

The Future Prospects of Importance of VR's Impact on Education

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Abstract. With the gradual progress of science and technology, virtual reality technology has matured and has been applied to many fields of people's lives. VR education has become a research hotspot, but relevant review articles are not comprehensive. This paper mainly researches the development prospects of VR game education, ideological and political education and art education. In game education, VR technology provides more gameplay so that students' interest can be attracted, which can help student to focus their attention. In ideological and political education, VR makes traditional boring lectures more vibrant and can better help students understand abstract concepts. Finally, in art education, different from traditional art teaching, VR technology can help students feel the artistic atmosphere immensely. At the end of the article, we made a summary and an outlook of VR Technology. Overall, virtual reality technology provides a more efficient method of learning, and it is hoped that the technology will become popular in the near future.

Keywords: VR Technology; Computer Science; Education; Game Development.

1. Introduction

VR (Virtual Reality) can generate an immersive 3D virtual image in front of people's eyes through wearing a screen, position trackers, and through computer simulation generation technology. If people wear a headset that supports spatial audio and a VR-specific handle, they can furthermore experience interacting with this virtual world. It is hard to imagine that such an advanced concept was actually proposed as early as the 20th century. However, due to the limitation of early technological power, the computer could not complete the high-intensity calculation, and the effect of the display was also very unsatisfactory. As a result, one cannot get a comfortable virtual reality experience out of a 30fps low-resolution video. Although the real virtual reality feels like a fantasy, scientists have not abandoned this topic for so many years. Nowadays, although it is still far from perfect yet, with the help of modern technology such as 5G, the concept of "virtual reality" seems to be gradually becoming real [1].

The real world is colorful and fabulous because it is full of countless possibilities. By simulating visual graphics and audio, VR can be considered as our second world, and the VR world can be even more colorful than the real one because many "impossible" in reality will become "possible" in this VR world. Our group chose to learn how to make VR games because we are interested in the future development of VR. It is believed that as the technology becomes mature, VR technology can be applied in more fields, the field of education in particular. By simulating a realistic and interactive environment, VR can bring students a learning experience that is completely different from traditional teaching. Students can get rid of boring textbooks and demonstration videos, and truly try and experience new knowledge by themselves. Aiming at the impact of VR in the field of education, this paper studies in detail the possible future impact of VR on game education, ideological and political education, and art education.

2. VR in Education Games

2.1 Application of Educational Games based on VR

Gamification of virtual reality and augmented reality content can not only enhance the interest of learning or training process through gamification elements, but also improve the participation of learners. In this passage we are going to introduce three models of applications that VR used in educational games and compare them with the traditional education model.

- **Desktop-based virtual reality technology**

Desktop-based virtual reality technology cannot achieve a fully immersive experience, but its cost is much lower than three-dimensional virtual reality display. Educational games based on Desktop-based virtual reality can not only improve the fun of teaching, but also help learners operate and experiment from a three-dimensional perspective in terms of the authenticity of experiments (Fig.1). In terms of skill training, learners can practice procedural skills repeatedly with the help of manipulators, which improves the repeatability and practicability of experimental tools [2].

