A Study of Online Learning Context Optimization Strategies under the Metaverse Perspective

【**Abstract**】The development of online learning depends on the development and progress of Internet technology. Meanwhile, metaverse is considered to be a new generation of the Internet that will drive a new iteration of the Internet era. Integrating the metaverse concept into online learning will surely bring a profound revolution to the latter. In 2020, with the outbreak of the epidemic, online learning has become an important learning method for the majority of students studying in universities. However, the effectiveness of online learning is highly concerned and questioned. This study elaborates the connotation and spatial characteristics of metaverse technology, relies on its features and advantages, makes a specific analysis of the inner logic of metaverse integration into online learning, and creates an embodied learning context, immersive learning context, and interactive learning context for online learning according to the current situation of students' online learning, and proposes metaverse online learning context optimization strategies in terms of both classroom teaching optimization and policy optimization, with a view to improving students' online learning effectiveness.

【**Keywords**】 Metaverse·Learning context·Optimization strategy

1. Introduction

"The emergence of the third generation of immersive Internet, in addition to making everything connected, also allows people to have a more realistic environmental experience, and makes immersive 3rd generation online education becomes possible." [1] In the face of current two-dimensional network technology, the human-computer interaction of online learning can no longer support the social needs of students who want to be "face-to-face". Traditional online learning does not allow students to enter a certain context for learning and it is difficult to get a good sense of learning experience and presence, especially in the courses such as operational, experiential, and activity-based courses, on the one hand, teachers especially need context to conduct teaching activities, and on the other hand, students get a better learning experience through an immersive learning environment. Therefore, finding an innovative point to promote the upgrading of online education is a hot topic of concern for universities and even the whole society.

Contextual learning theory holds that "knowledge is the product of the learner's active construction based on a specific context and interaction with the context, and is a process of cultural adaptation." [3] Metaverse-based online learning relies on supporting technologies such as artificial intelligence, VR/AR/MR, digital twin, and blockchain, which can reconstruct the online virtual environment and create a new online learning environment that integrates reality and reality, and the immersive experience of learners online is further enhanced. Although metaverse-based online learning is still in the exploration stage, it is coming to us as a new trend of development.

2. Literature Review

2.1 Metaverse

The concept of "metaverse" has been widely discussed, and there is still no relatively uniform definition. It is also known as "mirror world" and "imaginary space", which first originated from the science fiction novel *Avalanche* published in 1992. From the literal meaning of the word "meta-universe", “Meta” means beyond or super, and it also means a higher, transcendent state; "Universe" means world and space, and indicates a comprehensive and extensive existence. This means that the "meta-universe" is a new type of world beyond the real world and in a higher dimension.

With the extensive academic concerns, the concept of metaverse has been constantly mentioned, such as: Metaverse is a virtual world that is parallel to and interacts with the real world, which is actually the third generation of Internet after PC (computer) Internet and mobile Internet (Nie Huihua et al. 2021). Metaverse, a kind of virtual world that starts from a game platform, is based on digital currency, and is supported by a series of aggregated digital technologies and hardware technologies (Yuan Yuan et al. 2022). Metaverse is the inevitable trend of social informatization and virtualization, the ultimate stage of the development of the Internet, the motive force of the universe is the function of the Internet center from information to people, the transfer drives the development of media technology, aims to bring a comprehensive change to human society and shape a new social form in the future (Fang Lingzhi et al. 2021).

The understanding of scholars both home and abroad on the metaverse can refer to an immersive experience integration form of Internet elements based on the Internet, information technology, virtual simulation technology, digital technology and so on. That is, everyone and everything in the real world can be projected into a virtual world, where you can do anything as in the real world. It links virtual and reality, enriches human perception through technical means, enhances all kinds of human experiences, and extends human creativity and more possibilities. Metaverse is a way or field of human social life in the future, therefore, as one of the scenes of our social life, education will also usher in new opportunities for the development of education metaverse. With the popularity of new information infrastructure such as cloud computing, big data, blockchain, artificial intelligence and 5G communication technology, the Internet of Things, brain-computer interface, virtual reality (VR), augmented reality (AR), mixed reality (MR) and their wearable devices continue to explore and develop, virtual and reality accelerate the penetration and integration, making the education metaverse possible.

