



The Feasibility Study of VR Technology to Solve the Problem of Education in China - Based on the Concept of Metaverse

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Abstract. Metaverse and VR technology are the important products of the new era, and it is generally believed that metaverse and VR technology can be combined with some fields other than entertainment and games to solve some existing problems in different fields. Meanwhile, there have been many obvious problems in the field of education in China at present, and will these problems be solved by introducing metaverse and VR technology? By studying the characteristics of metaverse and VR technology and the current problems in education, this paper focuses on the current inequality of education in China and discusses how the characteristics of metaverse and VR technology can be applied to the education field and solve the problems existing in the education field. Further research on the possibility of using metaverse and VR technology in the field of education to improve or solve these problems.

Keywords: **Keyword:** metaverse; VR immersive experience; education; educational inequality

1 Introduction

The metaverse, which was previously considered a revolutionary technology, is also gradually spreading to the general public. For the present, the revolutionary technology of the metaverse is in the process of spreading to the public, and in recent years, the concept of the metaverse has received extensive attention. In other words, the metaverse is the most revolutionary technology and concept of this century, and many companies and fields have already started to conduct metaverse-related research.

For example, in October 2021, Facebook, a well-known social media company, announced that it would change its name to Meta and officially enter the field of metaverse development (Rodriguez, 2021) [1]. Similarly, in 2021, metaverse became one of the hottest topics, and many companies besides Facebook also announced the development of metaverse at the same time, so many people called 2021 as the "metaverse year" (Professor Shen Yang's team from Tsinghua University, 2022) [2]. However, in 2021, the focus on metaverse is mainly on NTF, virtual real estate, and

metaverse social, thus ignoring the possibility of applying metaverse in other fields, such as education.

Education has always been the most important field for most societies in the world, and the application of new technologies in the education for the benefit of students has become a topic of wide interest. Therefore, this paper will discuss the possibility of applying metaverse in the field of education and the pros and cons of applying metaverse in the field of education.

2 Metaverse and Virtual Reality

2.1 The Relationship Between VR And Metaverse

In simple terms, the metaverse is a virtual world established by a virtual 3d technology engine, and people can enter this virtual world through some specific devices, such as VR devices. Moreover, users can create, trade, and so forth in this shared virtual world. Moreover, "the metaverse is device-independent and not owned by a single provider" (Gupta, 2022) [3], similar to the creation of a new decentralized virtual world on the Web. The metaverse is an online 3D immersive environment that will revolutionize the way we socialize, work, shop, and entertain (Adegiori, 2022) [4].

VR, whose full name is Virtual Reality, allows users to use specific VR devices to access a virtual interaction platform created by a 3-D virtual engine. The VR device can also collect the user's body and language information and convert this information into electronic signals to the virtual interactive platform. At the same time, the sensory feedback felt by the user in the virtual world is also fed back to the user in reality in the form of electronic signals. This mode of collection and feedback forms a closed loop to give the users a sense of context and a strong immersive experience (Pavlovic, 2018 & Charara, 2017 & Kovačević, 2021) [5-6].

The relationship between VR and metaverse is like a key and a lock; VR devices are one of the important ways for users to enter the metaverse, and it is because of the technology of VR that allows users to have a strong immersive experience in the metaverse. Although VR sounds very novel and people intuitively feel that VR and metaverse are products of recent years, in fact, the concept of VR and metaverse actually emerged as early as 1935 (Barnard, 2019) [7], when people already had a similar vision of metaverse and VR, so VR and metaverse have a relatively long history.

2.2 The Development of VR

In 1935, Stanley G. Weinbaum published a novel titled "Snow Crash" and mentioned some science fiction scenarios and concepts very similar to VR and metaverse (Barnard, 2019) [7]. At that time, these concepts were only in fantasy, and the metaverse concept was not developed in-depth due to technical conditions.

The actual development and research of VR can be divided into three main phases. 1956 to 1979 belong to the first phase, in which VR devices had prototypes and were

already used in some fields, belonging to the earliest VR (Barnard, 2019 & Displair, 2022) [7-8]. As technology progressed, the function of VR equipment became more powerful, and VR devices became portable. From 1980 to 1996, the second stage, more and more companies invented head-mounted VR devices and VR glasses (Barnard, 2019 & Displair, 2022) [7-8]. By the third stage, which is from the early 21st century to today, head-mounted VR devices became more popular and gradually civilianized (Barnard, 2019 & Displair, 2022) [7-8]. At the same time, VR devices in this stage can give users a more robust immersive experience compared to previous VR devices. The third stage of VR device development is the most familiar form of VR device and technology in today's society. It also starts to be genuinely used in people's daily lives.