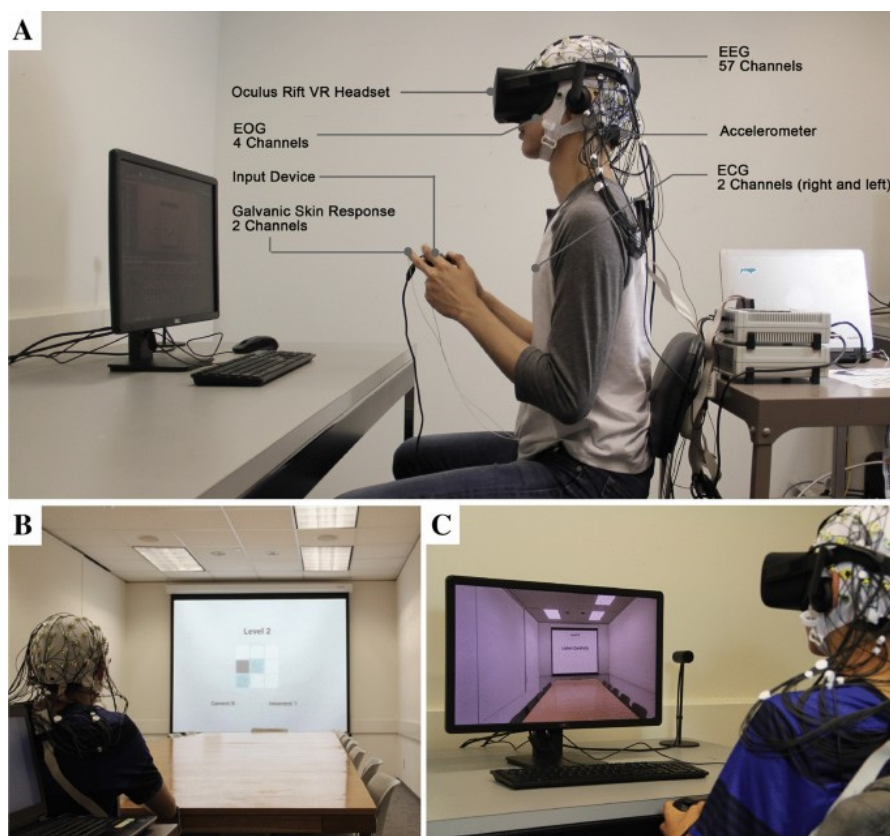


Fig 1. Desktop-based VR education games

- **Virtual reality technology based on head-mounted devices**

Virtual reality technology based on head-mounted devices makes learners' hands and other body parts relatively free, which can be fully combined with knowledge content such as creation, movement and model understanding for design. The immersion system of the head-mounted device completely relies on the head-mounted virtual environment display device, which displays different pictures and sounds to enable learners to achieve immersive experience [3]. However, this head-mounted device is easy to produce visual vertigo and is not suitable for long-term wear. The immersive system with the environment is to project the multi-angle profile picture of the object on the four walls of a room, and the user can achieve a fully immersive 3D virtual reality experience by wearing polarized glasses.



Fig 2. The experiment HOLOLENS by Microsoft using head-mounted based VR

- **Laser-controlled Virtual reality technology**

Laser-controlled VR doesn't require the user to use a headset, but instead relies on hand-held tools and VR imaging to achieve a sense of control and immersion. Virtual reality educational games have higher learning effect and motivation, while virtual reality educational games have lower training cost than traditional real field, and can be reused. Laser-controlled virtual reality educational games allow learners to flexibly control the operating tools and are a good choice for training the learner's attention and reaction speed related motor skills (Fig.3).



Fig 3. Laser-controlled VR

2.2 Development Status and Prospects of VR Educational Games

The teaching goal of VR educational games is to achieve “edutainment”. The teaching software is designed with the support of VR, AR and other technologies. The traditional learning content which may considered boring is turned into interactive games, which enables the learning process both educational and entertaining. Thus, the students will be attracted by the brand-new form of interactive learning and their efficiency will get improved. The liberation and return of one's body are the core of Embodied cognitive theory, which attach great importance to learners' experiential learning and has been widely practiced in AI technology, psychology education, morality education and other fields. The further development of VR in the field of education game provides strong theoretical support force, making the education game design considering how to embed the education cognition content certain game background, the environment, the game play and the rules of the game, and how to meet the students' physical activity system and the law of the physical structure. Nowadays, some VR based educational games have been carried out in some countries. If VR and traditional teaching contents are put together to focus on the liberation and return of one's body, the teaching efficiency will definitely get enhanced.

In the future development of VR and AR education games, there are something we should take care.

