

Development Elements of VR Classrooms in China

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Abstract: VR classroom is an integrated teaching environment of content, hardware and platform. Its use is affected by the following three aspects, including price and performance of hardware equipment, cost and difficulty of courseware development, and quality of teaching by VR courseware. Therefore, the future development trend of in VR classroom should be the trinity of terminal+courseware+SaaS.

Keywords: VR classroom; VR HMD; VR courseware development; VR platform

1 Introduction

In 2016, the development of Virtual Reality (VR) shows a blowout situation. With the help of the media, VR has also entered the public's vision and become a well-known new concept of science and technology. At the same time, professional investors and practitioners generally call 2016 the first year of VR. Leading products HTC Vive and Oculus are expected to open a new era of VR, so that VR is no longer just for developers and technology enthusiasts, but more close to business and life, serving a wider range of ordinary people. However, after a short blowout and boom, the overall development of VR has rapidly dropped to a downward track. The development of VR games is not as expected, and the application in the commercial field is difficult to popularize. However, the education industry has become a promising area for developing VR because of the advantages of audience concentration.

VR, AR and MR are widely predicted to be the next technology to change the teaching methods and achievements. The advantage of VR technology lies in promoting learners' immersive, interactive, efficient and efficient learning. The characteristics and concepts of education are naturally coupled with the characteristics of VR technology. A large number of knowledge scenarios which are difficult to replicate, difficult to present and costly to repeat can be simulated and realized by using VR technology.

VR classroom is not just a collection of hardware devices, but also an integrated teaching environment of content, hardware and platform. Students and teachers will get more learning and teaching experience in VR classroom, which is an important focus of VR education companies in the next step. AR early education products are the earliest implements VR/AR education theory.

2 Demand analysis of VR classroom

The purpose of changing educational concepts and improving educational methods is to enable students to learn knowledge more efficiently and accurately, and to cultivate their interests and expand their abilities. There is no doubt that VR technology is attractive in the field of education. The simulation and interaction performance of virtual reality may completely change the presentation and dissemination of traditional teaching content. Every participant in the education sector has a need for VR technology to enter the classroom.

2.1 Students' demand

VR provides an accurate and refreshing way to simulate the conditions and space, which can help students better learn knowledge, understand concepts, and make the complete learning process more accurate, controllable and fun.

2.2 Parents' demand

With the development of science, technology and economy, parents' investment in education is increasing year by year. Their perspective and vision are gradually in line with the latest development of international education. They hope that new forms of education can bring help and promotion to students.

2.3 Teachers' demand

The introduction of VR technology is the requirement of the development of teachers' information literacy. In 1974, Paul Zurkowski, president of the American Association of Information Industries, firstly proposed the term information literacy. He believed that information literacy is the technology and skill used to solve problems. Information literacy is the overall description of people's information behavior ability and thinking mode in the information age, including information discovery, evaluation, utilization, communication and other abilities. It is a comprehensive ability and quality. It is generally believed that information literacy can be divided into five aspects: information awareness, information knowledge, information ability, and information morality and information cooperation. For teachers, information literacy is the ability to express information and use information tools in teaching and scientific research, as well as the ability to research and explore the laws of education and teaching on the information technology platform. How do teachers adapt to the influence of VR technology on the world, and explore how to study the changes in VR technology in the teaching mode and the presentation form of teaching content, are the needs of modern teachers to improve their information technology literacy.

2.4 Demand of schools and governments

As the main investor of VR education, schools and governments have invested relatively high funds and resources to introduce VR teaching methods. The purpose is to enhance the scientific and technological application in the whole education system, improve or change the overall education situation, and at the same time, to realize the positive promotion of higher education and social impact.

3 Mainstream manufacturers and applications of VR classrooms in China

3.1 101VR immersion classroom

Huayu 101VR immersion classroom solution integrates immersion virtual reality technology (VR) with teaching. With high-quality teaching resources as the core, it integrates terminal, application system, platform and courseware, creates a close to real learning environment for students, visualizes abstract concepts, and creates a highly open, interactive and immersive three-dimensional learning environment for learners.

3.2 101VR creator classroom

The 101VR creator classroom focuses on the cultivating students' innovative spirit and practical ability. It integrates immersive virtual reality technology (VR) with STEM education and creator education. It is based on VR editor and it relies on the massive 3D educational resource material library in the cloud to provide free space for students to play and turn students into creators.

3.3 VR super classroom

The integrated output of hardware and software of Hei Jin VR super classroom, aiming at K12 education, carries on the comprehensive transformation to the traditional classroom. The hardware of VR Super Classroom consists of the following hardware components: intelligent blackboard, super classroom system computer, VR controller to control students' HMD (head mount display) and each student is equipped with an IPAD and VR HMD.

The courses offered by VR super classroom are divided into K12 stages of science, history, geography, biology, physics, chemistry, art and so on. Interactive courses in higher education and vocational education, such as hazard testing, simulated driving, mechanical operation, virtual sand table, etc.

4 Development elements of VR classrooms

According to the current development of education in China, whether VR classroom has broad prospects for development, there are roughly the following key factors.

