

Research on the Innovation of Education form of Education Meta-universe Based on Optimization Theory

Fan Chen^{a,*}, Hongxia Wu^b

Aviation Tourism Department, Sichuan Science and Technology Vocational College, Chengdu, Sichuan,
China

^a825182196@qq.com, ^b929896391@qq.com

*Corresponding author

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Abstract: Development direction of education form: large-scale, digital, virtual, intelligent, personalized. The educational meta-universe breaks through the limitation of time and space, reconstructs the relationship between educational subjects and solves the social problems such as educational equity, which is beneficial to the high-quality development of education. This research adopts the multivariable optimization algorithm, from education to the technical characteristics and learning characteristics, discusses the macro universe education under the yuan for change and innovation education scene, analysis of the micro learners under the perspective of education yuan interaction patterns and practices of quality of the universe in ascension, analyzed the education yuan universe application cases, prove that have good development space.

1. Introduction

The educational meta-universe can break the limitation of time and space, and solve the social problems such as educational equity, educational resources integration, scale and personalized unification, which is a new way of educational development. It is necessary to deeply study the technology and educational basis of the educational meta-universe and fully understand the important role of the educational meta-universe in the future.

Through the deep integration of virtual and real, online and offline, the educational meta-universe drives the transformation of the educational process from organized to self-organized.

Bring new opportunities for teacher development (Zheng Zhong et al., 2022)[1]. The educational meta-universe is conducive to breaking through the time-space limitations of the real world and assisting teachers to flexibly create teaching environments and carry out immersive experiential teaching (Zi Xun Hua et al., 2021)[2]. Liberate teachers from basic and repetitive activities. The educational meta-universe can promote the remodeling of teaching environment, the aggregation of teaching resources, the transformation of teaching methods, the change of teacher-student relationship and the renewal of teachers' professional norms, thus bringing new challenges to teachers' development. As an innovation of education, the educational meta-universe needs proper application, further improvement and improvement.

This study from the perspectives of technology and education and construct and clarify the basic architecture, interaction, and the characteristics of the breakthrough, subjectivity reading education yuan of his creation of the universe and challenges, to explore a new generation of Internet education law of education form, discusses technical humanity, understanding learners interactive environment and practice of education quality, provide reference for the development of education modernization.

2. Teaching the Concept of the Meta-universe

2.1. Educate the Technical Underpinnings of the Meta-universe

The term Metaverse originally came from the concept set in Neil Stephenson's 1992 novel

Avalanche. In the novel, by means of Avatar, anyone in any place in the world can be synchronously connected in real time through Metaverse, a virtual reality universe, and engage in all activities such as work, life, entertainment and leisure. The world runs in parallel with the material world of human beings and develops synchronously and in the same direction.

Based on the relevant technological foundation, the educational meta-universe constructs exclusive virtual images for students and teachers through the vigorous development of virtual technology, and creates digital twin images for real individuals in an immersive world. The core of education is the exploration of human beings (Zuchao Li 2007) [3], and human freedom is the key perspective to create virtual social interaction. Teachers and students can communicate freely and equally in the sea of virtual world, which is the real personality entity of visualization. Attention and construction is an important practice of the educational meta-universe to the humanistic educational concept (Hackl,C.2021.) [4].

2.2. Technology and Education Interact

Both Industry 4.0 in Germany and Society 5.0 in Japan have in common a high degree of integration of virtual space and physical space to achieve cross-domain collaboration and solve the bidirectional balanced development problem between technological progress and social issues.

Interstructuralism argues that technology and society are interdependent. The "structural rigidity" of technology will put forward new requirements on the structure of organizations and society, while the "technological rigidity" of society requires the adjustment of the technology itself and its application (Boczkowski, 2004). To find the best balance between technological development and social problems and explore the path of sustainable development.

Education also faces the problem of coordinated development between technology and society. On the one hand, technology improves learning efficiency, promotes accurate teaching, and helps to build a high-quality education environment. On the other hand, it also brings the issue of educational equity. For example, by squeezing out spare time, exam-oriented education has been packaged with "smart" systems. Technology shapes society.

