Potential Applications of the Metaverse in Higher English Education

Qingnian Wang[1], Lan Tang[2], Yunpei Wang[3]

[1]School of International Education, South China University of Technology, Guangzhou, China
[2]School of Journalism and Communication, South China University of Technology, Guangzhou, China
[3]School of Economics and Management, South China Normal University, Guangzhou, China
Email: qnwang@scut.edu.cn, 202221053341@mail.scut.edu.cn, 20210733012@m.scnu.edu.cn

Abstract

The metaverse, which is powered by blockchain, artificial intelligence, digital twins, and other cutting-edge intelligent technologies, is a three-dimensional digital space that combines the virtual and the real. It sparks a new technological trend across the globe with great potential in the education. The paper develops the basic framework of the education metaverse on the basis of the concept, technology and theory, investigates its potential application in the teaching of speaking, listening, and interpreting in higher English education, and analyzes its prospect from two dimensions of advantages and challenges. The education metaverse helps to foster the innovation of educational modes, ideas, and systems as compared to traditional courses.

Keywords

Metaverse, the Education Metaverse, Higher English Education, Digitalization, Strong Interactivity, Deep Immersion

1. Introduction

In October 2021, Facebook CEO Mark Zuckerberg changed the "Facebook" to "Meta", claiming to turn Facebook into a metaverse company in the following five years (CNN BUSINESS, 2021). This action sparked a metaverse mania. The metaverse accelerated the global technological upheaval. Various countries all over the world also explored the specific forms and methods of "metaverse + education" to promote educational reform and innovation with the metaverse. Underpinning technologies of the metaverse such as virtual reality, digital twin, artificial intelligence and cloud computing have already been applied in education with positive outcomes, indicating that the metaverse has great potential in

education to some extent.

Higher English education should keep up with current technological advancements. The experiential and embodied teaching in the education metaverse align with the new future education model of "Education 4.0" (World Economic Forum, 2020), which promotes the digitalization, informatization, and personalized transformation of education. Above all, research into the application of the metaverse in higher English education is novel, cutting-edge, and extremely valuable.

2. Basic Framework of the Education Metaverse

The application of the metaverse in education has both technical supports and theoretical basis, so the education metaverse is feasible and significant. The basic framework of the education metaverse is established in **Figure 1**.
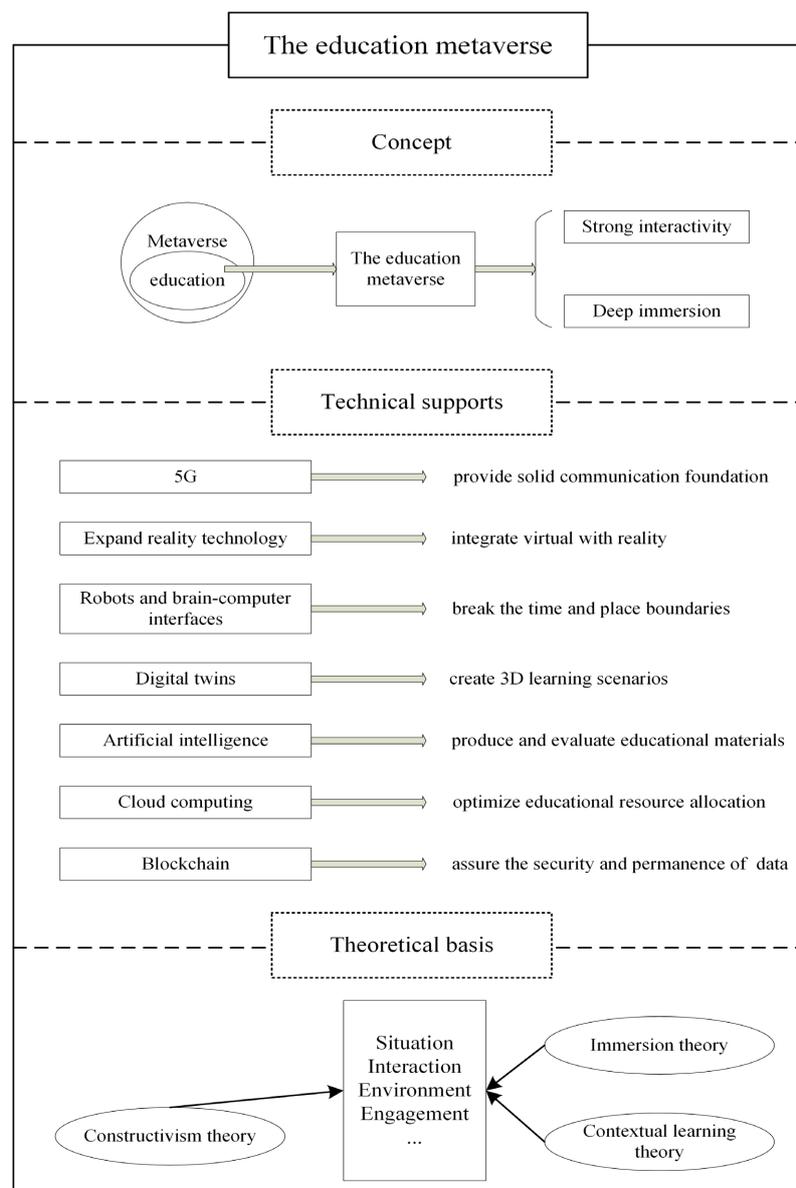
Figure 1. The basic framework of the education metaverse.