Firstly, VR and AR educational games need to be developed with adequate instructional design. The design of educational games can consider the different technology types and characteristics of virtual reality or augmented reality. The choice of tabletop or head-mounted device can consider specific costs and conditions, and set up corresponding game segments in combination with specific operation modes. Embodied cognition and flow theory also provide more sustainable development directions for virtual reality (Fig.4). Augmented reality games with an emphasis on characters, positions, or missions provide a useful way to design educational games [5]. The development of network and hardware equipment also provides a good condition for the learning mode of independent learning and cooperative inquiry. Three elements of an effective learning environment are as follows: first, a goal that can motivate learners is presented; Second, put learners in a real learning environment; Third, set tasks for learners that require analyzing information and designing action plans. Based on the above-mentioned game cases and relevant theories, it can be found that goal motivation, real situation construction and timely and effective feedback are the key points to be considered in the design of such educational games. In addition, the safety assessment of VR and AR educational games should also be considered in the instructional design process to ensure the personal safety of game players.



Fig 4. AR glasses in translation

Secondly, VR and AR educational games should pay more attention to learning effect evaluation and process feedback. The ultimate goal of educational games is to improve students' learning effects, and the measurement of learning effects is an important way to test the attainment of learning objectives, while different types of knowledge have different measurement methods. The learning content includes declarative knowledge and procedural knowledge, and the test types include knowledge-based, competency-based and skill-based. It is found that when the test type is knowledge-based, the learning effect of declarative knowledge is better than that of procedural knowledge (Fig.5). When the type of test is skill-based, learning is better when the content is procedural than when the content is declarative. It can be seen that when using intelligent technology for teaching, it is still necessary to combine traditional teaching design to classify knowledge and develop corresponding measurement tools. Virtual reality and augmented reality educational games usually involve direct interaction between the learner and the game platform, and the correct guidance and feedback provided by the game is very important. For the learning feedback of declarative knowledge, detailed explanation is better than visual guidance, and for the learning feedback of procedural knowledge, error reminding of knowledge is also better than visual guidance.

The virtue learning environment and multi-dimensional understanding of learning material is built by VR and AR. The educational game elements that combined with smart technology can enhance the interest of practicing, making it not just a demonstration, observation and experience tool. Instead, learning content can help learners to deeper practice and construct the learning-application mode. The use of VR and AR technology can enhance the interaction between the body and the environment in the process of learning. Gamification design can promote the flow experience of students. Is there a

certain connection between embodied cognition and flow experience? How does the brain neural mechanism in the field of gamification teaching and learning play a role? Starting from educational games, with virtual reality or augmented reality as the technical basis, and learning science as the theoretical guidance, a series of scientific research needs to be explored by educational researchers and practitioners.



Fig 5. Laser-Controlled VR in Chemistry

3. AR in Ideological and Political Education

As the education industry grows, terms such as smart classroom, interactive classroom, VR/AR classroom and holographic classroom are gradually entering our vision.

VR technology not only enhances the existing virtual experience, but also expands the new application scenarios, so that ideological and political education is no longer bound to a fixed space, and the educational means and content creation present the characteristics of dip media narrative. "VR + ideological and political education" reconstructs the overall teaching method of traditional ideological and political education, not only makes the position of college students in education change in time and space, but also makes ideological and political education with the powerful reproduction function of VR technology [7].

3.1 Enhancing Ideological and Political Education the Sense of Presence

VR technology realizes artificial intelligence "from addition to integration" and carries more and more sensory functions. In the setting of VR ideological and political education scenarios, it seems that the perceptual ability of college students can exist beyond the limits of physical contact and become an intelligent subject that integrates VR and the human body. Unlike the "representational body" of flesh and blood, the "reproduced body" of the VR scenes with symbolic markers reshapes the perceptual abilities of college students. Although traditional ideological and political education can also be taught through text, audio, video and other educational media.

The VR ideological and political education scene has the advantage of 360-degree panoramic presentation, which can integrate the virtual scene, perceptual management and college students' "portrait" and other multiple signal transmission systems. The VR ideological and political education scene can exclude the interference to the maximum extent and maintain itself to reflect the inner regularity of the "fact" world steadily, and the form and quality of the information acquired by the students is close to the "fact" received by the senses [8]. VR ideological and political education scenes The VR ideological and political education scene gives college students a new form of identity construction and replacement, from simply exporting personal expression through virtual images to fusing old and new identities, giving them new "physical experiences" with a strong sense of reality and presence, and thus revealing their mastery. This unmediated sense of "presence" is closer to

reality, eliminates the distance between college students and ideological and political education scenes, and gives more powerful imagination space.

