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Post-pandemic era – a preview of the impact of augmented reality technology on learning methods in domestic education industry

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Abstract: During the period of Covid-19 pandemic, all industries, especially Chinese higher education, have been impacted to varying degrees. Responding to the call of the national government, Chinese colleges delayed their openings and resorted to online teaching instead of the conventional class teaching method. But at present when the pandemic is declining and under control, would the teaching method completely go back to the conventional way? Would the reform of teaching methods in the crisis has lasting impact on the education industry? This paper analyzes the reform trends in the education industry during the post-pandemic era and focuses on the application prospect of augmented reality (AR) technology in the reform of teaching methods.

1. The analysis of the current situation of education reforms during the coronavirus pandemic

Since the outbreak of the COVID-19 pandemic, colleges around the country responded to the country's call of "suspending classes without stop learning" by delaying their opening and resorting to online teaching in the face of the crisis. Now colleges are reopening, but domestic policies of education reforms indicates that education reforms won't stop because of the contained and dissipated pandemic. Although the online teaching is a move carried out to deal with the special situation, the rolling out of this teaching mode undoubtedly provided a preparation for the definite reform in the education industry[1].

Online teaching has many advantages comparing with the traditional teaching method. Such as:

First, online class can complete the teaching and interaction process through basic electronic communication tools. Teaching tasks can be completed to a large extent without gathering people[2].

Second, the learning methods for students are more abundant. There are many options for online teaching platforms, and teaching resources are rich[3-4]. Moreover, teaching progress can be carried out at many platforms in a combination way of recording and live streaming. Students can also replay the online courses after the class. The function of replay enables students who couldn't attend the online class in time to study independently[5].

Third, teaching methods have been enriched. This nationwide online teaching experience has improved teachers' application skills of information technologies, pushing teachers to actively study and learn together[6-7]. So teachers could master teaching operation at least one platform. Meanwhile, in the exploring process, teachers can acquire more excellent online resources, which could promote

the improvement of teachers' teaching ability[8].

Although online teaching has above advantages compared with the traditional mode, it also has some problems that cannot be ignored.

First, resources online with good and bad qualities are mixed, and if there are no reasonable selection and control, the teaching effect would be greatly affect. Also, not teaching face-to-face, teachers are more seem like "live-streaming performers" and they are prone to play solo in the class, and this would also affect the teaching efficiency[9].

Second, the effective control over students is insufficient. Without on-site teaching, teachers could not discipline students[10]. If students have bad self-discipline ability and distract from classes like playing games, listening to music or reading online novels, teachers cannot timely intervene. This would lead to a bad teaching effect.

Third, comparing with teaching face-to-face, the interactive experience of online teaching would be worse. Teachers cannot accurately know the learning progress of students, and thus targeted instruction is hard to conduct[11].

Then what is the reason of these problems? Many people think it is the pandemic. Actually the deeper reason is the limitations of the conventional online education.

Conventional online teaching mode has already been widely applied in many online tutoring institutions. But the large-scale application in colleges in the pandemic is unprecedented. In the complete online classes, teachers cannot supervise and address all the problems of whether the students listen to, pay attention to and understand the lessons. For the prospect of the reform of teaching methods in the educational industry, these problems need to be faced and solved to further upgrade teaching methods and modes.

2. The possible effect of AR technology on the reform of educational methods

Augmented Reality (AR), also called mixed reality, applies virtual information to the real world through computer technology. By the AR technology, the real environment and virtual objects coexist in the same image or space in real time. Virtual reality technology has made steady development in many industries like medical and television. This sort of big change also generates new possibilities and chances for AR to make a revolutionary impact on the reform process of the educational industry. The advantages of the application of the AR technology in teaching are mainly reflected in its deep interactivity, sense of presence, autonomy, and multi-sensation, including the realness of the users' presence as main characters in the simulation environment, the degree of the accordance with the law of physics of the users' movement in the virtual environment. Besides the visual perception of computers, the multi-sensation includes the senses of touch, smell, hearing, etc. This kind of deep interactivity and the interaction experience of multi-sensation are the exact pain points and pressing needs of the present conventional online teaching.

3. The practical significance of the application of the AR technology in the intelligent educational reform

First, AR can significantly enrich textbooks and other related books. It can provide more plentiful audio-visual educational materials, and the immersive education would greatly stimulate students' enthusiasm to learning especially in terms of art education. Figure 1 is the typical user interface of the application of AR technology in class.

Figure 1: The typical user interface of the application of AR technology in class

Second, AR technology can greatly improve the flexibility of the time and methods of learning. According to students' learning habits and time, it can provide personalized plan of resource distribution, so that the personal needs of learning habits and time can be specially met. The effectiveness of this technology raises the flexibility of learning to a new level which would be discussed from following respects:

1) AR can enable students to learn in the realistic production practices. Instead of theoretical courses and tedious lectures, students can learn through practice with AR. Comparing with the form of video and audio, the experience of practice can improve students' learning experience, helping students memorize more long and boring basic concepts. This approach of learning from practice can effectively help students improve learning efficiency and make learning become easier. The realistic class based on the AR technology is shown in figure 2. This technology can enhance students' memories of knowledge.

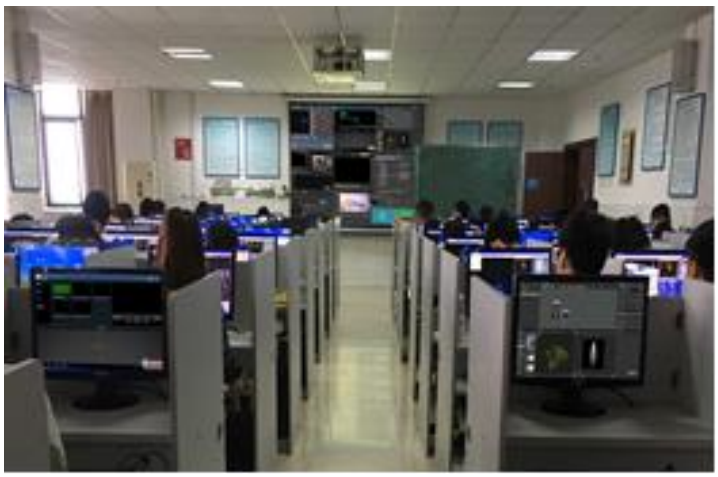

Figure 2: The typical teaching situation based on the AR technology

2) Students can participate in production practice in a safer way. Some teaching operations are dangerous, such as electricity and mechanisms, and they are difficult for students without much experience. Students are also prone to fear of difficulty due to worries about misoperation. AR technology can construct immersive situation by means of digitization, equipping students with safe and realistic environment to accept this kind of education, and this has excellent learning effect.

3) AR technology can improve the experience of sensation. Memories of knowledge are acquired

by the memories of sensation which AR can create through the sense of touch, vision, hearing, etc. For many skills that cannot be learned in reality, AR technology can made them accessible through virtual experiences.

At the same time, the application of interactive design to the visualization of intelligent power grid data is promising in the exploration of the new direction in the field of industrial mass production. The application not only could extend the application scale of the subject of interactive design itself, but also could play a positive role of the subject in industrial mass production, having a relatively strong realistic significance on improving the industrial production efficiency.

4. Conclusion

The application of AR technology is of great significance to the development of the education in the post-pandemic era. These applications in use has a distinct feature which is they can teach you how to put one operation into practice, especially applicable for cultivating practice-oriented professional talents. More applications are developing and enabled, bringing some optimistic vision for the deep promotion of the reform of educational methods with AR technology.

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