2.2 Connotative characteristics of the metaverse

2.2.1 Process virtualization

Metaverse is essentially a process of virtualization and digitization of the real world, which requires a lot of transformation of its own content production, economic system, user experience and content of the physical world, and this process may takes some time. Virtualization is to provide immersive experience based on technologies such as virtual reality and augmented reality, to generate a mirror image of the real world based on digital twin technology, to build a social and economic system based

on blockchain technology, and finally to achieve close integration between the virtual world and the real world in terms of economic system, social system and identity system.

2.2.2 Morphological spatialization

Metaverse is integrated, linked and created by using various scientific and technological means, forming a virtual world that maps and interacts with the real world. Although it is a new type of virtual social living space, it has the basic characteristics of ordinary space. When facing a new space constructed by technology, people can realize the interaction of two heterogeneous spaces through relevant interfaces, which is the same principle as ordinary space interaction; at the same time, the principle of virtual reality and augmented reality is immersion, and it is considered to be the most important feature of space. So, the emphasis on morphological spatialization promotes the possibility of metaverse application in various scenarios.

2.2.3 Virtual reality convergence

According to the basic principle of metaverse, the final result of the development of metaverse is to create a virtual space which is integrated with the real space, and this virtual one is not simply a parallel relationship with the real one, but a relationship of intersection and integration. On the one hand, the two should promote each other and make more intersections, on the other hand, in order to achieve the integration and symbiosis of the two, that is, virtual space is no longer simply a copy of the elements of real space, but to create more spatial elements with more scenes and life elements that are not available in reality.

2.3 Current Studies

Research by foreign scholars on the metaverse in education, teaching, and online learning has focused on exploring the impact on three areas: teaching methods, educational philosophy and multilingual learning. The application of metaverse on teaching and learning is a way to enhance classroom teaching and learning, and is particularly effective for continuous assessment of teaching and learning (Masferrer, et al. 2014). Introducing a blink system for students' avatars in the virtual learning course of the metaverse, which can effectively analyze students' responses by recording the number of blinks, and then evaluate students' learning effectiveness (Barr, etc, 2015). The application of metaverse augmented reality technology in teaching and learning can improve students' learning performance (Reyes, 2020). Metaverse is effective as an assessment tool in the bachelor's degree examination (Alvaro-Farfan, et al. 2020). By extending real-world learning tasks to the virtual world, metaverse builds learning models that can fill the gap in education the lack of consistency in describing the whole learning process (Ariyadewa, et al. 2010). Metaverse is an innovative pedagogical tool that brings new ideas to the field of education (Mascitti, et al, 2011). A hybrid education concept based on metaverse is proposed, involving radiation, nuclear safety education and science, technology, engineering and mathematics education (STEM education) (Kanematsu, etc, 2014). In terms of the impact of metaverse on multilingual learning, scholars have argued that

metaverse provides a multilingual learning environment and enhances multilingual learning (Kanematsu, et al. 2010; Nakahira, et al. 2010; Farjami, et al. 2011).

Domestic scholars focus on the characteristics of educational metaverse, educational metaverse online classroom design and educational metaverse optimization path. Some scholars point out that, educational metaverse means that "As the participants or organizers of teaching activities, teachers, students and administrators create and participate in teaching activities independently by immersing themselves in the educational metaverse, and naturally respond to the teaching behaviors in the virtual and real worlds, break through the constraints of physical laws and geographical space in the teaching process, and realize the two-way transmission of information in both worlds." Its features include the immersive supertemporality, human-centered interactivity, integrating education and entertainment into one, and Personalization.

