Understanding Online-Merge-Offline Teaching Mode Based on Metaverse

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Abstract: Online-Merge-Offline (OMO) has become an important development trend in the education field. With the support of the Internet, multimedia and other information technologies, the metaverse, as a new concept, has been gradually developed on the basis of virtual reality, artificial intelligence, 5G, cloud computing, big data processing and other technologies. It has immersive experience, cross-scenario interaction, and cross-border data dissemination technology. The construction of the enabled Online-Merge-Offline learning space can integrate the virtual and physical scenes, provide necessary environmental support for the integration of online and offline teaching, and simultaneously meet the teaching and learning needs of teachers and students in the physical world and the virtual world. Therefore, it is necessary to advance the layout of Online-Merge-Offline education of metaverse, promote the education and teaching of metaverse related technologies, and promote the reform of educational methods by using the characteristics of metaverse.

Keyword: Metaverse, Online-Merge-Offline, Teaching Model

1 Introduction

Online education is the general trend of future changes in education. In recent years, visual immersion technologies represented by virtual reality, extended reality, virtual world, and digital twin are constantly reshaping online education [1] from the aspects of learning resources, teaching organization, and system platform. During the period of education stagnation caused by the COVID-19 epidemic, most countries and regions chose online education to ensure the stability and continuity of education [2]. Online education has become an important part of the modern education system, but pure online education is difficult to support students' demand for immersive learning environment and natural human-computer interaction. Although the information age of hybrid education also broke through the single offline teaching closed, fixed space-time teaching method, integration of multi-channel and platform resource advantage has become a more three-dimensional modern teaching mode, but still cannot get rid of Online-Merge-Offline teaching split, remote online education lack of perfect regulatory system, student participation and low self-consciousness. So need to find innovation of singularity to promote the development of online education, metaverse to the present online hybrid teaching mode to realize iterative upgrade, integration of artificial intelligence (AI), extended reality (XR), block chain, cloud computing, digital twin, the

ITEI 2022, December 23-25, Harbin, People's Republic of China

DOI 10.4108/eai.23-12-2022.2329169

development of intelligent technology as an opportunity to [3], activities without boundary, learning experience integration, information service equivalence of online fusion teaching, provide guarantee for personalized teaching [4]. This paper intends to focus on the connotation, design model and design principles of online and offline integrated learning space based on the metaverse, and design the corresponding online and offline integrated teaching modes and strategies, so as to provide ideas for the real implementation of online and offline integrated teaching.

2 Related concept explanation

2.1 Metaverse concepts and features

The Metaverse consists of two parts, the "Meta" and the "Verse". Metaverse is the latest research hotspot in the development of virtual digital space technology at home and abroad. The concept of metaverse was proposed in Avalanche by Neil Stephenson in 1992 [5], aiding to describe "multi-person online virtual world parallel to the real world based on information technology". Therefore, the idea, concept and support technology of the metaverse do not appear suddenly, but are composed of many small universes [6] [7]. In order to allow the virtual avatar to shuttle freely in different cosmic spaces, the metaverse needs to establish a unified operating standard and architecture [8]. Based on the composition characteristics, the meta-universe has the characteristics of identity, friends, immersion, low latency, diversification, anywhere, economic system and civilization. It is a comprehensive platform of "creation + entertainment + display + social networking + transaction" using digital technology [9].

2.2 Construction of Educational Metaverse Space

In 2008, Collins predicted that in the field of higher education, metaverse technology will be applied to enhance students' innovation ability [10]; In 2014, Kanematsu and other scholars tried to realize the method of integrating virtual and real teaching mode in STEM education [11]; The emergence of new education infrastructure provides the guiding basis, material basis and key technologies for the innovation and change of education in the information age. How to improve the quality of Internet educational resources has become a new topic of educational exploration in the new era, and the development of educational information will also enter the critical period of digital transformation. Theoretically, the educational metaverse is an intelligent interactive space integrating teaching and experience [12], With human teachers, virtual digital human teachers and intelligent robot teachers cooperating to teach, students can enter the teaching application scene of the educational metaverse through the infrastructure layer and technology platform layer, allowing students to interact freely in the digital space, a digital space that allows users to physically an immersive, 3D, computer-generated digital twin of the campus. The virtual reality built based on vr / AR technology can realize the deep integration of virtual and reality, which will greatly expand the border of teaching and learning. The traditional campus, classrooms and laboratories will be escorted by the integration of virtual and reality, online and offline. See **Figure 1.**

