

Application of VR Technology in Middle School Students' English Speaking

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Abstract. With the continuous deepening of education informatization reform, digital learning has gradually become an important part of education. Among them, the virtual learning environment is created through Virtual Reality (VR) technology, and the abstract learning content is embodied in the virtual environment in combination with the game teaching method of educational games. This not only reduces the requirements for learners' transfer ability but also can be better applied to English teaching. Based on the characteristics of VR, the author designed a VR education application for middle school students. There are five parts to this article; the first part introduces the background information about VR and the problems that Chinese middle school students are facing. The second part analyzes VR's characteristics and demonstrates the feasibility of VR in oral English learning based on VR characteristics. The third part describes the application's activities in detail and the fourth part is to analyze the advantages and disadvantages of the application. The last part summarizes the outcomes and limitations of the application and predicts this application's future development.

Keywords: Virtual Reality, English speaking, Middle school students, Immersive environment.

1. Introduction

With the development of science and technology, more and more emerging technologies have been presented to people. These technologies bring various electronic goods like online media, smartphone, and Virtual Reality, which makes digital learning can no longer merely exist in science fiction movies. Digital learning developed rapidly and played a significant role in recent years, especially during COVID-19 period. At that time, plenty of schools had to turn to online teaching, so a growing number of people were aware of the importance and convenience of digital learning. Nowadays, digital learning "has received increasing attention because teaching is increasingly shifting from traditional media such as books and face-to-face lectures to computer-based media such as commentary animation, instructional videos, hypertext involving printed text and educational games or simulations [1]".

Digital learning has become an important method of learning. For instance, today many schools add multimedia equipment in classrooms and numerous teachers have a preference for using this equipment in their class, "the teacher can tell the content while letting the students watch it, so as to improve the efficiency of learning, which to a certain extent makes up for the limited classroom time [2]". Moreover, some schools especially universities have online courses for all learners around the world which breaks the limitation of time and space due to digital learning's convenience. These examples demonstrate the benefits of digital learning, and they also show the importance of correct media selection.

One typical learning media is Virtual Reality. VR is "an advanced human-computer interface that simulates a realistic environment [3]". Virtual Reality has no limitation in screen size like phones, it typically requires a headset with two wireless consoles for the individual users to enter the virtual world. The users can move freely in the 3D virtual world and see everything in 360 degrees. Furthermore, they can touch and use almost everything in the digital world and interact with NPCs. VR breaks the limitation of space and time and provides an immersive environment for users to experience. VR is extremely popular, one of the reasons is that VR can be used as a learning media because it has an advantage "in that it provides learners with a 3D space in which they can experience

their own learning [4]”. Other advantages like visual support, enhanced learning interests, and authentic learning opportunities were also identified by Shadieff and Yang [4]. Nowadays, VR plays an important role in the different learning areas. For example, “within the engineering field, nowadays VR is being effectively used in engineering education [5]”. Besides engineering, VR is also conducive in medical education, space technology, and mathematics, general education, special needs education and language learning [4]. Among them, VR use in language learning is representative and comparatively efficient.

According to Huang et al. [4], “Immersive learning and the increase of motivation were the main factors that promote language learning [4]”. As mentioned above, VR provides an immersive environment for learners through create a virtual world, and learners can learn knowledge with enjoyment. In this case, “students were motivated to learn and highly engaged in the learning activities which resulted in positive effects on their learning [4]”. Furthermore, students are able to learn the content within an immersive context, which helps them to understand most of the learning points deeply and helps them to consolidate what they have learned. These advantages play a huge part in language learning especially in speaking.

Language learning includes four major parts: listening, speaking, reading, and writing. Among them, listening, reading, and writing can be learned in the classroom, but learning oral skills in the classroom is comparatively inefficient. One of the reasons is that “teachers are too much focused on the production of language in writing as most of the tasks are based on worksheets [6]”. Additionally, students don’t have a language environment to practice or consolidate their speaking skills. In these cases, difficulties of improving speaking ability exist, and these difficulties have also led to various language learning problems. In China, the “dumb English” problem is quite serious.