From the perspective of technology application, some researchers regard metaverse as a collection of various new Internet technologies such as blockchain and cloud computing [2], and take educational metaverse as a vertical application of metaverse technology in the field of education, a virtual-reality fusion educational environment shaped by new technologies, which has the characteristics of comprehensive interacting of virtual and reality, comprehensive collaboration of human and machine, and comprehensive linkage of school and society in terms of application scope. From the perspective of degree of technology application, virtual reproduction, virtual simulation, virtual and real fusion, and virtual and real linkage are presented from low to high. For the classroom design and optimization path of metaverse teaching, some scholars believe that it is necessary to start from three aspects: teaching objectives and contents, teaching means and forms, and teaching measurement, specifically in the multiplicity of learning objectives, individual choice of learning content, free switching of learning methods and multidimensional measurement of learning effects. In order to give full play to the respective advantages and avoid the limitations of online and offline teaching, researchers will strategically organize online and offline teaching activities to achieve teaching objectives with different focuses (Yu, et al., 2022). Metaverse technology will empower classroom teaching from network fluency, information connectivity, data reliability, interaction convenience, knowledge vividness and teaching intelligence (Song, et al. 2022).

2.4 Theoretical Basis

The learning context mainly refers to the atmosphere and environment constituted by the various factors (people, objects, places, places, etc.) that influence learning and their relationships with each other in the cognitive process of learning. Context-based learning is a contemporary cognitive theory that "assumes that knowledge and behavior are inseparable and that all knowledge is situated in activities that are connected to the social, cultural, and physical environment. Therefore, the metaverse perspective of online learning context emphasizes that knowledge and action are interactive and knowledge is contextualized in learning, which is the theoretical basis for creating the metaverse online learning context.

2.4.1 Embodied cognitive theory

The origin of embodied cognitive theory is the concept "life is education" and "learning by doing" put forward by John Dewey, a famous American educator. He believed that knowledge is experience, and that this experience is the "engagement" with one's environment, and learning requires contact with society and nature. Therefore, he believed that schools should emphasize students' inquiry activities and that the process of inquiry is the process by which experience occurs [7]. In the 1980s, David Kolb, an American social psychologist and educator, proposed an Experiential Learning Circle based on Dewey's "learning by doing", he argued that teachers should focus on engaging students in the process rather than emphasizing the outcome of their learning in order to maximize the improvement of students' learning styles [8]. Embodied cognitive theory is a learning theory developed on the basis of the traditional cognitive view, which is a further refinement and enhancement of the traditional cognitive view. On the one hand, this theory emphasizes that physical experience and mental state are two inseparable factors that have synergistic effects in the process of cognitive formation and development, so that human cognitive formation is the result of the interaction between the brain, the body and the environment in which it is located. On the other hand, it is believed that the body is not simply an object, but a natural subject, an important means of relating to the world. In *Embodied Mind: Cognitive Science and Human Experience*, F. Varela emphasize that perception and motor processes, perception and behavior are inherently inseparable from cognition, and that embodiment "includes not only the body as a living, experiential structure, but also the environment or context in which the body acts as a cognitive mechanism."[9] Therefore, online learning based on embodied cognition theory requires the creation of more cognitive contexts and diverse sensory stimuli, especially the role of embodied cognition should be given full play.

Contextual learning is an environment that provides learners with hands-on participation in the learning process, which is particularly meaningful and valuable for experiential learning, contextual learning, and activity-based learning currently promoted by major universities. However, although today's online learning shows some flexibility in terms of time or location, it is still mainly based on listening to the instructor's lectures, and it is difficult for learners' physical senses to participate in learning, making many online learning activities ineffective and unsustainable. In the online learning context created by the metaverse, learners can participate in learning either as a real person or as an "avatar", and they can also communicate with other learners. According to the concept of metaverse, this "avatar" is integrated with the real learner, so the learning can be mapped to the learning of the real learner, and the experience of the "avatar" also affects the cognition of the real person; the cognition of the real person in turn affects the behavior of the "avatar" and creates a strong sense of presence. This "avatar" represents the digital identity of the learner, creating the conditions and possibilities for the learner to participate in online learning in person, and can effectively promote the learner's knowledge.