In general, the progress and development of VR devices can make the metaverse have a stronger immersive experience, allowing the concept of metaverse not only to stop at trading virtual assets, but also to become a virtual second world built on the web. Therefore, this article will focus on the immersive experience brought by VR to the metaverse and discuss the possibility of applying the immersive experience of the metaverse to the field of education.

3 The Pain Points of Education

Education is very important for any country. It can improve the quality of the people as well as the economic situation of the citizens and reduce the number of poor people. However, there are still many problems and pain points in education that need to be solved.

First of all, education is not very fair, and not all families can provide the same educational resources to their students. Specifically, in Chinese society, the gap between the rich and the poor is very large. According to the report given by the National Bureau of Statistics, "comprehensive public data show that the Gini coefficient is maintained at a level of 0.46-0.47, which is higher than the international alert line of 0.4" (Sun, Yinni, 2022) [9]. This means that there is a large asset gap between high-income groups and low-income groups, and this gap will be intuitively reflected in the resources for children's education, and directly leads to the inequality of educational resources.

Specifically, families with higher incomes have more opportunities to send their children to private schools and international schools that charge higher fees and offer higher levels of education or have the ability to send their children to countries with higher levels of education, such as the United Kingdom and the United States, while low-income families can only send their children to regular public schools. Moreover, high-income families can provide children with some additional educational resources. According to the CFPS (China Family Panel Studies) [10], extracurricular classes do improve students' performance in certain subjects, such as math (CFPS, 2018). Children from low-income families are unable to attend expensive extracurricular classes due to their family's financial situation, which directly leads to an academic gap between children from low-income families and children from

high-income families, and this gap becomes larger over time. As also stated in the CFPS report, extracurricular classes reflect, to some extent, social and educational inequality (CFPS, 2018) [11]. Also in China, there are many examples of students from low-income families need to use their spare time to help their families. As everyone often says: "The poor children manage household affairs early" (Zhihu, 2018) [12], which leads to these students needing to spend a lot of time and energy to sharing some of the household chores or work at home. This can lead to children from low-income families not being able to spend as much time and energy on their studies and education as children from high-income families. This financial pressure from the family causes students from low-income families to gradually distance themselves from students from high income families in terms of academic performance. Overall, a family's economic background or income situation can directly affect a student's education, and disparities in the family's economic background can lead to educational inequality.

In addition to the influence of family economic background, regional problems also contribute to the emergence of educational inequality. First of all, in China, the gap between urban and city per capita income has already produced a large gap, for example, according to the data given by the National Bureau of Statistics, the per capita disposable income of super first-tier cities such as Shanghai has reached 76,437 RMB, while for second-tier cities such as Shijiazhuang, the per capita disposable income is just more than half of Shanghai, so the income gap between cities is already very obvious, not to mention some rural and township areas, etc. (National Bureau of Statistics & Xiaoyu, 2020) [13]. As mentioned above, the income situation of families can directly lead to the inequality of educational resources, so students living in cities with lower per capita income will not have the same educational resources as those in cities with higher per capita income.

But in fact, the problem of inequality in educational resources caused by geography still exists, and the regional income gap is not necessarily the main cause of inequality in educational resources. In 2020, a picture of Shenzhen Middle School's "luxurious" teacher line-up caught the internet, according to Shenzhen Middle School's recruitment announcement for 2020, "In 2020, the school has 66 new teachers, including 39 masters, 21 PhDs, and 6 PhDs (post) " (Xiaoxiang Morning News Official Hundred, 2021) [14], and almost all of the teachers are from world-renowned universities. In contrast, in some rural areas or small towns in China, only 51.6% of rural teachers have a bachelor's degree or higher (Interface News, 2020) [15]. Because of the working environment, salary, and work pressure, some excellent teachers are not willing to teach in rural areas, which leads to the weakening of teachers in rural areas and some towns. At the same time, according to the data provided by EO Intelligence, both the teacher-student ratio and the educational composition of teachers are better in towns than in villages (Gao Mingzhu, 2018). This means that there is a very big gap in teacher strength between the countryside and towns, and even cities, and quality teacher strength is the most important part of education resources, so students in the countryside cannot get the best quality education resources. At the same time, because the infrastructure of rural or urban schools is not very good, there is not enough money to buy some teaching equipment,

which makes rural and urban students lose a lot of opportunities for hands-on experience, for example, some chemistry or biology experiments, without the support of sufficient experimental equipment, it is difficult for students to truly experience the mystery.