The term “dumb English” means students, who studies English for a long time, are good at English reading and writing, but they can’t do listening and speak well. This problem exists in students of all ages, but is extremely severe in middle school students. Middle school is a particularly important stage because it cultivates students’ interest and lays a foundation for English learning, and as people grow older, their language learning ability will decline. All in all, middle school is the most significant period for English learning, especially in speaking. Nevertheless, the limited financial ability of most students’ families causes these students can’t have access to a better language learning environment let alone a native oral environment. Lacking oral environment causes the improvement of their English-speaking ability has stalled. Based on the fact that middle school students need new English oral learning methods for help, this essay will discuss how to use VR for learning guidance.

2. VR Characteristics

With the advent of the Internet era, the impact of online teaching, and the promotion of educational informatization, traditional teaching has gradually changed to integrate with digital technology, and educators explored more kinds of teaching methods, such as online/distance teaching. At present, VR technology continues to find new integration points with digital education fields such as distance online teaching and traditional education. As an emerging technology, it continues to play a role in helping students improve their learning ability and literacy. The success of VR is inseparable from its characteristics, including immersion, interactivity, and imagination.

The word *immersion* refers to “the feeling of being totally present in a computer-generated world [7]”. In the VR world, what users feel is to be in the special interface of the virtual world. The virtual environment offers “transparency of knowledge representation, which allows learners to approach concepts as ‘first-person, non-symbolic’ experiences [8]”. The observation perspective is to observe from the inside to the outside of the virtual space, rather than from the outside to the inside as an outsider. This kind of media feeling that observers associate themselves into the virtual environment enables people engaged in skill training and simulation to carry out focused observation and thinking more realistically. As a learning tool, the immersion of VR provides a more realistic and richer educational scene for modern teaching, and it also provides students with an immersive learning

experience that traditional teaching classes cannot provide. In addition, VR can create scenes in real life for teachers and students to enhance students' understanding of knowledge. VR can also create things that do not exist in the real world, such as ancient buildings that merely exist in history, in this case, fidelity addresses the insipidity of traditional teaching, and enhance students' learning interest. For language learning, VR is able to "generate an authentic environment, which helps students learn the language while they are repeating what they learn in the virtual world [9]", which helps students consolidate what they had learned at school. Furthermore, with high immersion, VR is capable of interacting with the virtual world.

Interactivity is another significant feature of VR. VR constitutes a 3D interface, which enables the interactive subject to actively exchange with the world recreated by the computer. The interactivity of VR is reflected in the interaction between people and the environment. The environment can affect users, and users can also give feedback and control the environment with natural behavior. Natural behavior includes their language and body movements. The virtual simulation system with interactive functions can respond to human behavior in real-time. The interactivity of VR is of great significance for teaching. It allows learners to interact with simulated 3D objects in real-time, providing learners with a highly natural interactive experience. When it is applied to architectural design teaching, the real-time feedback and visual display functions of a VR immersive environment can enhance students' understanding of architectural space design. In language learning, interactivity provides interactive communication between the virtual environments, such as NPCs, icons, and signifiers, with students, and helps students to transfer their knowledge and skills to real situations through the contextualization of learning [8].

VR is obviously both interactive and immersive, but the third feature *imagination* is easy to be ignored. VR is not only a medium or high-end user interface, but also has applications involving practical problem solutions in engineering, medicine, military, and other fields. These applications are designed by VR developers. The degree to which an application can solve a specific problem, that is, the degree to which the simulation performs well, largely depends on human imagination. Imagination in a VR environment refers to the ability of the human brain to perceive non-existent things [10]. The technology used as a cognitive tool can help learners clarify their thoughts and engage in meaningful learning. Therefore, a successful VR environment will stimulate learners' ability to creatively perceive and imagine non-existent things. Learners can experience an imaginary reality through a variety of physical experiences: VR can be used to create impossible scenes in the real world and help solve specific problems. VR is not only a user interface but also can be used to solve practical problems in various fields, that is, the visualization function provided by VR technology makes it suitable for conveying difficult abstract concepts imagination can be regarded as the idea of system designers to implement specific goals. Because the components of the VR system are suitable for solving complex problems in various fields, the VR system is a more effective means of expressing ideas than traditional 2D drawing or text interpretation. The application from VR systems used to stimulate users' imagination has gradually attracted more attention of VR system developers and researchers. For language learning, imagination can help designers to create different scenes to enhance immersion and provide high interactivity for students.