3.2 Enhancing Ideological and Political Education Empathy

The survey found that VR has more empathic effect on audiences compared with traditional media. [2] VR ideological and political education scenes play an effect that traditional ideological and political education cannot achieve in realizing the manifestation of college students' subjective emotions and the development of subjective experiences. In the era of immersion media, human-computer integration breaks through the time and space dimensions, and VR technology can not only better optimize the sensory experience of college students, but also bring them a new experience of "time travel". Students can experience the "time travel" across the river of time, from the present moment to the past time; they can also feel the "space flight" that breaks through the space limitation, and quickly switch from the immediate space to the distant scene [9]. In high quality data-based information technological conditions, ideological and political educators can construct VR data-based virtual space-time with the help of high-performance computers, and simulate and reconstruct the experience reality of college students with a high degree of "first view". "The VR ideological and political education scene opens up the visual interface of "human double", which is a sensory complex directly manipulated by human free will in real time. Immersed in the VR ideological and political education scene, college students' visual images will overlap with the "human double" in space, shifting them from third-person objectified representations to first-person subjectifies representations. "The "human double" places college students at the center of the audiovisual field, and their visual and auditory senses are touched by the audiovisual fusion of mainstream ideology. emotional experience" of college students, so that they have a strong will to accept, digest and absorb the mainstream ideology from their hearts. AR performance using in political education as showing in fig.6-8, has higher performance.