4.1 VR hardware application in educational scene

HTC vive and oculus use room scale technology to make VR interact in space. They are representatives of premium VR equipment. They monopolize every link of equipment manufacturing, standard-setting and equipment supply. As the HMD and hardware manufacturers control pricing power, it is difficult to reduce costs and prices in the short term. With a HMD and a mainframe, an intermediate set of VR device costs about \$ 2 500. For a VR classroom, six or twelve sets of equipment have already invested high hardware costs. The cost of equipment loss and maintenance during use, and the cost of reformation for adapting the classroom to VR equipment, have hindered the popularization and promotion of VR classroom. Chinese educational institutions have abundant funds in information construction in recent years. Still, if the price of hardware equipment is reasonable enough, VR classroom may will be popularized as a normal classroom in the future. Otherwise, it will become just an exhibit of school information construction.

In addition, wiring can become a complex problem due to the use of many devices, such as host, RoomScale Sensor and HMD links. Moreover, how to avoid the electronic interference between the room scale

sensors will also bring difficulties to the design of the whole VR classroom.

Unlike the premium VR market, Android VR has a big price advantage, for its price is only about one-tenth. However, the refreshing rate of the display screen is insufficient; wearing for a long time (more than 10 minutes) will bring uncomfortable dizziness, and unable to implement the interaction between virtual space and real space. At the same time, Android HMD also has the problem of fragmentation of VR courseware, which is difficult to integrate.

Therefore, there is no ideal VR equipment to achieve the popularization of VR classrooms.

4.2 Cost and difficulty of customizing teaching courseware

After more than 2 years' development from 2016 to now, VR has not fully entered the expected areas (entertainment, life, education), and the number of paying users is not large enough to support the high cost of VR courseware development. For VR education, because the courseware has a specific use, the number of users is smaller, the cost is higher, and it is much more difficult to make profits through advertising.

The development of VR courseware requires 3D modeling, while the establishment of 3D model requires a long time and labor costs. For educational courseware, 3D model needs to be customized according to the specific needs, which is difficult to reuse. High cost has become the biggest obstacle to customizing VR teaching courseware. Even though Android VR courseware does not have spatial interaction, the cost of modeling is still considerable, not to mention the premium VR courseware with spatial interaction.

4.3 Improvement of teaching quality via VR courseware application

From the perspective of teaching process management, VR equipment can easily make teachers lose control of the teaching process because of its obvious closeness and immersive experience. Only by establishing an effective central control system can teachers control the teaching process.

The frequency of VR courseware used in teaching also determines whether the courseware is effective in improving the quality of teaching. If the use frequency is too low, the correlation between VR courseware and teaching quality cannot be evaluated; if the use frequency is too high, the use cost will increase rapidly.

Educators in some fields have high expectations for VR in virtual reality and space interaction, such as medical surgery, advanced equipment production and other academic fields. But for now, the best Room Scale technology is far from what people expect.

5 Development trends of VR classrooms

Teaching has a very strong visualization requirement. From the perspective of "educational visualization", using more abundant means to show the content will become a just need in the field of education. Three-dimensional, holographic, semi-immersed 3D products and AR products will play their respective roles in schools. VR educational products with good interaction and strong immersion represent the future of educational visualization. VR is primarily used to create virtual immersion experiences, especially those that are costly, dangerous, or not easily accessible in the real world.

In many people's understanding, VR classroom is equivalent to VR HMD+VR courseware, but in order to make VR technology truly penetrate the whole process of education, it still needs a system of products, including not only hardware and courseware, but also the SaaS platform for its management.

1) Hardware

In order to achieve the requirement of "teaching visualization", besides the immersion terminal based on VR HMD, it also needs a VR classroom solution with AR terminal and multi-person interaction support system.

2) Content

Making high-quality and low-cost VR courseware is an important condition for separating the VR classroom from the former educational technology. Courseware developers need to cooperate with educational institutions, formulate teaching system according to the syllabus, and fully visualize the appropriate curriculum from the perspectives of introducing theme, curriculum setting, content presentation and training design. In addition, we need to develop a standard VR content platform to attract third-party developers to participate in the design and development of curriculum content, and to attract better team participation through revenue sharing. We need to promote high-quality courseware in educational institutions through platform integration ability, so as to ensure the quantity and quality of courseware production.

3) SaaS platform

In order to enable teachers and students to better apply VR technology, it is necessary to establish SaaS platform to effectively control the application of products and content, including teacher preparation, classroom management and control, students' self-study and data feedback, shown in Figure 1.

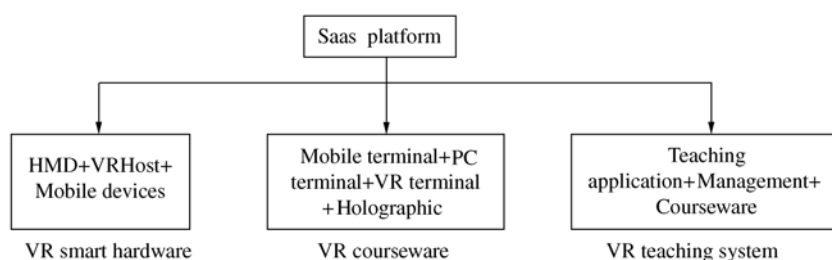


Figure 1 SaaS platform

6 Conclusion

VR offers a next generation teaching tool for in-depth and interactive learning using 3D immersive technology and front-project holographic display. However, more must be done to develop the technology, which will lower the cost and improve the user experience.

References

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Brief Biographies

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