In summary, characteristics of VR include immersion, interactivity, and imagination. These features play a significant role in language learning and make it possible to learn oral English through VR

3. A Design of VR in English Oral Learning

To design an English oral learning application for middle school students, the first problem that needs to solve is to select a suitable VR device. Firstly, VR can be separated into immersive VR and non-immersive VR. The immersive VR "uses hardware such a headset that covers a user's eyes to fill their entire field of vision with a virtual environment and create a stereoscopic 3D effect [10]", but the non-immersive VR can merely do something simple. To pursuit an English environment with

high immersion, immersive VR like HTC Vive is the better option. However, immersive VR like HTC Vive requires wireless Internet, Power Supply, and a spacious room. In other words, it has a high requirement for the site. In this case, a classroom is not a wise choice, because there are plenty of students in one classroom, and it might be crowded for all the students to use VR at the same time in one classroom. Furthermore, because of the VR headset's opacity, students can't see each other with VR headsets, which might cause some injury accidentally. Therefore, school is not an appropriate place to use VR, and home is comparatively suitable for students to use VR. Although they cannot learn new things at home, students are able to review and consolidate the oral content learned that day through VR. It leads to the learning objective of this application is that practice and improve students' oral English.

With the features of VR, creating an immersive English-speaking environment with high interaction and imagination is not impossible. As a result, the problem of lacking an English-speaking environment can be addressed perfectly. This application can provide different speaking scenes, for example, asking directions, ordering food, or helping people find their lost property, it bases on the learning content that students had learned that day or that week. Taking "ordering food" as an example, briefly describe the teaching design of this activity.

Learning Design Activity: Ordering Food

Target Population: Middle school students

Time: 15-20 minutes

Teaching Objectives: Master vocabulary about food; understand NPCs' questions and give the correct answer with simple English sentences.

Resources/ materials: A full VR equipment (VR headset with two consoles).

Possible Problems: Equipment failure, poor network environment

Hypothesis: After using VR, students can order food easily in English native environment, and their listening and speaking skills can be improved.

Learning Stage:

1. Students wear VR and review vocabulary quickly by matching English vocabulary with Chinese meanings (1 min).
2. Students enter the virtual restaurant with an NPC friend after they match vocabulary with meanings correctly (2 min).
3. Students can walk around and find a seat, then they need to ask a waiter to order food (2min).
4. Students need to say what they want to eat with correct word collocation, and the system will capture the keywords and give food (1-3 min).
5. Students' NPC friend will tell students what he/she wants to eat in Chinese and students must order food for this friend (2-4 min, if students ordered the wrong food, the mission will fail).
6. Both students and NPC get their food, mission complete (1 min).
7. The system evaluates students' pronunciation and mission completion time (1 min).
8. The system gives a score and feedback about students' pronunciation (1 min).
9. Students listen to their pronunciation and correct themselves (2 min).
10. Students reread their sentences until they can pronounce each word correctly(2-3).

After completing these learning tasks, students' oral ability in "ordering food" situation can be improved. In addition, with the correction of students' pronunciation, students' accents can be more recognizable and native when they order food. "Ordering food" is merely one typical situation in language communication, with the learning of the course, English oral practice will cover a variety of situations and scenes, these situations and scenes almost cover all aspects of English communication. As a result, this application is able to simulate conversations in almost all scenes, which helps to improve students' English-speaking ability. In the beginning, students might not be capable of answering questions with sentences but answering questions with few words instead. After a while, they will have the ability to answer questions with simple sentences. With years of practice, students can answer questions in fluent English. Additionally, a pronunciation correction system can help students to correct the mistakes in their English pronunciation. Furthermore, this application can

solve social phobia with foreigners in some ways due to its immersive environment. Eventually, students can become excellent bilingual speakers. In this case, the lack of language environment has been solved, so the difficulties of improving speaking ability do not exist anymore. This means “Dumb English” caused by improving oral ability difficulties has been solved.