2.4.2 Immersion theory

Immersion theory, also known as flow theory, is a theory in the field of psychology that describes a mental state, pioneered by the American psychologist Mihaly Csikszent-mihalyi, who argued that immersion is used to describe a mental state in which a person is fully engaged in some activity, unaffected by other factors in the surrounding environment, and achieves a state of extreme pleasure. Early immersion

theories suggested that the main factors affecting immersion were "challenge" and "skill". On the one hand, when the challenge is too tough, for example, the environment is more complex and the method is more difficult, people will lose control and mastery of the environment or the method because their skills are not up to par, and they are prone to psychological anxiety, tension and even frustration. On the other hand, when the challenge is simple, people are dismissive of the challenge and become bored due to too much control. Thus, immersion theory suggests that "the state of immersion occurs only when the challenge is moderately difficult. "[13] Using immersion theory to explain various social life issues can help to enhance the effect, for example, theater can "interpret the script through people or objects, silent or audible, and use film and television language and audiovisual effects to create scenes of emotional immersion and engagement."[14]

With the development of computer science and technology, immersion theory is the discussion of human-computer interaction, especially in the theoretical study of metaverse, which takes immersion as the main feature of metaverse learning. Some studies point out that, based on the development of various technologies such as intelligent technology, the learning scenario presented by the metaverse is more realistic than the previous virtual space, making it more active, exploratory, interactive and immersive, achieving a superior sensory experience and a more immersive experience in the digital field [15]. Therefore, the immersion learning context based on immersion theory is to provides learners with a deep involvement of body and mind in learning, which reflects the depth of the learner's presence in the learning environment and is a state of continuous physical and mental engagement and even emotional sublimation. Although the popularity of online learning is relatively high now, it is an indisputable fact that the attractiveness is not strong and the learners' participation is not deep. This is especially prominent in the online learning of practical courses in epidemic situations, mainly because the online learning environment does not match enough with students' learning habits, learning abilities and learning contents.

The online learning environment in the metaverse perspective is different from the ordinary online environment. On the one hand, it should have good display technology as support, such as 3D display technology for ray tracing, rendering and other effects; on the other hand, the metaverse space under the new technical support has a higher degree of realism, and the bridging of the virtual world and the real world makes the sensory experience in the metaverse online learning environment further enhanced, which is conducive to the learners' full dedication to learning. Under the metaverse online contextual rendering, the learners' sensory system is greatly mobilized, and learners are more easily "engaged" and "involved". In short, strengthening the iteration of metaverse scenario-based learning needs to rely on the continuous progress of technology, breaking some of the original limitations of scenario-based learning, no longer staying in the multimedia broadcast, text interaction, etc., so that to achieve "learners and teachers can perceive the real experience whether in virtual scenarios or real scenarios, so that the learners' sensory perceptual system can be fully stimulated and mobilized. " [16]

2.4.3 Contextual learning theory

Contextual learning theory asserts that "learners' learning is a social interaction process, and the knowledge and skills learned are acquired during the interaction between the learner and the context" [19]. This theory explains the position and role

of interaction in contextual learning, arguing that "interaction is also an important basis for deep learning, and context is a key element of deep learning in which learners use the interaction of activities and contexts to acquire knowledge while becoming members of a community in which they gradually adapt and progress." Since the advent of online learning, interaction methods have been enhanced with the development of technology, but they are mainly limited to voice, text, and video interactions, which are not as effective as they could be. Whether it is face-to-face classroom teaching or online teaching, communication and interaction is one of the important purposes for learners to participate in learning, however, most online interactions are difficult to be attractive at this stage. metaverse brings learners a space that integrates virtual and real. According to its definition and characteristics, online learning under metaverse will break the so-called 'virtual' and 'reality' barriers in the current era, eliminate the concept of 'online' and 'offline', and finally dissolve the boundary, infinite expansion and constant dynamics."Thus, the metaverse brings about a blurring of the boundaries of the learning space, and interaction is no longer limited to sound, text and video, but is all-encompassing, thus providing a new way of interaction for online learning, and increasingly tends to be live and real, heralding a fundamental change in the way online learning interacts.