2.1. Concept

"Metaverse" originated from the science fiction novel Snow Crash published by Neil Stephenson in 1992. In the book, Stephenson describes a three-dimensional digital space, the metaverse, parallel to the real world, where people can interact and communicate through their respective Avatars. There is no academic consensus on the concept of the metaverse because it is still in its infancy. Facebook's founder, Mark Zuckerberg, sees the metaverse as the embodied Internet and the replacement for the mobile Internet (The Verge, 2021). Matthew Ball (MatthewBall.vc., 2022), an expert in metaverse and integrated media, thinks the metaverse as a sort of successor state to the mobile Internet.

Education is one of the main application scenarios of the metaverse (Yoo & Chun, 2021). According to Baszucki, the metaverse has eight key features: Identity, Anywhere, Friends, Low Friction, Immersive, Civility, Variety, and Economy (VentureBeat, 2021). The combination of it and education will create a three-dimensional digital education space independent of the physical world, with fundamental characteristics such as interactivity, immersion, diversity, and breaking the limitations of time and space. This education space with strong interactivity and deep immersion is "the education metaverse". The education metaverse will spring to life in the next five to ten years (District Administration, 2022).

2.2. Technical Supports

The concrete presentation and user experience of the education metaverse are impacted by network environment technologies based on 5G, virtual-real interface technologies on extended reality, robotics and brain-computer interfaces, and content production technologies on artificial intelligence and digital twin. 5G's characteristics of high speed, low latency, low energy consumption, and large-scale device connection provide a solid communication foundation for the 3D digital education space. Expand reality technology create an educational scene that integrates virtual with reality, which stimulates students through a variety of senses, including sight, hearing, touch, smell, and taste, thus improving the learning process. Robots and brain-computer interfaces enable the metaverse, a science fiction concept, to become a reality and dismantle the time and place boundaries in current education. Moreover, they allow students to enter the education metaverse for learning anytime, anywhere. Digital twins combine advanced artificial intelligence algorithms to create highly detailed 3D visualization simulation learning scenarios to create an immersive learning experience.

The inner workings of the education metaverse will be impacted by artificial intelligence, cloud-based data processing technologies, and blockchain-based systems. Artificial intelligence produces and evaluates a large volume of non-repetitive educational materials, laying the groundwork for rich teaching scenarios while simultaneously guaranteeing the safety and legitimacy of the education metaverse. Cloud computing has the benefits of high computational capacity and speed, and it can dynamically distribute different educational resources to optimize re-

source allocation. Decentralization, traceability, and non-tampering characteristics of blockchain assure the security and permanence of the data produced during the educational process. Additionally, it offers technical assistance and objective data for post-class correction by teachers, student reflection, management and evaluation of instruction (Sun et al., 2021), education history, and certification of academic qualification (Bhumichitr & Channarukul, 2020).