2.3. Multivariable Optimization Algorithm

It is necessary to analyze objective function in a simple and uniform way. To use simple function to approximate complex function optimally, we need to select the approximate function and study the error.

Definition of optimal approximation: let x_1, x_2, \dots, x_n is n linearly independent members of the inner product space U . Its generating space is M , denoted as: $M = \text{span} \{x_1, x_2, \dots, x_n\}$. $x \in U$. For any element of U , find a set of numbers a_1, a_2, \dots, a_n ,

$$\left\| x - \sum_{i=1}^n a_i^* x_i \right\| \leq \left\| x - \sum_{i=1}^n a_i x_i \right\|$$

Where $\sum_{i=1}^n a_i x_i$ is any element in M . $x_0 = \sum_{i=1}^n a_i^* x_i$ is called the optimal approximation functional in M . The problem of finding the optimal approximation element is the problem of finding the projection. Equations are established according to the projection properties of inner product space:

$$\left(\sum_{i=1}^n a_i^* x_i, x_j \right) = (x, x_j) \quad (j=0, 1, 2, \dots, n)$$

$D_i(i=1, 2, 3, \dots, n)$ is to replace the element in the i th column of the determinant of the coefficient with the constant term of the system, so the above equation can be solved. Thus the best approximation element of X in M can be found. In particular, when x_1, x_2, \dots, x_n is the canonical orthogonal system, then simplified to $a_i^* = (x, x_i)$, and It is called the generalized Fourier coefficients of X .

2.4. The Transfer of Knowledge in the Education Meta-universe

Different from the real world in which knowledge is transmitted through books and languages, in the educational metauniverse, knowledge can be fixed and transferred through technology forms such as non-fungible tokens (NFT) and blockchain. NFT technology can save and transfer abstract intellectual property such as subject knowledge and teaching courseware in education in the form of blockchain, which improves the protection level of educational copyright.

In yuan in the digital world of the universe, all the activities of the learners to record in the form of data, through the big data support and the help of artificial intelligence algorithm, on the road of learning guidance, learning methods and learning attitude, for learners learning activities and study direction in the universe in education yuan for decision support. Data has become today's most important asset for tech companies evaluating users.

2.5. The Content is a Real Interaction with the Mirror Subject

The educational metaverse not only contains the physical interaction between teachers and students in the traditional classroom, but also the interaction between virtual and virtual. In learning, there is not only interaction with virtual teachers, but also interaction with virtual classmates, and interaction with virtual environment.

The educational meta-universe can complete the simulation of learning environment different from the real world, and the corresponding knowledge can be perceived by learners in visual, auditory and even tactile ways, so as to achieve unprecedented immersive interactive experience of the environment. Knowledge can be discovered through learners' own exploration, which can get rid of "indoctrination" teaching, improve their curiosity and inquiry ability, and establish their own knowledge system.

Based on the above analysis, the framework of the educational metauniverse is mainly composed of technical support, interactive formats and rule design. Compared with the traditional Internet interaction, the education meta-universe provides a more three-dimensional interaction between teachers and students, which not only enriches the interaction between real subjects, but also may generate two new mapping relationships between real subjects and virtual avatars, and between virtual avatars and virtual avatars.

3. Changes in the Educational Scene

3.1. Immersive Learning

The educational metauniverse based on VR,AR and other simulation technologies can help learners visualize their inner understanding ideas and cognition, project their own learning activities into the virtual twin world, and provide learners with the immersive experience of whole-hearted and self-absorbed use.

People perceive and understand the world through the interaction between the body and the world, or the effect of the body on the objective world [6]. The educational metaverse can not only simulate the real world, but also have the construction imagination beyond the real world. It can create a situational expression beyond the real world, mobilize learners' sensory role in the virtual space, stimulate learners' creative thinking and personalized imagination, and get immersive learning experience.