Interactive learning contexts are learning environments that provide communication and interaction for learning participants, where interaction is the main way in which any learning occurs and develops. Interaction is the core viewpoint of contextual learning theory, which is "the essence of learning is the process of individual participation in practice, interaction with others and the environment, and the process of forming the ability to participate in practical activities and improving socialization." In the Internet era, interaction has become a learning strategy, and in the virtual learning context, "learners get more opportunities to communicate and cooperate with teachers and peers, which helps to maintain positive emotional experiences and strengthen emotional and communal perceptions in learning, which in turn motivates learners to adopt deep learning strategies. "[21]

3. Metaverse integrated into online learning

3.1 The inner logic of metaverse integrated into online learning

3.1.1 The learning style supported by metaverse online learning

The online learning contexts created under the metaverse are capable of embodied, immersive, and interactive learning, and the connotations of these contexts have fundamentally changed compared to traditional learning contexts. The fundamental reason is that the internal logic of the metaverse has changed. Learning first began with books and classrooms, and since the advent of Internet technology there have been new ways of learning. Web-based learning has brought about the first change in the way students learn. Internet learning provides a new carrier and space for people to learn, especially the development of multimedia, provided us not only with text, but also video, audio, etc., which greatly enhances the effect of people's learning. With the emergence of mobile Internet, mobile learning makes learning ubiquitous, breaking the traditional boundaries of time and place and allowing students to learn all the time. Fragmented learning has once again changed the ecology of learning and brought revolutionary changes to learning. However, both changes in learning styles

are perceived from the outside, and the learner remains separated from the actual scene. With the help of the Internet, artificial intelligence and other technical means, metaverse tries to make learning move from the "outside" to the "inside" of the scene, that is, to perceive and construct knowledge from the inside, and to realize a kind of immersive learning, thus completely changing the way of perceiving online learning and the way of perceiving knowledge. Metaverse will bring a new revolution to the Internet, so the impact of online learning based on the metaverse will be revolutionary to the learning sector.

3.1.2 The learning carriers supported by metaverse online learning

With the changes brought by the third generation of the Internet to online learning, the online learning space has also undergone qualitative changes. Changes in various factors in the online learning space significantly affect people's cognition of learning knowledge. In the first and second generation Internet era, learning focuses on cyberspace and physical space, which is often called concepts such as "online learning and offline learning" and "online learning and face to face learning", and these concepts emphasize the clear binary relationship of physical connection. Metaverse creates an integrated learning space for online learning. The concept of "virtual space and real space" based on the metaverse emphasizes the coexistence of virtual and reality, the integration of virtual and reality, which brings about a sense of immersion that blurs the boundaries of specific physical spaces such as class, classrooms, and schools, and at the same time is destined to bring about the breaking of local barriers, thus realizing the integration with virtual space. In other words, the metaverse-based online learning space tends to be more of an integrated space with a integrate of virtual and reality; on the other hand, in the first and second generations of the Internet era, Web 2.0-based online learning presents a two-dimensional network structure, and the basic means of reading are computers, tablets, cell phones and other flat devices, so online learning is mainly based on a flat interface, so the sense of presence and the sense of immersion in learning is particularly insufficient. Metaverse uses the Internet, VR/AR/MR and other technologies to show learners a three-dimensional space, and learners can "enter" this three-dimensional space with their virtual bodies to learn, all the experience is completely different from the flat one, and the whole learning is immersive. With the development of technology, this three-dimensional structure will be further enhanced, and the experience will be further enhanced.

3.1.3 The learning motivation supported by metaverse online learning

Online learning supported by metaverse is a digital learning ecology built on advanced digital technology, integrating artificial intelligence, big data, cloud computing and a new generation of communication technology to become an intelligent learning field that integrates reality and imagination. Therefore, metaverse builds a wisdom learning system that integrates the latest human science and technology, which is conducive to the improvement of learners' information literacy and has the mechanism of empowering knowledge cognition and wisdom learning. On the one hand, metaverse integrates modern technology to form a wisdom learning scene with deep integration of virtual and reality. Compared with traditional online learning, metaverse is based on the digitization of identity, which extends the flat interaction of points and lines to three-dimensional, multi-dimensional and real-time

