition with reference to Assamese language using novel fusion technique. *International Journal of Speech Technology*, 21(2), 251–263. <https://doi.org/10.1007/s10772-018-9501-1>
- Bodagh, N., Bloomfield, J., Birch, P., & Ricketts, W. (2017). Problem-based learning: A review. *British Journal of Hospital Medicine*, 78(11), C167–C170. <https://doi.org/10.12968/hmed.2017.78.11.C167>
- Capizzo, L., & Madden, S. (2022). Organizing community: Activist public relations as place-making. *Public Relations Review*, 48(5), 102260. <https://doi.org/10.1016/j.pubrev.2022.102260>
- Chimatapu, R., Hagraas, H., Starkey, A., & Owusu, G. (2018). Explainable AI and Fuzzy Logic Systems. In *Theory and Practice of Natural Computing*, 11324, 3–20. [https://doi.org/10.1007/978-3-030-04070-3\\_1](https://doi.org/10.1007/978-3-030-04070-3_1)
- Colomo-Magaña, E., Soto-Varela, R., Ruiz-Palmero, J., & Gómez-García, M. (2020). University Students' Perception of the Usefulness of the Flipped Classroom Methodology. *Education Sciences*, 10(10), 275. <https://doi.org/10.3390/educsci10100275>
- Cumbers, A., Shaw, D., Crossan, J., & McMaster, R. (2018). The Work of Community Gardens: Reclaiming Place for Community in the City. *Work, Employment and Society*, 32(1), 133–149. <https://doi.org/10.1177/0950017017695042>
- Damayanti, S. A., Santyasa, I. W., & Sudiarmika, A. A. I. A. R. (2020). Pengaruh Model Problem Based-Learning Dengan Flipped Classroom Terhadap Kemampuan Berpikir Kreatif. *Jurnal Kependidikan: Penelitian Inovasi Pembelajaran*, 4(1), 83–98. <https://doi.org/10.21831/jk.v4i1.25460>
- Dua, M., Aggarwal, R. K., & Biswas, M. (2019). Discriminative Training Using Noise Robust Integrated Features and Refined HMM Modeling. *Journal of Intelligent Systems*, 29(1), 327–344. <https://doi.org/10.1515/jisys-2017-0618>
- Garcia, I. (2018). Symbolism, Collective Identity, and Community Development. *Societies*, 8(3), 81. <https://doi.org/10.3390/soc8030081>
- Gollapudi, S. (2019). Artificial Intelligence and Computer Vision. In *Learn Computer Vision Using OpenCV*, 1–29. [https://doi.org/10.1007/978-1-4842-4261-2\\_1](https://doi.org/10.1007/978-1-4842-4261-2_1)
- Guidara, A. (2021). Artificial Intelligence and Fuzzy Logic. In A. Guidara, *Policy Decision Modeling with Fuzzy Logic*, 405, 47–67. [https://doi.org/10.1007/978-3-030-62628-0\\_5](https://doi.org/10.1007/978-3-030-62628-0_5)
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Hwang, G.-J., Yin, C., & Chu, H.-C. (2019). The era of flipped learning: Promoting active learning and higher order thinking with innovative flipped learning strategies and supporting systems. *Interactive Learning Environments*, 27(8), 991–994. <https://doi.org/10.1080/10494820.2019.1667150>
- Jain, A. A., Saraogi, A., Sharma, P., Pandit, V., & Hiremath, S. R. (2023). Swarm of reconnaissance drones using artificial intelligence and networking. *Australian Journal of Multi-Disciplinary Engineering*, 1–8. <https://doi.org/10.1080/14488388.2023.2220154>
- Jurova, J. (2017). Do the Virtual Communities Match the Real Ones? (Communitarian Perspective). *Communications - Scientific Letters of the University of Zilina*, 19(1), 14–18. <https://doi.org/10.26552/com.C.2017.1.14-18>
- Kanwal, S., Azam, A., Gulzar, M., & Santos-García, G. (2022). A Fixed Point Approach to Lattice Fuzzy Set

- via F-Contraction. *Mathematics*, 10(19), 3673. <https://doi.org/10.3390/math10193673>
- Kazanidis, I., Pellas, N., Fotaris, P., & Tsinakos, A. (2019). Can the flipped classroom model improve students' academic performance and training satisfaction in Higher Education instructional media design courses? *British Journal of Educational Technology*, 50(4), 2014–2027. <https://doi.org/10.1111/bjet.12694>
- Ke, F., & Xu, X. (2020). Virtual reality simulation-based learning of teaching with alternative perspectives taking. *British Journal of Educational Technology*, 51(6), 2544–2557. <https://doi.org/10.1111/bjet.12936>
- Khan, M. B., Santos-García, G., Noor, M. A., & Soliman, M. S. (2022). New Class of Preinvex Fuzzy Mappings and Related Inequalities. *Mathematics*, 10(20), 3753. <https://doi.org/10.3390/math10203753>
- Kholiq, A., Ismail, A., Permata, K. I., & Ali, M. S. (2022). Socio-religious Practices of Kalang Shaman: Symbol of Minority People's Resistance in Indonesia. *JSW (Jurnal Sosiologi Walisongo)*, 6(2), 145–158. <https://doi.org/10.21580/jsw.2022.6.2.12123>
- Låg, T., & Sæle, R. G. (2019). Does the Flipped Classroom Improve Student Learning and Satisfaction? A Systematic Review and Meta-Analysis. *AERA Open*, 5(3), 233285841987048. <https://doi.org/10.1177/2332858419870489>