Education includes not only the acquisition of knowledge from books, but also the acquisition of abilities, cognitive improvement, and other aspects of development. In today's society, there is an increasing demand for all-rounders, which means not only sufficient knowledge, but also various abilities, such as the ability to analyze and think independently, etc. Not only that, but also high emotional intelligence, healthy psychology and a broad perspective are also important components of an all-rounder. The all-round talents not only need to learn knowledge in school, but also need some life experience to improve their vision and insight, as the old saying goes, read ten thousand books and travel ten thousand miles. Rationally, traveling a million miles requires financial support, but for low-income families, it is not enough to allow their children to travel frequently, even in China there are still many students who have not left their city before going to college, which means they do not have the opportunity to broaden their horizons through travel and so on. However, for children from high income families, travel is a common thing, and much of the knowledge and content in books can be truly experienced through travel, which not only allows these children from high income families to broaden their horizons, but also allows them to truly feel the importance of learning.

In general, the disparity in family income directly leads to unequal educational resources for children, while the economic status of the region also leads to the problem of unequal distribution of educational resources. Although the college entrance examination is very fair from a macro point of view, students from low-income families are unable to compete with children from high-income families because of the inequality of educational resources, thus they cannot enter a good university to receive a better education. At the same time, when these students from low-income families graduate and enter the society, they lose their competitiveness because of their experience and education, thus forming a vicious circle and further widening the gap between the rich and the poor, causing social problems.

4 Using VR Technology and Metaverse to Solve Educational Pain Points

With the development of the times, VR technology has become more and more mature, and scholars have begun to focus on the feasibility of using VR technology in different fields, and whether it can bring new breakthroughs and developments to the field. At present, VR devices and metaverse technology are mainly used in entertainment and social networking, such as VRchat, while there are very few examples of VR being used in other fields, basically only a few fields are trying to use VR technology, but in general, the application of VR in other fields is not popular. The reason is that VR technology itself is not very popular, and the technology is not very mature, the main thing is not to understand what advantages VR can bring to the

field, and what problems can be solved. VR is a tool-based and highly inclusive technology, specifically, VR and computers are important tools to help solve problems and improve productivity, while VR, like computers, is an important tool that can help solve problems and improve productivity. At the same time, VR can be used in any field like computers and help solve some existing problems. For example, VR devices can be used in the design field to help designers better present their design ideas while allowing clients to see the results more visually, and VR devices can also be used in various fields such as healthcare and business and are not limited to the entertainment and social fields. Therefore, VR can also be used in the field of education to solve the current educational problems.

VR can be a good way to help solve the problem of uneven distribution of educational resources that currently exist in China's education system. Specifically, students can use VR devices to access a virtual classroom created by a computer and attend classes in the virtual classroom. And because of the characteristics of VR devices, students can access the virtual classroom to learn at anytime, anywhere.

At the same time, because of the immersive experience of VR can provide users, that is, students, with an immersive feeling when learning, and this immersive feeling is not comparable to the existing 2D online live classes.

One of the reasons for the unequal distribution of educational resources in China is the disparity in family income, which means that children from low-income families cannot attend the same expensive offline tutoring classes as children from high-income families. Although there are currently online tutoring classes that are relatively cheap or can be paid by low-income families for students to choose, the effect of online courses is not as significant as that of offline courses because of the disadvantages of traditional technology. For example, online courses are not as attractive to students as offline courses, which means that students who receive online courses are not able to focus on the class, teachers are not able to take care of all students, and communication between students and teachers is hindered by the fact that they are online; at the same time, not all online courses are real-time, most of the online courses are still in the form of recording, which not only lacks interactivity, but also exacerbates the problem of students' inability to fully focus and communication barriers. VR technology can be a good solution to this problem, VR technology can provide students with an immersive experience, as if students are really in the classroom, so students using VR equipment online after-school tutoring classes compared to the use of traditional technology online tutoring classes, not only to improve the attention of students, but also to enhance the interaction between students and teachers, as the real offline classroom Learning as well as teaching, in simple terms, is to virtualize the offline classroom and present it to the student's face in a virtual reality way. At the same time, the price of VR devices and computer prices are basically the same, and there are many VR devices than the price of computer equipment is lower, which means that children of low-income families also have the opportunity to participate in better after-school tutoring classes.