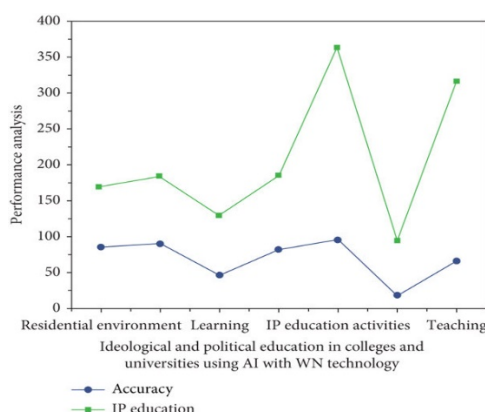


Fig 6. AR performance using in political education

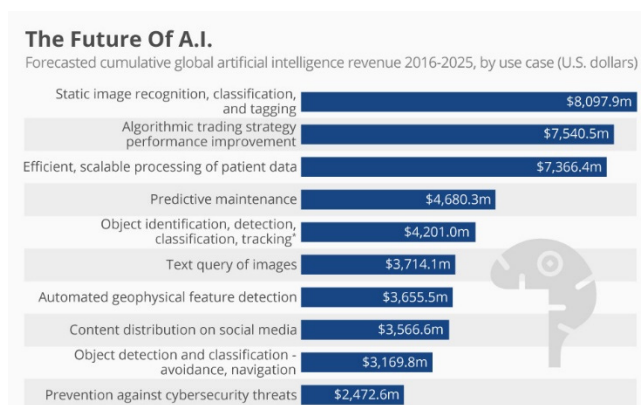


Fig 7. The future of AI

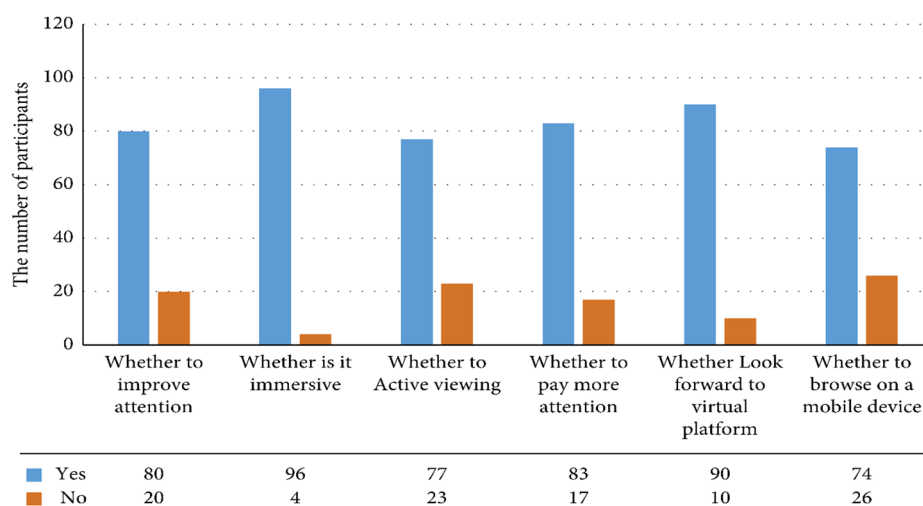


Fig 8. Statistical results of questionnaires on the integration of virtual reality technology into ideological and political education.

3.3 AR's Disadvantage in Political Education

As the current VR equipment is not perfect, first of all, there are some people who will feel uncomfortable wearing VR equipment, feel dizzy, want to vomit and other symptoms. Prone to motion sickness (motion sickness). This is the VR field has not been able to solve the problem. When we substitute the user's visual and auditory senses with the virtual world, the user's body's physical senses (internal sensation, body force, and motion) are still in the reality, and when we move in the virtual world, however, it does not feel like the body is moving in the same way, it is straightforward to feel dizziness. The more affordable the VR device, the less accurate the capture of head position. Children may get dizzy soon after being in VR and have to stop learning. If this problem is not solved, it will be difficult for VR education to become widespread.

The second is the price of equipment, now Two modes of implementation of virtual reality technology are available: cave type or headset type. The cave type is the use of projection or screen, wrapping up the space and replacing it with a digital image. Headwear is the common VR helmet, so that users can only see the image displayed by the helmet, thereby replacing the user's vision. Regardless of which one, the equipment is more expensive. The helmet type in particular, although the individual cost is lower than the cave type, but each student needs a device, the total will be very expensive. The price of good VR equipment is generally high, and considering the number of problems, once popularized, it will be a huge expense, so it is difficult for the average school to afford, and this problem, if not solved, will largely affect the popularity of VR education. As shown in the pictures, Questionnaire statistics on the integrating of virtual reality technology into ideological and political education. The application of VR in art.

3.4 Development of Online Courses in China

Online courses in China have started to develop for a very long time. As we can see in the graph, in 2016, there were about one hundred and four million students using online courses. The number was growing year by year after 2016 (Fig.9). Especially in 2020, when the coronavirus outbreak on a large scale all over the world, many students had to stay at home to finish their courses. at that time, many schools held online classes, which added to the total scale of online education users. However, the growth rate kept decreasing for the reasons of government policy and underdevelopment. For example, students cannot pay all their attention to the lessons and they cannot always connect to the classroom well. All these factors lead to a decrease in the growth rate of online education users.