4. Advantages and Disadvantages of the VR English Oral Class

With the advantage of the virtual scene, this application can enable students to have a new experience in English language learning and enhance their learning initiative. Its advantages are summarized as follows:

Firstly, this application enables students to directly feel the charm of English, the concretization of abstract knowledge, and the visualization of perceptual knowledge through language communication in virtual scenes, and finally makes students feel that what they had learned in the classroom content is vivid, interesting, direct, clear, and easy to accept, which is convenient to transform knowledge from the textbook into personal ability, to promote the improvement of teaching effectiveness.

Secondly, this application also can create virtual scenes of courses. In the created three-dimensional environment, students can not only interact with people, objects, and scenes in multiple dimensions but also interact freely in behavior or language, which can effectively reduce learning barriers [11]. The use of this application in middle school English learning can organically combine the knowledge of various disciplines, broaden students’ learning horizons, and stimulate students’ skills in listening and speaking. Additionally, it can promote students’ overall improvement.

Thirdly, using VR technology, this application creates a learning method that combines eyes, hands and brain. Students can experience the same situation as reality in virtual situations, enjoy the learning experience of the coexistence of reality and three-dimensional sense, and meet students’ psychological needs and excitement on a fresh basis, to stimulate students’ interest in English learning.

However, this application is not perfect. It also has its shortcomings, the most fatal of which are its price and hardware facilities. Like Mantovani says, “cost surely represents one important limit to VR penetration into educational context [12]”. Immersive VR equipment is expensive, for instance, a full set of wireless HTC Vive cost about 17500 RMB (2588 dollars), so not all families in China can afford a set of VR equipment. In addition, the normal operation of VR technology requires highly configured computers, and old models or computers with low configuration simply cannot operate successfully. Network speed is also a problem that must be faced. The login and use of VR need to keep the network open, and there are certain requirements for network speed. If the network speed is unstable in the learning process, it is likely to drop or get stuck, which will affect the learning effect of students. In addition, the lack of teaching content is also one of the problems of this application.

Teaching requires both rigorous content and quality. At present, the integration of many educational products and subject education is low, because most education experts and front-line excellent teachers cannot participate in the development and design of VR education courses. Without the participation of subject teachers, the quality and preciseness of VR teaching content developed will be greatly affected, resulting in the unreasonable content layout of educational products, and even common-sense errors. Furthermore, this application is based on the textbook, so there are certain limitations in the learning content. In other words, students cannot learn knowledge beyond the textbook, therefore, the range of skills to be developed is still limited [13]. This will make the “dumb English” problem cannot be solved completely.

Based on the above summary of the advantages and limitations of this application, it can be concluded that the prospect of this application in English learning is foreseeable, but the implementation process is tortuous. Identifying and adapting this application to fit the pedagogical needs of educators can be tedious and difficult [14]. Furthermore, it is important that the students know what the goal of the application is and that they do not addicted in the application [15]. If

teachers want to make good use of this application for middle students in English oral learning, this application still needs a long time to design and testing.

5. Conclusion

As an innovative learning tool in the digital generation, VR's immersion, interactivity, and imagination provide a virtual environment for middle school students to learn English speaking. Students are able to talk with an NPC in English to consolidate their speaking skills. Additionally, they can improve their listening through listen to NPCs instruction. This VR application can stimulate students' interest in learning, improve their learning motivation and form a strong internal drive, and promote students to independently and continuously approach the goal of improving their language ability.