Learning theory holds that the external environment is conducive to learning, and the metaverse provides the external environment for learners constructed by instructional designers. Whether it is to help students understand the corresponding learning actions, or to construct virtual textbooks to help students understand knowledge, the educational metaverse can provide the appropriate teaching environment for learners.

3.2. Characterized by a Border Breach

The space-time boundary. Compared with the existing virtual reality scenes, the educational metaverse is more deeply social and closely related to the attributes and elements of the real society.

Therefore, the educational metaverse has more extensive and in-depth application scenarios for the breakthrough of the space-time boundary.

Relationship boundaries. The educational metaverse reshapes the relationships among various educational subjects, breaks through the limitations of time, space and organization between subjects, and reshapes the educational activity patterns among relations. The relationship breakthrough in the educational metauniverse is characterized by objectivity, spontaneity and pluralism.

Communication boundaries. Relying on the interaction-centered characteristics, the educational metauniverse has broken through the boundaries of the traditional Internet in spatio-temporal relations and emotional dimensions. The mirror subject can play a substitute and perfect role in physiological and psychological aspects. Speech synthesis, brain-computer interface, brain-brain interface and other technologies can help learners overcome communication barriers at the physiological level.

Emotional boundaries. Emotion is an important factor to support students' learning and growth. The changes of identity and communication in the educational metauniverse help to break through the emotional boundary between educational subjects and promote the continuous improvement of personality of learners in the real world.

3.3. The Teaching Material Characteristics

Textbooks themselves do not simply point to the storage of knowledge and information, but should include the organization of content and its form. In education yuan in the universe, instructional designers have more passing way of teaching knowledge, whether it is implicit in the virtual world to teaching knowledge, or to teaching knowledge, explicit in hearing, touch, or transfer teaching knowledge through virtual social, broke the traditional teaching materials to transmit knowledge from the dimension of single visual feature.

The data of educational meta-universe textbooks are stored in distributed systems or blockchain services to ensure knowledge copyright and data security, and facilitate learners to call and query at any time. In the dissemination of teaching materials, you can also point to point dissemination. In addition, virtualization enables learners to operate devices that would otherwise be inaccessible, such as medical learners performing surgeries far from hospital wards; History learners can travel to any moment in history textbooks and become witnesses of major events in the long history. Physics learners can explore the process of the Big Bang, or even go back a thousand years and do free-fall experiments with Galileo. The educational metaspace provides infinite possibilities for the construction of teaching materials.s.

3.4. Teachers' Characteristics

The teacher of the education metaverse is an individual account, not a specific image, and the image can be set arbitrarily. Based on artificial intelligence and big data technology, the teachers in virtual reality are visualized as cartoon characters to overcome the shortcomings of weak teacher-student interaction in traditional classroom. With the help of instant messages such as audio and video, the virtual teacher-student interaction in new classroom is constructed. In the open-world education meta-universe classroom, the existence of teachers is more to provide the connection between reality and virtual, let learners understand that this is the classroom situation and learning state. The educational metaverse provides different images of teachers for different students. For example, learners can use Hawking's image to discuss the meaning of the universe, Confucius' image to talk about the virtue of being a human being, and Jobs' image to listen to the spirit of innovation. To transcend the identity attribute of teachers in traditional classroom and improve the experience of learners in virtual classroom.

4. Innovation and Challenge

4.1. Virtual new Form of Learning Interaction

Compared with the traditional Internet interaction, the educational meta-universe provides a more three-dimensional way of interaction between teachers and students, which will not only enrich the interaction between real subjects, but also may produce two new types of interaction between real subjects and virtual avatars, virtual avatars and virtual avatars.

Different from the teaching mode in which teachers ask questions and students answer questions in traditional schools and online learning, the meta-universe, with the help of virtual images and real physical interaction, enables learners to directly interact with each other close to reality and lead learners to understand relevant knowledge elements. For example, let medical discussants directly analyze 3D human body structures, and let mechanical discussants directly adjust the parameters of simulated machine tools.