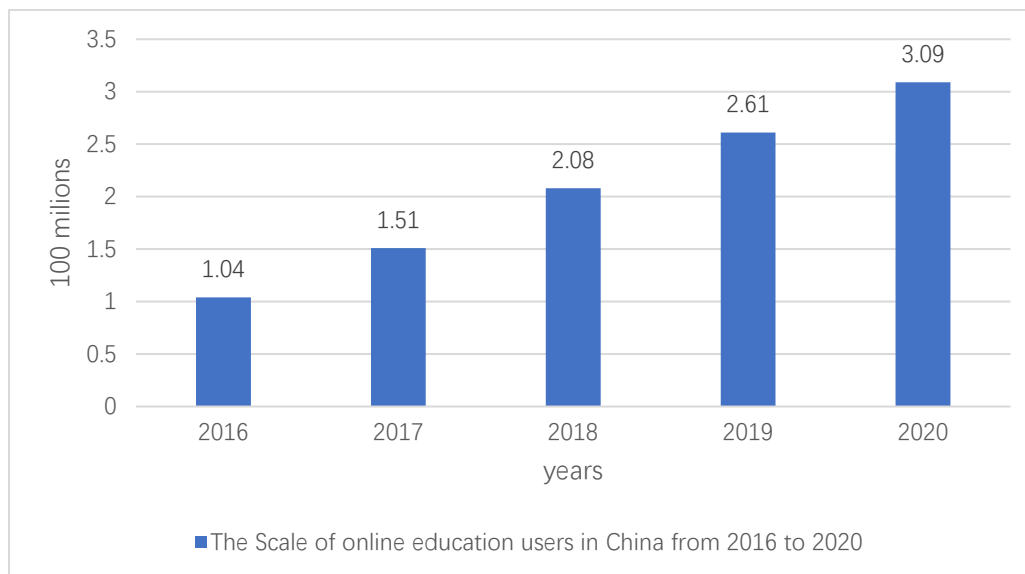


Fig 9. The Scale of online education users in China from 2016 to 2020

Since the online courses can apply the common students, art students can also take the classes online and practice. When they are at home, they cannot get their professor's opinions and instructions, so online courses for art students became more and more common. A survey showed that in the middle of 2020, a large number of apps and software appeared to help with students' practice. In the contrast, the total scale of online course users of art students only increased for a year. In the first half year of 2022, these apps and software kept decreasing and most of their companies went bankrupt (Fig.10). Many scholars analyzed and argued that it was because they cannot get direct instruction and students will behave wrongly as they cannot see the teachers well. From these three graphs, we can see that the number of normal online course users is keeping increasing and the number of art online course users is decreasing this year. We can know that the market for online courses is increasing. The reason why the total scale of online course users of art students decreases is that students cannot get a good experience from the course's platform. They cannot practice well and the teachers cannot teach them well too. However, developing and using the VR technology can use this problem.

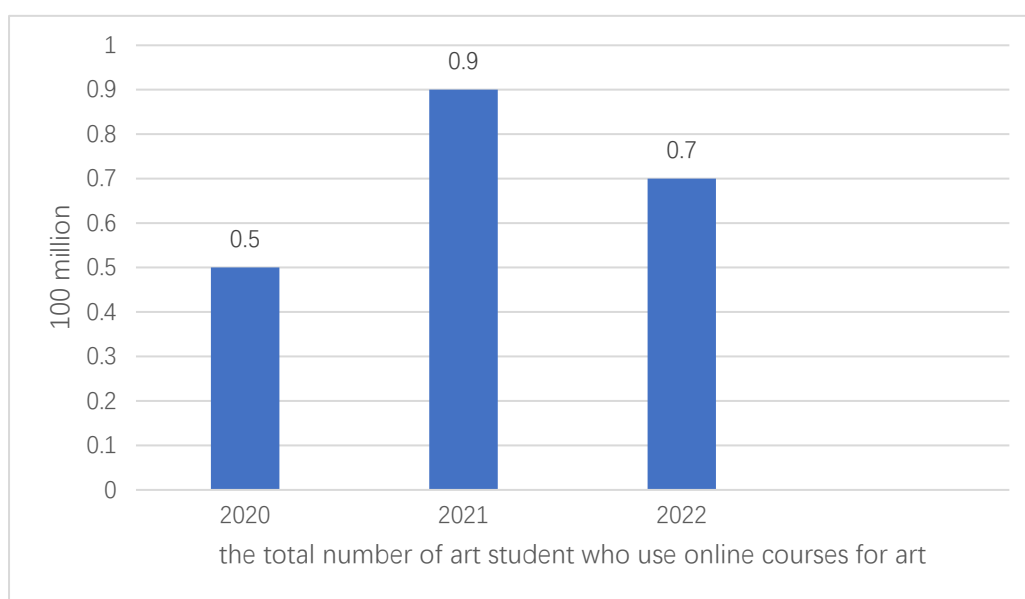


Fig 10. The total scale of online courses users of art students

3.5 The Advantages of VR for Realizing Online Courses

With the development of technology, we can use VR devices to study online instead of just using computers and mobile phones. When we use immersion technology in online courses, we can imitate the condition in the classes in the reality. For example, students can see the teachers on the stage teaching and walking instead of just watching the teachers sitting by the desk for a very long time or only listening to the teacher's sounds.