2.3. Theoretical Basis

Immersion theory emphasizes full-body engagement and achieves a state of ecstasy (Csikszentmihalyi, 1997). The study and application of immersion theory have expanded with the advancement of science and technology into the area of human-computer interaction. Based on the effects of human-computer interaction on work, Ghani and Deshpande (1994) postulated two key features of immersion: psychological satisfaction and complete attention. The metaverse creates a highly interactive 3D digital educational environment that enables students to fully immerse themselves with all of their senses and enjoy the learning experience. It also keeps with the principle of embodied cognition. In the education metaverse, experiential teaching fundamentally boosts students' engagement and ignites their internal motivation, thus enhancing both the quality and efficacy.
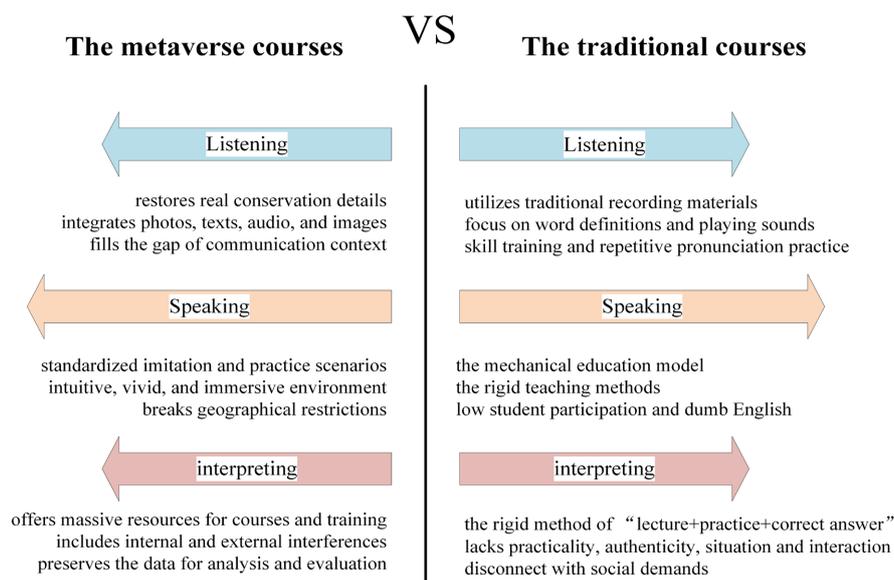
Piaget. J (2015) introduced the constructivism theory at the beginning of the 20th century, emphasizing the importance of the environment in developing their own cognitive structure. Constructivism emphasizes human initiative plays in the formation of cognitive structure (Sternberg, Zhang, & Rayner, 2011). According to constructivism theory, learning is a process in which students independently create connections between previous experience and new knowledge in the learning environment on the basis of their prior knowledge and cognitive abilities. With students at the heart of the process, the education metaverse overthrow the "fill in the blank" traditional education model and promote them to actively comprehend the learning environment and create the meaning of new information.

Lave & Wenger (1991), proponents of the contextual learning theory, emphasize that learning is influenced by particular social and physical environments. Learning behaviors in particular settings can have a significant effect on students' learning status and effectiveness. In the metaverse, a range of simulated learning scenarios are created, and knowledge is presented like in real-world contexts for practical application. The active role of learning scenarios is fully exploited, allowing students to investigate and reason on their own. Furthermore, students can connect, communicate, and work together in the education metaverse with the help of digital identities, thus improving learning results.

3. Potential Application of the Education Metaverse in Higher English Education

The five primary components of modern English instruction are hearing, speaking, reading, writing, and translation. Among these, more emphases of listening,

speaking, and interpreting are placed on the practical situations and interactive communication. Strong interactivity and deep immersion of the metaverse just fit the requirements of practical educational content. Therefore, the application of the metaverse in higher English education focuses on these three areas: speaking, listening, and interpreting. The outcomes of these three courses in the metaverse classroom are superior than those of the traditional courses. The comparison between the metaverse courses and the traditional courses is summarized in **Figure 2**.

