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В. СУНЬ

МЕТОДОЛОГІЧНИЙ ПОТЕНЦІАЛ ВИСОКИХ ТЕХНОЛОГІЙ В ОСВІТІ

Стаття присвячена одному з найактуальніших питань сучасної філософії, а саме – аналізу методології, за допомогою якої технології змінюють освітні простори та освітні моделі. Автор використовує метод філософської рефлексії, спираючись на першоджерела попередніх дослідників цього процесу. починаючи з їхнього концептуального аналізу з метою відстежити розвиток дистанційної освіти, її технологічну

еволюцію.

Результати дослідження показують, що, по-перше, з появою таких концептів, як digital campus, smart campus, цифровий кампус-близнюк і школа метавсесвіту, освітній простір змінюється на метавсесвіт, тобто з розвитком інформаційних технологій Інтернет має тенденцію до постійного оновлення, і зараз він розвивається до Web 3.0, який є синонімом наступної Інтернет-ери, і саме вона, на думку автора, і сприяє формуванню метавсесвіту. Автор також підкреслює наступне: трансформація мислення окремих людей (викликана наукою та високими технологіями), які працюють за нових умов, впливає прямо і побічно на зміни у характері мислення широких верств суспільства з метою адаптуватися до величезних за масштабом охоплення трансформацій у евристичній сфері. У цій ситуації вищі навчальні заклади встановлюють нові моделі навчальних програм, вводячи новий лексикон (як запас нових слів, висловлювань), в багажі якого такі поняття, як змішане навчання, перевернутий клас, віртуальне навчання, розумна класна кімната та інші.

Ключові слова: високі освітні технології, освітній простір, освітня модель, методологічний потенціал, метавсесвіт, змішане навчання, перевернутий клас, віртуальне навчання, цифровий двійник.

W. SUN

THE METHODOLOGICAL POTENTIAL OF HIGH EDUCATIONAL TECHNOLOGY

With the development of information technology, the Internet is also constantly iterative and updated, and is currently evolving to Web 3.0, which is synonymous with the next Internet era, which complements the metaverse. This essay is dedicated to one of the most relevant issues in contemporary philosophy: the methodology by which technology is reshaping educational spaces and educational models. The research adopts the method of philosophical speculation, starting from conceptual analysis, tracing the development of distance education and its technological evolution, and examining the educational process of technology from the source. The results of the study show that with the emergence of concepts such as digital campus, smart campus, digital twin campus, and metaverse school, the educational space is changing to the metaverse. The transformation triggered by science and technology covers both individuals and society, not only referring to the specific content or form of people's understanding and thinking, but also the depth and complexity of the thinking world of the entire society. In order to adapt to the changing situation, higher education institutions are establishing new curriculum models. Various words associated with these patterns are: blended learning, flipped classroom, virtual learning, smart classroom, etc.

Key words: high educational technology, educational space, educational model, methodological potential, meta-universe, blended learning, flipped classroom, virtual learning, digital twin.

Problem statement. Along with the iterative innovation of all kinds of information technology, the Web era has evolved from Web1.0 to Web2.0, and now it is presenting an important point in the evolution to the next generation of the Internet era, Web3.0.

Web 3.0 is the future of the direction of technological development, and the meta-universe is the future of application scenarios and lifestyles, and the two are mutually reinforcing. This article is dedicated to one of the most relevant issues in contemporary philosophy: the methodology of technology in reshaping educational spaces and models. The study adopts a philosophical discursive approach, starting from a conceptual analysis that traces the development of distance education and its technological evolution, examining the process of technology's educationalisation at its source.