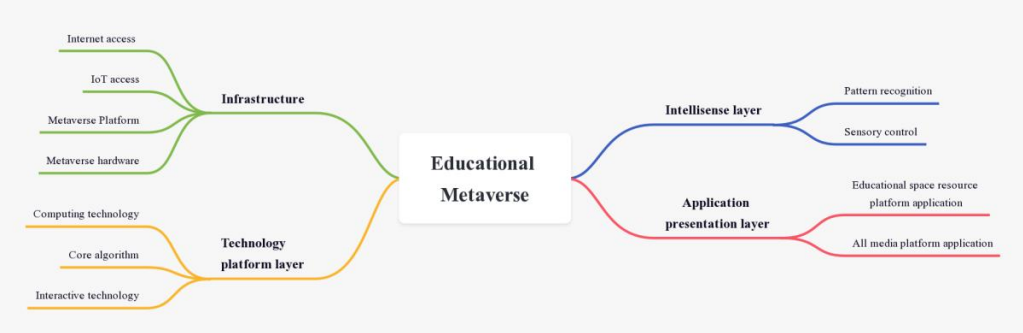

Fig. 1. Architectural Model of the Teaching Metaverse

2.3 Online-Merge-Offline teaching mode

The OMO (Online-Merge-Offline) was originally a business model, originating in the new retail space. In 2017, Kai-fu Lee first put forward the concept of OMO, and believed that the education industry is an important application scenario of the OMO model. With the progress of information technology represented by the Internet and AI technology, it has gradually penetrated into teaching, management, evaluation and other work, so people began to explore how to achieve continuous competition and long-term development based on online and offline teaching mode. Online and offline teaching has its own unique advantages. In order to realize the needs of the society for talent training, one of the keys to using technology to empower online and offline teaching for breakthroughs is to promote the coordinated deployment of online and offline teaching.

3 Metaverse applied to the theoretical construction of OMO teaching

In the future, Metaverse will become the innovative singularity for the upgrading of online education in the era of artificial intelligence. Metaverse will deeply reshape the online and offline course resources and teaching methods, and accelerate the promotion of new infrastructure to build its development foundation [13].

3.1 Connectivity of online and offline embodied cognition

Metaverse's embodied cognition theory is a metaverse built with intelligent technology, which supports learners to devote themselves to cognition and emotion, brings people a panoramic social perception experience, and creates the present effect of the co-existence of virtual and real scenes, especially it provides people with a real social emotional experience and increases their sense of participation. In the space environment of the Metaverse, the digital virtual space restores the elements of the offline physical space as realistically as possible, which is an important prerequisite for the virtual avatar to have an immersive experience during the on-site activities. The lower physical space has a high degree of connectivity. The core of embodied cognition theory is to emphasize the participation of the body in the cognitive process and the embodied interaction between the body and the environment. Therefore, in the

process of cognition formation, attention should be paid to the process of being in the situation, body perception and dynamic interaction. Metaverse Supporting and enabling online education enables learners to be immersed in a broader social and cultural situation, and fully mobilize the physical sensorimotor system to interact with the environmental world, so as to better promote the formation of learners' cognition.

3.2 OMO Diverse virtual spaces for immersive learning

The theory of immersion learning was proposed by Mihaly Csikszentmihalyi et al. It refers to the "immersion state" in which learners participate in an activity. The learning metaverse can provide digital twin worlds and fantasy worlds and other virtual spaces for immersive learning. OMO's educational metaverse can not only support the construction of an immersive learning environment, support learning behaviors in real scenes, but also satisfy some learning situations that cannot be created in real scenes through the virtual simulation learning space, providing learners with a borderless fusion of virtual and real interactive forms of learning environments and the multisensory engagement. OMO learning can bring a multi-angle, situational, gasified learning experience, Through the real sensory experience, the learners can produce a natural learning experience, and effectively improve the learners' knowledge transformation and transfer ability, Comprehensively help the training of innovative talents in the intelligent era.

4 Metaverse Enable the OMO teaching design model

Metaverse The learning scene space created is a virtual parallel world independent of the real world. To explore the teaching mode of OMO, we should first start with the attribute of "person, scene and thing" to clarify the technical support path of each element ， In this paper, the design model of the application of the universe and OMO teaching is developed see **Figure 2**.