The new communication form of the educational meta-universe greatly improves the understanding ability of learners, gets rid of the analysis under the two-dimensional situation (pattern, plane) in the traditional learning discussion, and promotes the understanding and learning of things to the three-dimensional three-dimensional level. The virtual model is used to support cooperative practice, cooperative inquiry and cooperative understanding, and the ability improvement brought by practical learning is highlighted in the interaction of virtual world.

4.2. Learners Communicate Across Fields

Through the Internet, learners communicate with learners of different races and cultures around the world in the same field. Jia Jiyou et al. built an intelligent language learning environment in the network space, allowing students to freely choose different types of virtual characters for human-computer dialogue, and familiarize themselves with the target language through free dialogue without limited topic or scene dialogue with a given topic. The teaching effect is remarkable. Based on the development of natural language processing technology, the educational metaverse enables real-time translation of virtual characters from different countries and languages, establishes the cornerstone of communication under the virtual universe, and overcomes the communication and understanding deviation caused by the language familiarity of foreign language learners. Education yuan universe provides a free communication space, let learners of different cultures can communicate the same problem of reality, through the virtual field of parallel processing, to remove obstacles of real communication, contain a lot of strange each other learners on the cooperation of no language barrier, bridge structures, unfamiliar to the familiar relationship.

4.3. Learners Collaborate and Create Independently

The unlimited virtual creativity of the education meta-universe and the copyright protection and knowledge recording functions brought by the blockchain give learners the opportunity to create knowledge. Learners are not only the carrier of knowledge dissemination, but also the source of knowledge development. Whether it is interest groups or peer assistance, learners complete the construction of relevant personalized environment in the educational meta-universe, create learning situations different from those fixed by the instructional designers in the meta-universe, and independently build practical learning places by giving play to their subjective initiative. Early research has shown that the virtual building environment enriched and developed the content of the realistic environment, can effectively improve the learners' creativity, such as popular in the world's first person sandbox game "my world", gave the players high degrees of freedom, in the virtual world has attracted global players to participate in individual creation, has been applied in lots of education teaching practice, Arouse students to "explore freely and create infinitely.

4.4. Face the Challenge

The educational meta-universe is the deep integration of many advanced technologies, education and teaching, and social relations. Challenges faced by the educational metasomes, new technology convergence and problems arising in the application field.

(1) Educational data operation and maintenance face greater risks. The educational meta-universe is a comprehensive digital form of human-computer interaction. All kinds of educational data are the basis of teaching implementation, evaluation and decision-making, while the acquisition, application and storage of data are facing risks.

(2) Educational digital copyright is difficult to protect. Standardized educational digital copyright is the premise of knowledge sharing and teaching and research cooperation in the education meta-universe. High-quality resources and high-quality education can only be achieved when digital intellectual property rights of individuals and organizations are well protected.

(3) Equity and equity in education are threatened by capital. As part of the whole social meta-universe, the educational meta-universe involves corresponding economic and social systems, such as money market, capital market and commodity market. Although technology is neutral, capital is profit-seeking, which brings potential risks to capital manipulation education.

(4) Educational value orientation is constrained by algorithms. Educational activities have great influence on the perfection of learners' personality and the formation of their values.

5. Conclusion

In the face of the future education form of educational meta-universe, which has both opportunities and risks, we should still proceed from the perspective of critical reflection, adhere to the realistic orientation, and explore the two-way promotion of education and meta-universe.

The educational meta-universe is not a substitute for the real world, but a reflection, complement and prediction of the real world. Still need to explore the two-way promotion of technology and society.

The educational meta-universe is the product of the development of technology and society. It surpasses the tool property of technology and can empower people and society in a deeper level. We should treat the mutual construction relationship between them correctly.

The educational meta-universe is subject to the constraints and norms of the real society. It is necessary to give full play to people's value judgment and subjective initiative, avoid the potential risks that technology application may bring to educational development, and ensure the correctness and fairness of teaching value orientation.

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