However, this is not the only way that VR can solve the problem of educational resource distribution. Most importantly, VR devices can largely solve the problem of uneven distribution of educational resources caused by geography. As mentioned

above, because of geographical differences, the distribution of educational resources in different cities in China is very uneven due to different economic conditions, which directly leads to students in low-income areas not enjoying the same educational resources as those in high-income areas.

VR, like online classes, allows students in different areas to have access to better teachers, and because there is no substitute for the immersive experience of VR online classes compared to traditional media online classes, students can also gain more from VR virtual classes. In addition, as mentioned above, the economic situation in some remote areas of China is not very good, and there is a big gap with the cities, which means that these areas do not invest much money in education, and schools in these areas will not buy a lot of teaching equipment. Therefore, in these areas, students in many schools lack practical experience, the classroom is not interesting, and the only way for students to acquire knowledge in school is through books. VR devices can replace these teaching devices, such as experimental equipment for subjects like biochemistry and physics. Specifically, students can access virtual labs by using VR devices and experiment with virtual lab equipment in virtual labs, which allows students to better understand the knowledge in books through experiments and effectively compensates for the uneven distribution of educational resources due to geographical economic differences.

Although, as mentioned above, metaverse and VR technology can theoretically solve the problem of inequality in Chinese education, it is still doubtful whether metaverse and VR technology can really solve the problem of inequality if they are really applied in the field of education in China, first of all, metaverse and VR technology are not very mature, and currently, they don't provide a fully immersive experience. Therefore, even if students use VR technology for online classes, it is likely that they will not have a good experience, and the experience may be the same as that of some traditional online classes, or even worse than that of traditional online classes. In other words, the current metaverse and VR technology cannot provide students with an immersive experience, so using VR for online lectures may not achieve the desired effect, or even reduce students' learning efficiency, resulting in the inability to truly solve the problem of educational inequality. Second, from a certain perspective, applying metaverse and VR technology to the education field not only cannot solve the problem of inequality, but may even exacerbate it. Metaverse and VR devices are still very expensive, for example, according to data, the starting price of oculus issued by Facebook is \$299 (Tencent, 2020) [16]. Therefore, the price of a good VR device is still very expensive for a low-income family and using a bad VR device will not allow students to feel the immersive experience. Therefore, the use of VR and metaverse in education not only fails to improve the problem of educational inequality caused by family economic status, but even exacerbates it. This is because high-income families can buy VR devices for their children, while for low-income families, buying VR devices is not a very good option. It can even lead to other problems, for example, because some children from high-income families have VR devices and can use them for classes, which can make some students without VR devices jealous and therefore affect the students' mindset causing psychological problems.

Finally, in today's society, VR technology and metaverse technology are very new to the general public, and it is very difficult for most people to accept new things, and not all families are willing to use VR devices for their children to attend classes. At the same time, because VR devices and metaverse are inextricably linked to games, parents may think that VR devices will make their children addicted to games. Therefore, it is still difficult to popularize the use of VR technology and metaverse in the field of education.

5 Conclusions

Overall, the metaverse and VR is a revolutionary technology in human history, and the attention has gradually become higher in recent years, and it seems that more and more companies are getting involved in the metaverse field. These companies. Whether these companies develop metaverse-related equipment or use 3-D technology engines to build a virtual platform for the metaverse, they are not widely used in some fields. In other words, because metaverse and VR are still widely used in the field of games, in other areas are basically rarely used or mentioned, so our lives are not improved or changed by the vigorous development of metaverse and VR technology.

The possibility and feasibility of using metaverse and VR devices in other fields have been proven to exist and can solve some of the pain points that currently exist in some fields. For example, in the field of education in today 's Chinese society, the problem of education inequality caused by family economic status is very serious, although there are a series of national policies to help students to solve this problem to a certain extent, but students of the same age still cannot get the same educational resources for other reasons. As we all know, education is very important for any country and region, so the problem of how to further solve the inequality in education still exists.

According to the characteristics of metaverse and VR technology, the application of metaverse and VR technology in the field of education can effectively alleviate the problem of educational inequality. Although, at present, the characteristics of metaverse and VR technology cannot perfectly achieve the expected effect due to the limitation of technology development, which cannot perfectly solve the current education problem in Chinese society or may aggravate the problem of inequality.

But all in all, metaverse and VR technology are still in the process of development. This paper has demonstrated the possibility of using metaverse and VR technology in education to improve the current pain points of education in China. Therefore, with the progress of science and technology and the development of the times, metaverse and VR can be used in education to improve the problem of educational inequality.

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