spatial interaction, and is a complete learning ecosystem where people can spontaneously build social relationships and social interaction and communication, and learn, exchange and discuss with peers, thus creating new knowledge content. On the other hand, virtual learning scenarios are constructed based on real-world scenarios, objects and communication forms, indicating that they support learners to apply intelligent learning methods for autonomous learning and learning creation. According to the basic principle of metaverse, the virtual learning environment can simulate the dynamic evolution law of natural phenomena and their formation process, for learners to perceive and understand in the form of virtual body, with visual, auditory, tactile, olfactory and other sensory channels, and carry out independent exploration and group cooperation; at the same time, metaverse can provide immersive learning scenarios, including reconstructing the real world through digital twin technology, or using the form of "VR + live broadcast" to display the collections, works or related activities of exhibition halls, museums, science and technology museums and other institutions, and generate three-dimensional maps of the real world through various technologies. Therefore, the metaverse-based learning scenario is full of sparks of wisdom, and also promotes the integration of various learning styles, providing a full-space learning option that can promote the development of the integration of online and offline learning, and the combination and integration of real and virtual learning, thus highlighting the learning ecology of the deep integration of various learning styles. In the context of strengthening the student-centered concept, promoting the deep integration of information technology and learning courses, and promoting lifelong learning for all, the formation of this learning ecology in the metaverse is what matters most.

3.2 The characters of metaverse integrated into online learning

3.2.1 Hyper-temporality

Metaverse is integrated into online learning, and the teaching scenario it builds can break through the physical limitations of time and space and has the characteristics of hyper-temporality. New digital technologies such as digital twin build real teaching scenarios to give students an immersive learning environment and teachers an immersive teaching environment. Specifically, hyper-temporality is expressed in the fact that students' virtual bodies can travel thousands of miles to virtually places of interest, natural scenery, the boundless universe, or to a certain exhibition, museum, or memorial, etc. Students can also be present in representative historical periods and scenes, and learn about the historical context and content of the subject as a "witness".

3.2.2 Strong interactivity

The important marker that distinguishes online learning under the metaverse perspective from traditional online teaching models is its strong interactivity. Interactivity refers not only to the interaction between teachers and students, interaction among students, but also the interaction between teachers-students, teaching situations and virtual teaching aids, as well as the interaction between constant switching of identities. For example, in a virtual reality learning context, students can learn in a relaxed and entertaining way. Students can come into the learning context by VR games, and learning via playing, meanwhile, teachers can

design a complete set of promotion and ranking system, so that students will spontaneously increase their motivation and participation in learning.

3.2.3 Superior personalization

The personalized characteristics of the online learning context under the metaverse perspective are manifested in the individual choice of learning content, the multiple mastery of learning objectives, the free switching of learning methods and the multidimensional measurement of learning evaluation. metaverse online learning emphasizes personalized learning. Students' personality characteristics, learning conditions, learning interests and development all have obvious personalized characteristics. Based on this, students' learning subjects, learning pace and learning elements in learning situations can be flexibly adjusted and freely switched to conform to students' learning growth trajectory to the greatest extent.

4. Metaverse Online Learning Context Optimization Strategies

Metaverse-based online learning tries to create a space where virtual and reality merge, so that learners, learning contents and learning places are all in this space, and learning activities happen in this space, and all participants take the initiative to create and participate in learning activities, then, learners become the center, thus forming a new kind of learning scenario. The role of the metaverse in learning will be further accentuated as the degree of integration of the metaverse's virtual and real space increases. From the perspective of learning principles, the metaverse provides space and scenarios, which is a different cognitive approach from classroom learning, where context becomes the main channel of cognition and experience becomes the main strategy of cognition. This is important for strengthening the core concept of "learner-centered" and promoting independent learning. In traditional online learning, although there is a convenient online learning space, this space is still a place where learners cannot "enter". The inner logic of online learning supported by the metaverse tells us that the online learning contexts can effectively break through this barrier. In practice, we can try to combine online learning classroom, technical support, and social support to create a better metaverse online learning context.

4.1 Optimization of classroom instruction for metaverse online learning

Teaching process optimization is the organic combination of teaching methods and forms, teaching objectives and contents, and teaching assessment and analysis to improve teaching effectiveness and achieve teaching objectives within limited teaching time, thus improving teaching efficiency.