VS

The metaverse courses   **The traditional courses**

Listening

restores real conservation details
integrates photos, texts, audio, and images
fills the gap of communication context

Listening

utilizes traditional recording materials
focus on word definitions and playing sounds
skill training and repetitive pronunciation practice

Speaking

standardized imitation and practice scenarios
intuitive, vivid, and immersive environment
breaks geographical restrictions

Speaking

the mechanical education model
the rigid teaching methods
low student participation and dumb English

interpreting

offers massive resources for courses and training
includes internal and external interferences
preserves the data for analysis and evaluation

interpreting

the rigid method of "lecture+practice+correct answer"
lacks practicality, authenticity, situation and interaction
disconnect with social demands

Figure 2. The comparison between the metaverse courses and the traditional courses.

3.1. Listening

The majority of Chinese universities utilize recording materials, and focus on word definitions and playing sounds to check student answers as their primary listening education strategies. The listening lesson is restricted to repetitive pronunciation practice and skill training. As a result, students learn in a passive manner without initiative or engagement. Additionally, multiple elements, including accent, facial expressions, body movements, and environmental influences, are present in the true English dialogue, but not in the class. And the English dialogue is not as bright and clear as the recording. Therefore, traditional listening lessons are difficult to improve students' actual listening ability.

The metaverse creates a 3D listening reality scene to fill the gap of communication context. The English listening course in the metaverse will provide three-dimensional real situations with photos, texts, audio, and images so as to change the mundane and monotonous usual conditions. It increases students' classroom participation by stimulating their senses. The 3D "real" classroom fills the gap in the communication context that is missing from the current listening lessons by simulating real conversation settings with accent, body language, emotions, and many other factors. It expands the scope of listening lessons

beyond exercises in pronunciation and skills. Students can listen and watch in "actual" English conversational settings, which helps them develop their practical listening and observation skills.

3.2. Speaking

In China, mechanical education model and low participation are common problems in oral English classroom. Dumb English can readily result from a tedious, rigid teaching model and low student engagement. It has actually grown to be a major problem. In addition, incorrect intonation, poor word choice, a lack of vocabulary, and a high frequency of Chinese English are issues that students frequently face. Admittedly, many Chinese English teachers themselves suffer from the above problems. Since English is not their mother tongue, the phenomenon is unavoidable. In order to provide students with a more genuine experience of cross-cultural communication, many universities employ foreign lecturers. However, limited classroom time and one-to-many teacher-student ratio cannot fundamentally improve students' oral expression. English learners with standard pronunciation and semantics in line with foreigners' expressive habits are needed for societal growth as international exchanges get stronger.

The metaverse provides the language environment and realizes the interconnection across time and space, thus promoting the normalization of oral cross-cultural communication. Standardized imitation and practice scenarios are provided for oral language training in the virtual simulation classroom developed by the metaverse. Imitation is one of the most important methods for raising students' oral English proficiency. In the metaverse class, students can emulate standardized English pronunciation and genuine phrases because they can more intuitively sense how foreigners pronounce and intonate. The metaverse class of spoken language is specific, intuitive, and vivid. An immersive learning environment encourages college students' inherent drive to participate in oral English. The accuracy and fluency of students' pronunciation can be improved with an abundance of "real" interactive dialogue training. The metaverse, breaking geographical restrictions, is expected to achieve interconnection in the sense of cross-time and space. Students can directly communicate with foreign friends in the metaverse space.

3.3. Interpreting

Interpretation courses are core skill-based and intended to foster compound talents, so high-level and challenging practical training is essential to be added in class. However, the interpretation courses are where the rigid teaching method of "lecture + practice + correct answer" is most frequently applied. Students only rely on basic textbooks or materials for interpretation training, so interpretation courses lack professionalism and practicability. Additionally, environmental elements, interaction requirements and unexpected factors are not covered in the classroom, which causes the interpretation training to be detached from the

actual situation, lacking in authenticity, situation, and engagement. Thus, it is difficult to cultivate talents who can actually match the demands of the modern market.