Analysis of recent research and publications and relevance. Web technology has evolved from Web 1.0 to Web 3.0, and the educational space is changing. The meta-universe is considered as the foundation of the future educational space. As far as the field of education is concerned, different researchers have interpreted and defined the concept of meta-universe [4, 14, 17, 19]. Some researchers have even proposed new concepts and frameworks such as "education meta-universe" and "learning meta-universe" [5, 8]. Based on its technological composition, the meta-universe is a scaled-up unification of high technologies such as artificial intelligence, VR/AR/MR, blockchain, communication technologies, cloud computing, big data, digital twins, etc., and a unifying imagery of a wide range of emerging technologies. The meta-universe makes people realize that the internet is not as simple as a technological tool, but a whole new information space. At present, there is no consensus on the understanding of the meta-universe of education, and its concepts and characteristics are mainly interpreted from the "technological application perspective" and the "spatial perspective". The technical nature of education determines that technology reshaping education is reshaping education technology, and the process of technology reshaping education is the process of evolution of education technology. The fundamental question of technology reshaping education is, what kind of education, what kind of education mode, and what kind of learning mode do we need in the age of technology? In the field of education, there is a "deep integration of online teaching and offline teaching", will the integration of the two reshape education? To answer this question, we need to trace the development of distance education and its technological evolution, and examine the process of the educationalization of technology from its origins.

Purpose of the paper. The results of the study show that the educational space is changing in the

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direction of the meta-universe with the emergence of concepts such as digital campus, smart campus, digital twin campus, and meta-universe school. The transformation triggered by science and technology encompasses both individuals and societies, referring not only to the specific content or morphological style of human awareness and thinking, but also to the depth and complexity of the thinking world of the whole society. In order to adapt to the changing situation, higher education institutions are establishing new curriculum models. Various terms related to these models are: blended learning, flipped classroom, virtual learning, smart classroom, etc. *Novelty.* Adopting a philosophical discursive approach, starting from a conceptual analysis, it traces the development of distance education and its technological evolution, and then discusses the methodological potential of high educational technologies in reshaping educational spaces and educational models.

Main body. *Different stages of technological development in the field of education in the Web era.*

With the iterative innovation of various information technologies, the Web era has evolved from Web 1.0 to Web 2.0, and is now presenting an important point in the evolution to the next generation of Web 3.0 in the Internet era. Each evolution will trigger a new round of information revolution, profoundly changing people's lives, work and all aspects of society. In the mid-to-late 18th century, the first industrial revolution ushered in the "steam age", technology promoted industrial development through the conscious application of natural sciences, and the new form of teaching organization that formed the class system led to educational changes. In the middle and late 19th century, the second industrial revolution opened the "electric age", realizing the close integration of natural science and industrial production, and the specialized and standardized subject courses and training models adapted to social changes and affected the development of education. At present, new technologies such as cloud computing, artificial intelligence, and big data are also having a profound impact on school reform, teaching reform, and classroom reconstruction in the field of education [1, p. 179]. Technological developments are considered the most important factor in initiating and expanding remote, online, and blended learning, where the educational process is primarily facilitated by educational technology [2, p. 4].

Tracing online education based on technology perspective includes three stages of development: (1) large-scale training - the early stage of one-way communication (Web 1.0 technology, multimedia technology, audiovisual technology, etc.); The essence of Web 1.0 is aggregation, union, and search, and the object of aggregation is huge and disordered network information. (2) Personalized learning – the current stage of two-way interaction (Web 2.0 technology, cloud computing, big data, etc.); The emergence of various platforms and software technology architectures of Web 2.0 has promoted the formation of a new dimension of education paradigm. The source of this paradigm is to provide a personalized and participatory learning space for all learners, changing the interaction mode between educational resources and learners.

In the open education resource sharing movement, the emergence of Massive Open Online Courses, that is, "MOOCs", is the most interesting wave of education informatization innovation. In MOOC programs, learners' learning behaviors are guided and supported by teachers to provide a learning experience that is close to formal education. (3) Experiential learning – the promising future of intelligent learning (web 3.0 technology, VR technology, Internet of Things, artificial intelligence, etc.); The essence of "Web 3.0" is deep participation, life experience, and the value of netizens' participation. Web 3.0 is not only an intelligent Internet, but also a three-dimensional holographic Internet, which can provide users with unprecedented interactivity, immersion and participation [3, p. 90].

The development of distance education has undergone many times of technological education, but each technological change around the new paradigm formed by the combination of individual technologies has not been able to replace the old paradigm, the existing technological changes are only the evolution of a single technology in the old paradigm of distance education, or the education of a new technology, as the main combination of distance education has not formed a replacement of the educational paradigm. Somehow though, the "metaverse", signifying a metaphysical universe, is a term that could bring people into the awareness that our own "base reality" may not really be so basic after all. Was it ever? Blurring the lines between what is real and what is surreal or metaphysical, could have some profound impact on the human psyche. What starts to feel real becomes more way more subjective than objective in this kind of place [4]. Li Zhengtao et al. proposed that "for the education world, the real 'technological innovation' is to innovate a new place for education, a time and space for education, create a new way of educating people, and create a new world of education, which is the fundamental value of the education metaverse"[5, p. 14].