4.2 Teaching methods and forms

Firstly, as far as teachers' "teaching method" is concerned, metaverse online learning provides teachers with richer forms of teaching presentation. Different from the teaching method commonly used in traditional teaching, teachers can call and switch the context of virtual teaching aids freely and the integration of virtual and real, display and lead the teaching activities with the situational teaching method, and create an immersive and lively teaching atmosphere. By introducing game elements

and game scenes, students can spontaneously improve their enthusiasm and participation in learning, and the survival, maze, single answer, challenge, running and jumping sports, and secret room games can be used to improve students' interest in learning.

Secondly, in terms of “learning method” of students’, educational metaverse seeks more diversified learning methods and practical methods for them. Students complete stage tasks, meet pre-determined game victory conditions, search for hidden clues, and other game elements, and are rewarded with points, badges, segments and other markers after passing the level, and eventually passing the task. In this process, the fun of the game stimulates students' learning autonomy, so that students can actively accept and acquire the knowledge and values unconsciously. At the same time, the hyper-temporal characteristics of the metaverse facilitates the students' practice, effectively breaks the limitation of space and time, and forms the hyper-temporal practice. This breaks through the geographical limitation of practice and effectively saves the time and energy of teachers and students. Students can also deepen their understanding and understanding of the learning content through in-depth practice through sensory mobilization.

Thirdly, in terms of teaching form, it deepens the teaching form of multiple subjects and expands the boundaries of teaching form. Its interactive and personalized features allow teachers and students to conduct group teaching, group discussion, and individual tutoring more effectively, bringing into play the leading role of teachers and the main role of students. In addition, students are not only the users of teaching forms, but also can spontaneously apply, organize and create new teaching forms.

4.3 Teaching objectives and contents

Establishing moral values and educating people is the fundamental task of education. Generally speaking, educational objectives are divided into knowledge objectives, skill objectives and emotional objectives. Teachers often tend to focus on knowledge objectives over skill and affective objectives when implementing teaching objectives. The reason is that skill objectives are often limited by space constraints, making it difficult for teachers to organize hands-on activities for students. In this regard, the online teaching context created by metaverse can enhance the sense of immersion of teachers and students when practicing through virtual practice scenarios, deeply serve the teaching objectives set by teachers, and promote students to reach their skill goals. As far as the teaching content is concerned, the lack of coordination between the study of professional courses and the content of ideological and political education is a dilemma faced by more teachers in recent years. It is usually reflected in two extremes: one is that the key point of ideological and political education is so “light”; the other is that the knowledge points of it "dominate" the overall teaching content, which affects the progress and depth of professional knowledge learning. In either format, addressing the issue of internal coordination of instructional content is key to optimizing online classroom instruction. Combined with the characteristics of the metaverse, its interactivity, hyper-temporal and gameplay make the ideological and political education content achieve the effect of "moistening things silently". Virtual scenes enhance students' sensory immersion experience and drive them to invest more emotionally. For example, students and teachers can immerse themselves in a

documentary on the ocean, so that they can feel the problems of marine litter and human discharges in the ocean, and thus generate thoughts and feelings about them.

4.4 Teaching assessment and analysis

The assessment and analysis of teaching efficiency is an essential part of the whole teaching process, which determines whether the teaching process can achieve the expected teaching objectives, obtain effective feedback and continuously optimization. However, traditional online teaching assessment can only mechanically collect data on students' completion, which features low dimensional data sources, low accuracy and unstable, and cannot automatically perform diversified analysis. The online teaching incorporated by metaverse can be based on big data, blockchain, artificial intelligence and other information infrastructures, collecting and processing assessment data through big data technology, guaranteeing the quality and credibility of assessment data through blockchain technology, and finally realizing the intelligent assessment and analysis of teaching through artificial intelligence technology.