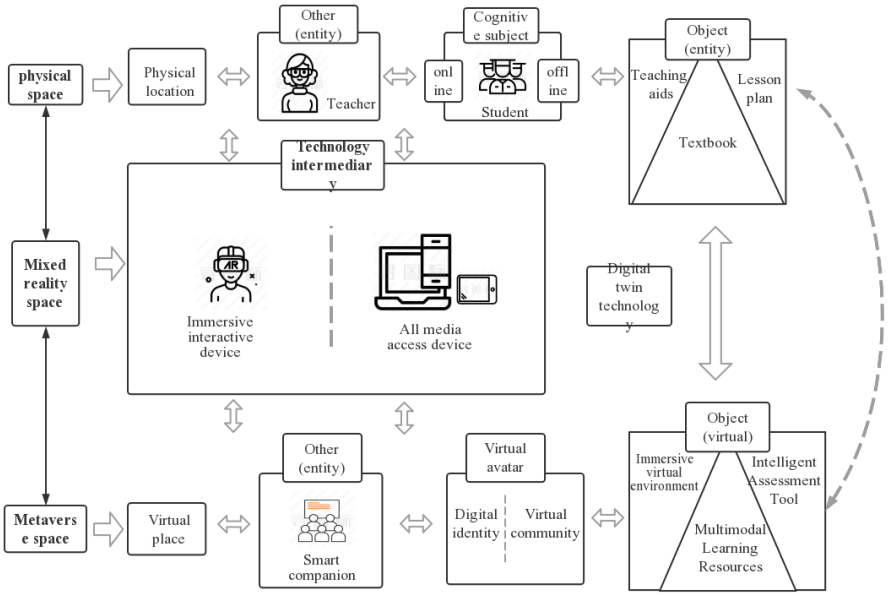

Fig. 2. Construction of the OMO teaching model based on the metaverse

4.1 OMO learning is a kind of activities in which students choose and use virtual technology for learning according to their learning objects in order to complete specific learning goals and tasks, and to realize some parts of the learning process in the real world virtually. Virtual learning belongs to the category of students' subject activities. Based on the OMO learning space, it is necessary to start from the relationship between subjects, places and objects, so as to understand the spatial structure corresponding to the communication degree of object between the subject and the object object, which is easy to transfer and has more universal thinking ability [14]. The objects provided by learning space are divided into physical object and virtual object. Physical object includes teaching materials, teaching tools and other learning resources in various physical space; virtual object includes immersive virtual situation, multi-modal learning and intelligent evaluation tools.

4.2 The creation of the place space includes not only the physical space corresponding to the entity and the metaverse space of the virtual place, but also the mixed reality space corresponding to the physical space and the virtual place. The physical space of the learner includes the infinite object of the real world. The organizational structure of different physical space subjects can be multiple, which can be concentrated together or dispersed [15]. After the construction of physical space, the mixed reality space is used as a technical intermediary, and formal and informal learning is conducted across time and space and structure. In the mixed reality space, learners can choose the way to learn according to the multi-dimensional way. Immersive interactive devices and all-media access devices are the two common forms. Immersive virtual reality implementation way is based on 5G, XR, holographic projection, digital twin new technology fully integrated, break the time and space boundaries, make learners learn field new changes, wearing a special helmet display, data gloves and body parts

tracker, through visual, hearing, touch and smell can be realistic in the virtual scene experience or interaction, provide a borderless immersive experience for learners. The all-media access device is a non-immersive device that combines all media means with computers, tablets, computers, and augmented reality (AR) glasses.

4.3 Metaverse learning space includes three types of individual, local area and public space, and its activity subjects can be divided into virtual avatar and virtual others. Under the action of metaverse field attribute, the virtual community with complex social relations is further formed. Virtualization is a virtual digital identity reflected by technical intervention; the virtual other refers to the artificial intelligence body, such as artificial intelligence teacher and intelligent learning partner. Specifically, it is as follows: when the subject of the physical space experiences the knowledge in the virtual learning space to obtain the real learning experience, in such a situational learning, the students' learning effect is better than the empty teaching in the physical air, so as to effectively improve the learning performance.

5 OMO teaching mode and strategy based on metaverse

5.1 The OMO teaching organization form

Metaverse provides a new path for the realization of online and offline, inside and outside the class, inside and outside the school, and the new classroom. The innovative practice of metaverse technology is the overall goal of course teaching experiment. Relying on the smart campus, smart classroom environment and VR all-in-one terminal, Based on various digital education platform tools such as MetUniverse, using metaverse situational educational resources, VR immersive resources, 3D sand table games and other digital education resources, Build up a diversified teaching environment, multi-modal resources and multi-subject interaction of the yuan-universe classroom, set up the "remote + local" double teacher and "teacher incarnation + physical teacher" virtualization and real double teacher teaching team, Build the course into a thematic, immersive course, carry out various innovative classroom teaching activities such as flipped classroom, situational teaching, project learning, independent inquiry learning, group cooperative learning, collective learning and whole class research, To form a new form of mixed classroom teaching with the integration of virtual and real, physical immersion, independent inquiry, multiple interaction and the combination of theory and reality.