High technology reshapes educational spaces

With the development of information technology, the distinction between real and virtual is becoming more and more blurred [6]. With the in-depth development and comprehensive transformation of education informatization, concepts such as digit campus, smart campus, digital twin campus, and metaverse school have emerged one after another.

(1) Digital campus.

The concept of a "digital campus" originally originated from The Campus Computing Project, a research project at Claremont University in the United States. Shen Peihua et al. define digital campus as "digital campus is based on the network, using advanced information means and tools to realize all digitization from the environment (including equipment, classrooms, etc.), resources (such as books, lectures, courseware, etc.) to activities (including teaching, learning, management, services, offices, etc.), build a digital space on the basis of the traditional campus, expand the time and space dimension of the real campus, improve the efficiency of the traditional

campus, expand the functions of the traditional campus, and finally realize the comprehensive informatization of the educational process"[7, p. 19]. Qian Xiaolong et al. pointed out that "digital campus is the use of modern information technology to build a digital space on the basis of traditional campus, and finally realize the informatization of the education process"[8, p. 16]. In summary, the digital campus is a digital space built on the basis of the traditional campus, which digitizes the daily teaching and management work, and it is in the initial stage of education informatization.

(2) Smart campus.

Due to different perspectives, the definition of smart campus has different emphases. Some emphasize the application of technology represented by the Internet of Things [9, p. 124], Some focus on the construction of a smart learning environment [10, p. 64]. China's national standard "Smart Campus Overall Framework", which came into effect in January 2019, defines "smart campus" as "the organic connection between physical space and information space, and anyone, anytime, and any place can easily access resources and services"[11]. Smart campus is the further development and upgrading of digital campus and a more advanced form of education informatization.

(3) Digital twin campus.

The concept of "twin" originated from NASA's "Apollo program", which is to build two identical space vehicles, one of which is launched into space for a mission, and the other is left on Earth to reflect the working status of spacecraft in space during the mission, thereby assisting engineers in dealing with emergencies that arise in space. Around 2003, the idea of a digital twin first appeared in Professor Grieves' management course. Grieves calls this idea "Conceptual Ideal for PLM (Product Lifecycle Management)." In this scenario, the basic idea of digital twin has been embodied, that is, the digital model built in the virtual space is interactively mapped with the physical entity, and the operation trajectory of the whole life cycle of the physical entity is faithfully described [12]. It wasn't until 2010 that the term "Digital Twin" was officially coined in NASA's technical report and defined as "a system or vehicle simulation process that integrates multiphysics, multiple scales, and multiple probabilities." In recent years, digital twins have become more and more widely spread. At the same time, thanks to the development of a new generation of information technology such as the Internet of Things, big data, cloud computing, and artificial intelligence, the implementation of digital twins has gradually become possible. The "Digital Twin Application White Paper" published by the China Electronics Standardization Institute pointed out that "the digital twin campus is a virtual campus built based on digital twin technology to accurately map and reconstruct and optimize the physical campus, which realizes the two-way mapping, dynamic interaction and real-time connection between the physical campus and the virtual campus" [13, p. 35]. Based on the characteristics of interoperability, scalability, real-time, fidelity, and closed-loop, the digital twin campus can make intelligent decisions through simulation, analysis, and prediction of the campus physical process to optimize the campus operation process.

(4) Meta-universe school.

Many researchers believe that the metaverse offers an opportunity to reshape the educational space and change the teaching model. From the perspective of technology application, some researchers regard the metaverse as a collection of various new Internet technologies such as blockchain and cloud computing [14, p. 28]. Interpreting the educational metaverse as the vertical application of metaverse technology in the field of education, it is a virtual and real integrated education environment shaped by new technologies, which has the characteristics of comprehensive interweaving of virtual and reality, comprehensive collaboration between humans and machines, and comprehensive connection between school and society in terms of application scope [15, p.28]. From the low to the high degree of technical application, the characteristics of virtual reproduction, virtual simulation, virtual and real integration, and virtual and real linkage are presented in order [16, p. 21]. From a spatial point of view, researchers generally have two kinds of interpretive logic. First, the metaverse is regarded as a virtual space completely parallel to the real world, and the educational metaverse is interpreted as a new virtual education world created through network sharing space [17, p. 44]. It has the characteristics of interactive immersion, resource equality, and diversified experience [18, p. 1].