Another reason to use VR devices is safety. When learning something dangerous like soldering, students can learn online by the objects on the Internet, so they will not hurt themselves by mistake. Also, they can stay at home to have the lessons without bothering by other students. What is more, students can practice by themselves instead of only listening to the teachers by playing games with VR devices and it can keep the interaction between professors and audiences.

The third use of virtual reality technological devices is to imitate the scarce educational resources. Sometimes, some teachers may not be willing to have so many students or they do not have enough time for teaching, which limits the teaching resources. However, through virtual reality technology, students can learn the skills without considering the limit of resources as it will imitate the action of the teachers. Also, if students use VR devices when they have online courses, they will not worry about the seats as all the students can have the best seats in the classes.

3.6 Application and of VR in Art Online Courses

As VR technology has so many advantages and influences on the common students' online education, it can also help art students with their studies. To begin with, they can use VR devices to help them practice. It can help students with both music and painting. For instance, a professor is teaching students about art and shape in classes. Nonetheless, there are only some paper and pens prepared for the professor while students have nothing to practice. At this time, students can use VR to practice. They can better understand the three-dimensional shape and size of the art objects by sensing ears and eyes when using the devices. For music students, they can better use VR technology to help themselves. They can get direct instruction from professors through immersion glasses. They can see the professor's hands, and listen to the professor's musical instruments sound accurate, so they can imitate and understand the behavior of their professor better than the students who use computers and mobile phones. What is more, when the teachers sit, user would feel that user are monitored, so user may be effective when playing the instruments. It will also provide a wide platform for art students to practice and gain knowledge and information. When need to go to the museum or any art exhibition, they can watch the painting in any direction with VR technology. Without using it, they will just see a picture and they cannot see the texture, color, and trace of the brush well [10].

Moreover, there are some platforms or software which can help players to compose their own music. For example, there is a VR music software whose name is <PatchWorld>. <PatchWorld> is a VR music app developed by patchXR that provides a library of tools and instruments for making music. Players can design their own avatars and then use a unique interface to create their own sounds. And with over 200 blocks, there are endless creative options. Also, it allows players to compose and experience the same music.

In conclusion, VR technology has many useful ways to help music or art students and it can help players to compose.

4. Summary

In recent years, with the rapid development of technology, VR technology has appeared in more and more people's daily lives. Especially in the field of education, VR bring students a more efficient and interesting way of learning. In this article, we pick three topics (game education, political education, and art education) for our VR research project.

In VR game education, it is difficult for traditional video game education to maintain students' energy continuity and learning interest, VR game education however, by creating a immersive virtual

world, can make students maintain their learning motivation and make the learning experience more interesting. VR game education enhances the diversity of learning methods and the interactivity of the learning process. Therefore, VR game education can greatly improve the learning efficiency of students.

Traditional ideological and political education is a relatively boring subject because the text and pictures in the textbook are difficult to explain the abstract ideological and political theory clearly. However, VR technology can literally visualize abstract theoretical teaching, present a clear and intuitive 3D interactive for students, improve the affinity and interest in theoretical ideological and political education, help students form a perceptual understanding of theoretical teaching, and promote students to learn and practice. The level of ideological awareness will be continuously enhanced.

Through modern virtual reality technology, art students can observe the simulated art scene through visual, auditory, and even tactile experiences, and feel the atmosphere of art immersivity. With the help of VR immersive art teaching, abstract knowledge and skill operations can be more intuitively presented to students through virtual practice scenes, helping them to have a deeper understanding of the spatial structure, color matching, etc.

VR technology provides a more convenient learning environment. It is believed that with the further development of technology, VR education can be popularized and bring a different educational experience to more students.

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