5.2 Metaverse for the OMO teaching mode practice courses

In the teaching activities of OMO, on the one hand, it is necessary to build a comprehensive, whole-scene and whole-process seamless learning environment; on the other hand, it is necessary to create multi-dimensional and zero-time difference learning services to promote accurate, open and shared intelligent learning. See **Figure 3.**

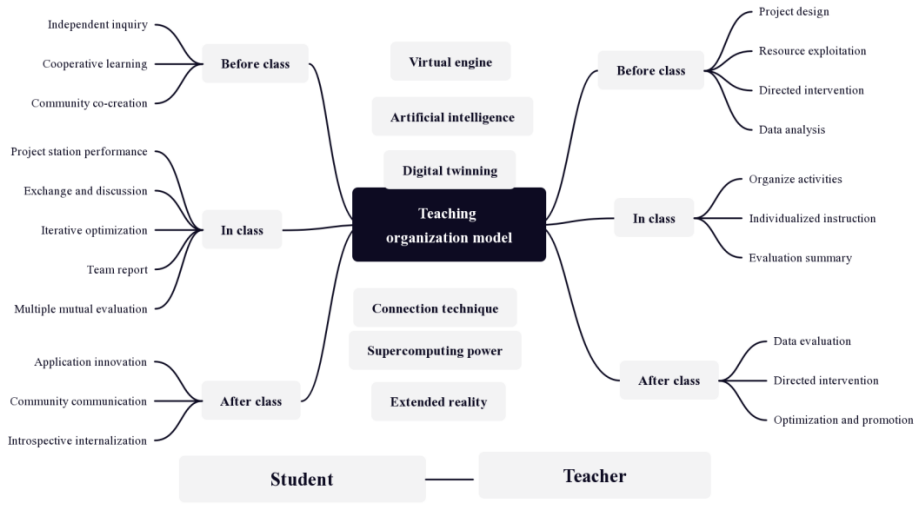

Fig. 3. Based on the metaverse online and offline integrated teaching organization model

Pre-class theme course design. Take the VR courses as an example, first of all, teachers should according to the learning content using thematic teaching form organization curriculum knowledge system, then teachers can develop a variety of learning resources, VR technology and derivatives as a reference point of curriculum and content selection, select VR overview, development, related products, equipment, industry application and key technology of six major theme content, guide students to know the VR technology development, master the technical characteristics of VR system, stimulate the depth of the VR application in many industries. Then the students share the problems and solving experience in the creation process of VR scene works, and carry out learning activities such as independent exploration, cooperative learning or community co-creation。During this period, physical teachers or artificial intelligence teachers can provide guiding intervention at any time to correct the wrong exploration direction and one-sided perceptual cognition for learners. Point out the advantages and disadvantages of each work, which helps students to learn from each other and absorb the design experience.

Diversified teaching practice in the class. The team of teachers and students enter the metaverse virtual situation in the form of virtual avatar, and teach in different roles. Using the combined combination of metaverse xi form and online conference platforms, metaverse technology is deeply integrated to carry out digital teaching innovation practices such as flipped classroom teaching, situational teaching, inquiry learning and collaborative learning. Online teachers explain the key and difficult points in teaching in the teaching link, evaluate the content of tests after class, give lectures based on the actual working ability requirements, emphasize the cultivation of post ability, and on-site tutoring teachers support the interaction between teachers and students in the teaching process. Finally, the teacher adopts the heterogeneous group strategy, taking the study group as the basic unit to conduct the team report and multiple mutual evaluation. By creating a virtual meeting room, they can discuss

the learning tasks, jointly plan and formulate the VR experience exploration plan, clearly find the information, record the discussion content, and summarize the discussion results.

After-school teaching practice. Learners rely on the virtual and real integration and borderless characteristics of OMO learning space, and use technology mediation to share virtual or real practical application scenarios with others in the form of mixed reality or virtual reality. According to the learning situation and prophet, teachers assign inquiry tasks that are relatively consistent with the real post tasks. At the same time, students give guidance in the whole process of inquiry, allowing students to carry out VR inquiry experience in metaverse, and apply professional theoretical knowledge, skills and methods to practical inquiry, so as to improve students' practical ability and professional skills.

6 Conclusion

To sum up, it shows that the new education models represented by "Internet + education" and "artificial intelligence + education" are transforming from the teaching paradigm of knowledge and ability standard to the literacy-based learning paradigm. As the learning style of educational change in the media, OMO provides conditional support for the transformation of the teaching paradigm to the learning paradigm, which is the focus of the current research. Compared with the plane network teaching, metaverse period hybrid teaching on the one hand through digital twin technology in virtual space, virtual classroom supervision through virtual identity, effectively avoids the shortcomings of lack of practice and poor supervision of online classroom; On the other hand, it enables online and offline teaching, gives full play to the advantages of 5G and other network communication to carry out online teaching activities, and realizes the deep integration of cross-platform and cross-media teaching resources. With the application of education as the starting point, the online and offline integration will be used to further promote the digital transformation of education, seize the new track of school development, and lead the school quality improvement and double high construction with education digitalization, so as to provide strong support for the construction of high-quality education and the teaching system and the training of innovative digital talents.

Acknowledgement. This research is gratefully supported by teaching reform topic of Hunan Institute of Humanities, Science and Technology [Grant number: RKJGY2213].

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