For example, some researchers pointed out that the education metaverse is a new type of education form based on the third-generation Internet and closely related to the attributes and elements of the real society, with interaction as the center and breaking through various boundaries (time and space, relationship, communication, emotional boundaries) as the center [19, p. 6]. Metaverse schools integrate advanced technologies such as digital twins, Internet of Things, artificial intelligence, extended reality, and blockchain, allowing users, such as students, teachers, professional and technical personnel, administrators, and other users to socialize, educate, and entertain in metaverse schools through their avatars.

High technology has caused changes in teaching models

The structure of thinking reflects people's level of thinking. People always understand the world with the existing thinking structure, and the external world is also formed through the thinking structure to form people's thinking results. Advances in science and technology are driving the development of thinking structures. Science and technology provide new concepts, which lead to the development of thinking structures. The central concepts of each era, such as "entity" in ancient times, "force" in modern times, and "information" in modern times, are condensed and summarized the world picture at that time and people's overall understanding of the world.

A system of thought organized by concepts forms a web of thinking that reflects the "web of natural phenomena." The more optimized the concept, the more perfect the thinking structure, and the conceptual evolution brought by science and technology enables us

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to grasp the increasingly complex world in a concise way, and constantly enhance our thinking ability and efficiency. The transformation triggered by science and technology covers both individuals and society, not only referring to the specific content or form of people's understanding and thinking, but also the depth and complexity of the thinking world of the entire society. In order to adapt to the changing situation, higher education institutions are establishing new curriculum models. Various words associated with these patterns are: blended learning, flipped classroom, virtual learning, smart classroom, etc.

Blended learning is a new term that has emerged in the field of education, but its philosophy and ideas have been around for years. According to Learning circuits, Blended learning is considered to be a combination of online learning and face-to-face learning. Essentially, Blended learning is a new type of learning style or learning philosophy. Driscoll (2002) has provided a more comprehensive discussion of blended learning, arguing that "blended learning means that the learning process can be a combination (or blend) of web-based technologies (such as virtual classroom live, collaborative learning, streaming and text) to achieve a pedagogical goal; It is a combination of multiple teaching methods (such as constructivism, behaviorism and cognitivism) and teaching techniques (or non-teaching techniques) to achieve the best teaching results; is a combination of any form of instructional technology (e.g. video, CD-ROM, web-based training and film) with face-to-face teaching and training methods; It is a combination of teaching technology and specific work tasks to form a good learning or work effect" [20, p. 18].

Flipped Classroom is a teaching mode that reverses the order of the two elements of traditional lecture and homework in course teaching. "Flipped Classroom" originated from "Woodland Park" high school in Rocky Mountain, Colorado, USA. In the spring of 2007, chemistry teachers Jon Bergmann and Aaron Sams began using screen recording software to record PowerPoint presentations and lectures and upload videos to the web to help absent students make up lessons. Later, the two teachers let students watch teaching videos at home, complete homework in class, and explain to students who have difficulties in learning. This teaching model is widely welcomed by students. Flipped classrooms introduce concepts such as active learning, student engagement, blended course design, course podcasts, and more. In the classroom, teachers act as coaches or advisors, encouraging independent intellectual curiosity and cooperative learning. More and more college teachers have begun to use flipped teaching models in their courses. The push for flipped classrooms has benefited from the Open Educational Resources (OER) movement. Since the Massachusetts Institute of Technology (MIT) Open Courseware Movement (OCW), a large number of high-quality teaching resources such as Yale Open Classes, Khan Academy micro-videos, TED (TED Education Channel) videos have emerged, providing resource support for the development of flipped classrooms and promoting the development of flipped teaching. A particularly successful example of the flipped classroom is an accounting course at Pennsylvania State University with 1,300 students. Class time is used for open discussions, guest speakers, or practical problem solving, and the role of mentor is shared by a number of teaching assistants. At Harvard University, a physics professor not only adopted a flipped teaching model, but also developed a related website called Learning Catalytics, which provides teachers with free interactive software so that students can fully discuss, apply knowledge, and get timely feedback [21, p. 48].