Metaverse can help teachers to conduct intelligent assessment and analysis. It continuously analyzes the teaching process, and obtains an evaluation of learning effectiveness through different stages of assessment quizzes, break-ins and test papers. It not only records students' objective scores, but also covers the whole type of data such as students' expressions, demeanor and behavioral performance in the learning process, all of which can be incorporated into the overall teaching quality assessment in the form of data, allowing teachers to follow up in real time, dynamically grasp students' learning progress, difficulties and emotional attitudes, and deepen the data basis for teaching reform. For example, in the metaverse virtual online learning course, the introduction of a blink assessment system for students' avatars can effectively reflect students' emotional attitudes toward the difficulty of a topic, thus helping teachers analyze students' learning effectiveness and improve the quality of student learning. Based on wearable devices to obtain quantitative data of the five senses (sight, sound, touch, taste and sense). The assessment and analysis of multi-dimensional data enriches the evaluation dimension of students, not oriented to the evaluation of knowledge and skills, but shifting to the evaluation of comprehensive quality, and finally implementing the fundamental task of establishing moral education.

4.5 Policy optimization of metaverse online learning

The development of metaverse integration in online teaching is still in the "embryonic" stage, and there is a lack of cooperative and collaborative strategies based on multiple subjects. Based on this, the strategy of online learning context optimization under the threshold of metaverse can be developed from the following aspects.

4.6 National policy leadership

National policy leadership is the first level of promotion strategy. Metaverse serves the fundamental task of establishing moral education, and optimizing the online learning context under the metaverse perspective is of strategic significance to

efficiently solve the problem of geographical and domain distribution of educational resources. Therefore, it is necessary to play a leading role in policies from the national level to provide basic support for the implementation of educational metaverse applications based on new generation information technologies such as 5G, Internet, artificial intelligence, big data, cloud computing and block chain, and actively promote terminal innovations such as wearable devices and audiovisual devices based on virtual reality. Strengthen the forward-looking research and development of basic capabilities of underlying core technologies, and support the research and development of technologies such as immersive display, real-time interaction, massive connection, huge communication, edge computing, sensing technology, image engine, blockchain, etc. that meet the requirements of metaverse.

4.7 Education industry standards

The industry standard of education management is the second level of promotion strategy. In addition to the state providing policy leadership and financial help based on the development of new generation information technology and terminal innovation, the development of the education metaverse cannot be separated from the education management department's leadership in the construction of industry standards. For example, it formulates the compliance and rationality of the educational resources, teaching environment and teaching platform involved in the metaverse, coordinates the development standards and rules to guarantee the healthy and orderly development of the educational metaverse products, and clarifies the program requirements of the educational metaverse in the teaching implementation link.

4.8 Universities-enterprise cooperation in practice

The cooperation practice between universities and enterprises is the third level of promotion strategy. Educational subjects and enterprises are the subjects of the metaverse in achieving the optimization of the teaching process. They should first understand the significance of the educational metaverse in promoting the optimization of the teaching process, and then start the practice in teaching methods and forms, teaching objectives and contents, and teaching assessment and analysis. The metaverse is the new educational technology tool, not the ultimate goal of education. The development of educational metaverse products follows the principle of implementing the fundamental task of establishing moral education; secondly, the development focus is clearly defined. The optimization of the teaching process should focus on learning efficiency and optimize the teaching effect with less investment of time, energy and money by teachers and students. Therefore, the actual development of educational metaverse products should follow the development process of emphasis and order, and give priority to the development of teaching scenes that are not easy to realize, difficult to obtain and achieve high cost in real scenes. Establish a platform for supporting support and multi-subject participation. For example, the establishment of educational data testing platform based on educational subjects, the establishment of school, enterprise industry multi-party educational data sharing, exchange platform to understand the commonality of the thinking and behavior patterns of student groups, to promote the optimization of the teaching process to provide accurate services.

5. Conclusion

Online teaching is closely related to the development of information technology, and the continuous development of metaverse technology will bring more possibilities for the digitalization process of classroom teaching. Based on the metaverse, through the organic combination of 1) teaching methods and forms, 2) teaching objectives and contents, and 3) teaching assessment and analysis, the teaching effect can be improved and teaching objectives can be reached within the limited teaching time, thus improving teaching efficiency; if further cooperation and collaboration among multiple subjects can be realized through national policy leadership, education industry standards and school-enterprise cooperation practices, the education metaverse will definitely The education metaverse will bring more development to our online teaching.

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