- Liu, Y., & Quan, Q. (2022). AI Recognition Method of Pronunciation Errors in Oral English Speech with the Help of Big Data for Personalized Learning. *Journal of Information & Knowledge Management*, 21, 2240028. <https://doi.org/10.1142/S0219649222400287>
- Manjunath, K. E., & Sreenivasa Rao, K. (2018). Improvement of Phone Recognition Accuracy Using Articulatory Features. *Circuits, Systems, and Signal Processing*, 37(2), 704–728. <https://doi.org/10.1007/s00034-017-0568-8>
- Mi, Q., & Gao, T. (2022). Improved Belgian AI Algorithm for Dynamic Management in Action Role-Playing Games. *Applied Sciences*, 12(22), 11860. <https://doi.org/10.3390/app122211860>
- Muyassaroh, I., Yulistia, A., & Pratikno, A. S. (2022). Analisis Pembelajaran Sains melalui Flipped-Problem Based Learning Berbantuan Zoom Meeting dan E-Campus Pelita Bangsa. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, 6(2), 433. <https://doi.org/10.20961/jdc.v6i2.63000>
- Nahak, S., Pathak, A., & Saha, G. (2023). Fragment-level classification of ECG arrhythmia using wavelet scattering transform. *Expert Systems with Applications*, 224, 120019. <https://doi.org/10.1016/j.eswa.2023.120019>
- Nerantzi, C. (2020). The Use of Peer Instruction and Flipped Learning to Support Flexible Blended Learning During and After the COVID-19 Pandemic. *International Journal of Management and Applied Research*, 7(2), 184–195. <https://doi.org/10.18646/2056.72.20-013>
- Nguyen Thi Phuong, H., Shin, C.-S., & Jeong, H.-Y. (2021). Finding the Differences in Capillaries of Taste Buds between Smokers and Non-Smokers Using the Convolutional Neural Networks. *Applied Sciences*, 11(8), 3460. <https://doi.org/10.3390/app11083460>
- Playfoot, D. (2023). Flipped Classrooms in Undergraduate Statistics: Online Works Just Fine. *Teaching of Psychology*, 50(3), 243–247. <https://doi.org/10.1177/00986283211046319>
- Poniatowski, K. (2019). Assessing Flipped Versus Traditional Classrooms: Is Flipping Really Better? *Journalism & Mass Communication Educator*, 74(4), 422–437. <https://doi.org/10.1177/1077695819835037>
- Putri, D. S., Colily, Y. M., & Zukhrufurrohmah, Z. (2023). Analysis of the Flipped Classroom Model Using Digital Media in Improving Students' Mathematical Communication Skills. *Mathematics Education Journal*, 7(1), 123–135. <https://doi.org/10.22219/mej.v7i1.23335>
- Ruiz De Miras, J., Balsas-Almagro, J. R., & García-Fernández, Á. L. (2021). Using flipped classroom and peer instruction methodologies to improve introductory computer programming courses. *Computer Applications in Engineering Education*, 30(1), 133–145. <https://doi.org/10.1002/cae.22447>
- Said, M. N. H. M., & Zainal, R. (2017). A Review of Impacts and Challenges of Flipped-Mastery Classroom. *Advanced Science Letters*, 23(8), 7763–7766. <https://doi.org/10.1166/asl.2017.9571>
- Schiavo, R. (2021). What is true community engagement and why it matters (now more than ever). *Journal of Communication in Healthcare*, 14(2), 91–92. <https://doi.org/10.1080/17538068.2021.1935569>
- Schijven, M. P., & Kikkawa, T. (2022). Is there any (artificial) intelligence in gaming? *Simulation & Gaming*, 53(4), 315–316. <https://doi.org/10.1177/10468781221101685>
- Stallwood, J., & Ranchhod, A. (2017). The Right to Remember: Implementing a Rudimentary Emotive-Effect Layer for Frustration on AI Agent Gameplay Strategy. *Computers*, 6(2), 18. <https://doi.org/10.3390/computers6020018>
- Walker, S., Mercea, D., & Bastos, M. (2019). The disinformation landscape and the lockdown of

- social platforms. *Information, Communication & Society*, 22(11), 1531-1543.  
<https://doi.org/10.1080/1369118X.2019.1648536>
- Wang, A., Xiao, R., Zhang, C., Yuan, L., Lin, N., Yan, L., Wang, Y., Yu, J., Huang, Q., Gan, P., Xiong, C., Xu, Q., & Liao, H. (2022). Effectiveness of a combined problem-based learning and flipped classroom teaching method in ophthalmic clinical skill training. *BMC Medical Education*, 22(1), 487.  
<https://doi.org/10.1186/s12909-022-03538-w>
- Widayati, S., Fahmi, M. H., Setyaningsih, L. A., & Wibowo, A. P. (2021). Digital Community Development: Media Pelestarian Kearifan Lokal Wisata Jurang Toleh Kabupaten Malang. *Jurnal Nomosleca*, 7(1), 29-44.  
<https://doi.org/10.26905/nomosleca.v7i1.5490>
- Widyaningrum, A. Y. (2021). Kajian Tentang Komunitas Virtual: Kesempatan dan Tantangan Kajian di Bidang Ilmu Komunikasi. *Jurnal Komunikatif*, 10(2), 141-152. <https://doi.org/10.33508/jk.v10i2.3457>
- Zyoud, S. H., & Zyoud, A. H. (2021). Visualization and Mapping of Knowledge and Science Landscapes in Expert Systems With Applications Journal: A 30 Years' Bibliometric Analysis. *SAGE Open*, 11(2), 215824402110275.  
<https://doi.org/10.1177/21582440211027574>