The metaverse restores real interpretation scenarios and improves students' practical ability. The metaverse offers massive resources for interpreting courses and training in sports, healthcare, finance, and other fields with the aid of VR, AI, digital twins, and many other technologies. In order to establish the actual scene of interpretation, the metaverse class integrates internal and external potential interference variables including the surrounding environment, the accent of the speaker, and equipment debugging. It promotes an in-depth integration between the students and the interpretation scene, develops an interpretation experience with a high level of immersion and authenticity, and strengthens students' ability to react quickly and effectively in actual conflict. Additionally, blockchain preserves each student's actual interpreting data, which can then be analyzed and summarized by students after class. Teachers assess students' proficiency in interpreting and offer pertinent instruction.

4. Prospect of the Education Metaverse

4.1. Advantages

The metaverse promotes the transformation of traditional classroom teaching to modern new teaching mode. The metaverse will change the specific methods of teaching and learning. It promotes the transformation of the English teaching mode from the traditional "teacher-led + students' passive cooperation" to the new "teacher-led + students' active exploration". It creates a new learner-centered educational model that enhances students' motivation and autonomy in the classroom and facilitates tailored instruction.

The metaverse promotes the renewal of educational ideas. Traditional educational notions like "fraction-only" ideas will be altered by the metaverse. The fraction-only idea, a malpractice of modern education, has long been criticized for distorting education and ignoring the development of students' all-around abilities. The flaws of the score management and evaluation system in the existing educational model can be remedied by blockchain, artificial intelligence, and other technologies of the education metaverse. In-class learning recordings of students can be stored by blockchain. Artificial intelligence analyzes and assesses these data from multiple dimensions to realize the diversification of student performance evaluation.

The metaverse will drive the reconstruction of the education system. The complete digitization of teaching management, education evaluation, and teaching-enterprise collaboration will be achieved through the reconstruction of the entire educational system by the metaverse. For instance, blockchain's anti-tampering functionality improves transparency and efficiency in education administration and assessment.

4.2. Challenges

The metaverse technology faces difficulties such as high research and development costs, uncertainty and instability. The underlying technology has high research and development expenses and necessitates a considerable expenditure of money, resources, time, and brainpower. However, it's possible that the desired outcomes won't materialize right away. High cost also means that they cannot be quickly popularized in the realm of education.

The metaverse presents huge challenges for students. On the one hand, students are susceptible to developing virtual world addictions, confusing the boundaries between virtual and reality, and even developing thoughts of escapism from the real world. On the other hand, a distracting digital metaverse with a weak teacher's dominant position may have negative effects on learning status and efficiency. Above all, technology is a double-edged sword, and so is the metaverse.

The metaverse presents huge challenges for teachers. The metaverse teaching requires exceedingly high demands for teachers. Teachers face tremendous difficulties, including selecting instructional materials, designing a new educational system, and finding out how to integrate online metaverse teaching with traditional classroom instruction. The first to adopt, become familiar with and even master them are teachers. It will take gobs of time and effort to complete these enormous projects.

5. Conclusion

The education metaverse prefigures the future-tense of digital education. The "Metaverse + Education" is an advanced form of "Internet + Education". Relatively speaking, expanded reality technology is one of the early and mature metaverse underpinning technologies applied in the field of education. It has been proved to have several benefits, such as increasing active engagement with learning materials (Hsu, 2017), increasing knowledge transfer (Radianti et al., 2020), enhancing learning outcomes (Lee, Wong, & Fung, 2010), and delivering better cognitive and affective outcomes (Calvert & Abadia, 2020). This technology will direct talent training in the era of intelligence (Guo et al., 2020). Despite this, it cannot take the place of the application of the metaverse in education. The metaverse will undoubtedly have a revolutionary, disruptive, and all-encompassing impact on the field of education, inevitably leading to the digitalization, informatization, and modernization of education.