At the same time, people should rationally view the status of this application in learning and try their best to extend the shelf life of technology use. In terms of technical support, people should ensure the normal order of English learning activities in an open environment. Prevent possible network violence and malicious network attacks to interfere with normal teaching activities. In addition, helping students to define the boundary between the real world and the virtual world is also a problem to be considered in the future. The beauty and unreal images in the virtual world may cause students to reject the real world, and students block themselves in the virtual world to deliberately disguise their identity of the real world, and finally immerse themselves in the virtual world. The impact of any learning software or educational application on students is unknown at the beginning of implementation, which is why it is necessary to conduct practical research to verify its teaching effect. In this process, the positive and negative effects are not only caused by the application but may be related to the student's emotions, the student's family environment, and their values, rather than unilaterally blaming this application for the problems. Therefore, if there are people who refuse to use educational applications as a reason for students' possible addiction, it is the teachers and parents in the real world who should rectify this. They push students to step by step into the virtual world and put pressure on their shoulders. Middle school students who have no place to release their pressure will vent in other places even if they do not vent in these applications. This application not only satisfies the purpose of students' pressure release but also achieves the purpose of learning English knowledge, playing a win-win role. Furthermore, even though this application has some obvious problems, it does not mean these problems cannot be solved in the future.

All in all, this application is practical and helpful for middle school students to improve their English speaking skills though it has some weaknesses. However, this application merely focuses on English in textbooks so far though there are plenty of languages in the world. In the future, this application might expand its language packs to help people who learn different languages. At that time, this application learning content will no longer be limited to textbooks, and it will be available for all people to learn language speaking.

References

- [1] R. Mayer, S. Lee, Q. Sheng, Thirty Years of Research on Online Learning, *Digital Education* 6(02), 2020, pp. 1-8.
- [2] F. Shan, Practice of Multimedia Instructional Design Principles in Digital Learning, *China Journal of Multimedia & Network Teaching*, 2008, pp.1-2.
- [3] J. M. Zheng, K. W. Chan, I. Gibson, Virtual reality, *Ieee Potentials*, 17(2), 1998, pp.20-23.
- [4] X. Huang, D. Zou, G. Cheng, H. Xie, A systematic review of AR and VR enhanced language learning, *Sustainability*, 13(9), 2021.
- [5] D. Vergara, M. P. Rubio, M. Lorenzo, On the design of virtual reality learning environments in engineering, *Multimodal technologies and interaction*, 1(2), 2017.

- [6] L. Reitz, A. Sohny, G. Lochmann, VR-based gamification of communication training and oral examination in a second language, In *Computer-Assisted Language Learning: Concepts, Methodologies, Tools, and Applications*, 2019, pp. 811-828.
- [7] J. Buchner, A. Andujar, The Expansion of the Classroom through Mobile Immersive Learning, International Association for Development of the Information Society, 2019.
- [8] B. Dalgarno, M. J. Lee, what are the learning affordances of 3 - D virtual environments, *British Journal of Educational Technology*, 41(1), 2010, pp. 10-32.
- [9] Y. Cho, *how spatial presence in VR affects memory retention and motivation on second language learning: a comparison of desktop and immersive VR-based learning* (Doctoral dissertation, Syracuse University), 2018.
- [10] C. Hastings, J. Brunotte, Total immersion: VR headsets in language learning, *The 2016 PanSIG Journal*, 2017 pp. 101.
- [11] T. J. Lin, Y. J. Lan, Language learning in virtual reality environments: Past, present, and future, *Journal of Educational Technology & Society*, 18(4), 2015, pp. 486-497.
- [12] F. Mantovani, VR learning: Potential and challenges for the use of 3D environments in education and training, 2003.
- [13] A. Andujar, J. Buchner, The potential of 3D virtual reality (VR) for language learning: an overview, In *Proceedings of the 15th International Conference Mobile Learning*, 2019, pp. 153-156.
- [14] E. Frazier, R. Lege, E. Bonner, Making Virtual Reality Accessible for Language Learning: Applying the VR Application Analysis Framework, *Teaching English with Technology*, 21(1), 2021, pp. 131-143.
- [15] M. Holly, J. Pirker, S. Resch, S. Brettschuh, C. Gütl, Designing VR Experiences—Expectations for Teaching and Learning in VR, *Educational Technology & Society*, 24(2), 2021, pp. 107-119.