Virtual Learning is a distance learning method based on information network technology. It is a management science and technology term published in 2016. Virtual learning is an online learning method that uses the network as a fully immersive interactive interface, transforms cyberspace into social space, connects people through virtual society, improves the perceptibility and interactivity between collaborative workers, and makes them have a more realistic immersive experience. This learning style is learner-centered, providing learners with interactive real-time courses that meet their individual needs and characteristics, and the curriculum is designed to focus on timely feedback and learning effects of learners, in the form of virtual learning communities, learning the real world in a virtual environment. "The essential difference between virtual learning and distance learning is its synchronization, synchronous discussions, on-site virtual classrooms, virtual classmates, virtual students, virtual teachers, etc. to teach and learn" [22, p. 111]. For collaborators to achieve "realism" and "immersion", the naturalness of interaction is particularly important, and multi-channel user interaction technologies (such as wearables) must be used, including natural language, gestures, head movements, etc.

The emergence and development of the smart classroom has its historical inevitability. The earliest proposal for a smart classroom was made at the beginning of this century, when classroom teaching shifted from focusing on knowledge transfer to smart learning and emphasising the cultivation and development of students' intelligence. Due to the computer network, the Internet of Things and IBM's "Smart Earth" strategy and its application in the field of education, triggered the emergence of the concept of "smart education", "smart classroom" and other concepts. By creating a learning space-time environment with a certain degree of wisdom, it aims to promote the comprehensive, coordinated and sustainable development of learners' wisdom. The development process of smart classroom is divided into three stages: initial exploration, rapid formation and ecological remodelling [23, p. 72]. The initial smart classroom is based on computer networks, multimedia, audio-visual technology, etc. to build a multi-screen display, audio-visual synchronisation, static and dynamic combination of classroom environment. With the development of cloud computing, big data, mobile Internet and other technologies, based on a new generation of information technology to develop network learning space, massive online open courses

(MOOC), digital laboratories, digital subject classrooms and other teaching facilities, the development of intelligent teaching systems, intelligent management systems and other business systems, the smart classroom has entered a period of rapid formation. With the continuous maturity of artificial intelligence, virtual reality, 5G and other emerging technologies, we have developed intelligent learning tools such as intelligent guidance systems, intelligent learning companions, teaching robots, AI learning machines and other intelligent learning tools based on data mining, learning analytics, and in-depth learning, and constructed a new intelligent teaching environment with the integration of "cloud, desk, and end". Through technology-enabled innovative teaching tools and means, building an intelligent learning environment and realising intelligent and efficient classrooms have become the characteristics of the smart classroom in the new era. There are various types of technology-enabled smart classrooms, such as those based on electronic schoolbags, Internet of Things technology, smart classrooms, "cloud, network and end" architecture, big data, teaching behavior analysis and disciplinary applications.

Although online teaching based on the Internet, computers and other information technologies also has the main characteristics of distance education, such as a breakthrough in educational time and space, online education has seen a tendency to intersect with, integrate with and re-domain the traditional school education system, which has been involved in the traditional education system and has seen the fusion of formal and non-formal learning, formal and non-formal education.

Conclusion. The development of distance education so far has occurred a number of technological remodelling of education, but each technological change around the combination of a single technology to form a new paradigm has not been able to replace the old paradigm, there have been technological changes are only a single technology evolution within the old paradigm of distance education, or some kind of new technology education, as the main combination of distance education has not been formed on the replacement of the old paradigm of education.

Although online teaching based on the Internet, computers and other information technologies also has the main characteristics of distance education, such as the breakthrough of educational time and space, online education has already appeared with the traditional school education system, many of the intersection, fusion, and re-domaining trend, which is involved in the traditional education system and the emergence of the fusion of formal and non-formal learning, formal and non-formal education, it can be said that the fusion of online education and offline education is taking place in a new paradigm, and the fusion of online and offline education is taking place. It can be said that the fusion of online and offline education is forming a new domain of education and beginning to redefine education.

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