Acknowledgements

Sciences Fund of South China University of Technology.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Bhumichitr, K., & Channarukul, S. (2020). Acachain: Academic Credential Attestation System Using Blockchain. *In Proceedings of the 11th International Conference on Advances in Information Technology* (pp. 1-8). https://doi.org/10.1145/3406601.3406614

Calvert, J., & Abadia, R. (2020). Impact of Immersing University and High School Students in Educational Linear Narratives Using Virtual Reality Technology. *Computers & Education, 159,* Article ID: 104005. https://doi.org/10.1016/j.compedu.2020.104005

CNN Business (2021). Facebook Changes Its Company Name to Meta. https://edition.cnn.com/2021/10/28/tech/facebook-mark-zuckerberg-keynote-announcements/index.html(accessed

Csikszentmihalyi, M. (1997). Flow and Education. *NAMTA Journal, 22,* 2-35.

District Administration (2022). A Whole New World: Education Meets the Metaverse. https://districtadministration.com/a-whole-new-world-education-meets-the-metaverse/

Ghani, J. A., & Deshpande, S. P. (1994). Task Characteristics and the Experience of Optimal Flow in Human—Computer Interaction. *The Journal of Psychology, 128,* 381-391. https://doi.org/10.1080/00223980.1994.9712742

Guo, X., Chen, X., Feng, X., & Zheng, S. (2020, October). The Enlightenment of "AR/VR" Technical University Course Education in Taiwan, China. *In 2020 4th International Conference on Artificial Intelligence and Virtual Reality* (pp. 22-28). https://doi.org/10.1145/3439133.3439146

Hsu, T. C. (2017). Learning English with Augmented Reality: Do Learning Styles Matter? *Computers & Education, 106,* 137-149. https://doi.org/10.1016/j.compedu.2016.12.007

Lave. J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation.* Cambridge: Cambridge College Press. https://doi.org/10.1017/CBO9780511815355

Lee, E. A. L., Wong, K. W., & Fung, C. C. (2010). How Does Desktop Virtual Reality Enhance Learning Outcomes? A Structural Equation Modeling Approach. *Computers & Education, 55,* 1424-1442. https://doi.org/10.1016/j.compedu.2010.06.006

MatthewBall.vc. (2022). *Framework for the Metaverse.* https://www.matthewball.vc/all/forwardtothemetaverseprimer

Piaget, J. (2015). *The Grasp of Consciousness (Psychology Revivals): Action and Concept in the Young Child.* Psychology Press. https://doi.org/10.4324/9781315722382

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A Systematic Review of Immersive Virtual Reality Applications for Higher Education: Design Elements, Lessons Learned, and Research Agenda. *Computers & Education, 147,* Article ID: 103778. https://doi.org/10.1016/j.compedu.2019.103778

Stephenson, N. (1992). *Snow Crash.* New York: Bantam.

Sternberg, R. J., Zhang, L. F., & Rayner, S. (2011). *Handbook of Intellectual Styles: Preferences in Cognition, Learning, and Thinking.* New York: Springer Publishing Company, LLC.

Sun, X., Zou, J., Li, L., & Luo, M. (2021). A Blockchain-Based Online Language Learning

System. *Telecommunication Systems, 76,* 155-166.
https://doi.org/10.1007/s11235-020-00699-1

The Verge (2021). *Mark in the Metaverse.*
https://www.theverge.com/22588022/mark-zuckerberg-facebook-ceo-metaverse-interview

VentureBeat (2021). *Roblox CEO Dave Baszucki Believes Users Will Create the Metaverse.*
https://venturebeat.com/2021/01/27/roblox-ceo-dave-baszucki-believes-users-will-create-the-metaverse/

World Economic Forum (2020). *Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution.*
https://www.weforum.org/reports/schools-of-the-future-defining-new-models-of-education-for-the-fourth-industrial-revolution

Yoo, G. S., & Chun, K. (2021). A Study on The Development of A Game-Type Language Education Service Platform Based on Metaverse. *Journal of Digital Contents Society, 22,* 1377-1386. https://doi.org/10.9728/dcs.2021.22.9.1377