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Lifelong Learning System in the age of Artificial Intelligence: Change, Opportunity and Reconstruction

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Abstract: - Artificial Intelligence advances the offline and online education, digital education and virtual education, eventually all the way to lifelong education with online, digital and virtual Characteristics. In the era of "Artificial Intelligence" (AI), computer technology, Internet technology, big data technology, and cloud computing technology have been widely used in all life and work, making the information dissemination space broader and faster. Information Space provides a platform for new knowledge acquisition and learning for education. The lifelong learning system for the whole population has been updated to break through the modes and limitations of traditional education and meet the needs of all people. This paper first analyzes the connotation and characteristics of lifelong learning for all and points out the current policies and opportunities. Finally, it proposed to build a high-quality, efficient, and sustainable comprehensive lifelong learning system to form an excellent social learning situation in which "everyone can learn, everywhere can learn, and always can learn." To enhance lifelong learning, efforts focus on expanding the main body responsible for learning, building intelligent learning environments, and providing precise guidance based on educational needs. It is also essential to improve feedback mechanisms, service places, and create an integrated online platform, alongside establishing knowledge-based organizations. This research focus on accountability and quality in lifelong learning since it is evolving with new technologies and opportunities. At the same time, it can expand learning, create an intelligent environment, improve feedback, and establish an online educational platform. This will provide inclusive and high-quality educational opportunities to all learners.

Keywords: Artificial Intelligence; Lifelong Learning System; Information Technology; Lifelong Learning

I.   INTRODUCTION

Lifelong learning is indispensable with AI in the globalization, digitalization and intelligentization. With the support of Internet technology, big data technology, and cloud computing technology, the speed and time of information transmission have further accelerated, breaking the shackles of time, mainly meeting and promoting the transformation of people's life, work, and learning methods, and improving efficiency. In this context, people's learning needs have also changed, showing the characteristics of diversification, personalization, and lifelong. China Education Modernization 2035 mentioned that "building a modern education system serving comprehensive lifelong learning" is necessary to build a lifelong learning system based on the current to meet the future. Besides, changing the traditional education model and innovating the traditional education system is one of the key means. Therefore, we should make good use of Artificial Intelligence technology well, grasp the "AI" and realize the reform and innovation of lifelong learning systems for a more closely global education.

II.   THE CONNOTATION AND CHARACTERISTICS OF THE NATIONAL LIFELONG LEARNING SYSTEM

A.   The Connotation of the Lifelong Learning System for All

Lifelong learning for all is naturally formed after the social development to a certain state, which has been shown to be a learning type social state. [1] The formation of a learning society is achieved over time but needs to go through preliminary construction, formation, development and maturity, upgrading, etc. It is a dynamic and lengthy process, which reflects the process of social modernization and is also part of the development of social modernization, so it is called the lifelong learning system for all.

B.   Characteristics of the Lifelong Learning System for All

First, the characteristics of the lifelong learning system for all are relatively prominent and shown explicitly as follows: first, the characteristics of the popularization [2], that is, learning is not limited to traditional school and institutional education, not only the activities and rights of a specific group but also the opportunities and rights of the whole society to receive education and participate in learning, which all members of society cover. At the same time, the lifelong learning system for all reflects publicity and inclusiveness. Its construction purpose is to provide opportunities and rights for education and learning to all members of society, and to meet various education and learning needs.

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Second, life-long characteristics are that the whole life of people accompanies learning activities throughout all stages of development and the entire process of development [3], and everyone's life has different stages. The learning needs and purposes of each stage are different, and the learning contents and methods involved in each stage are also different, which has a lot to do with the social environment and growth environment in which people live at different stages. However, the nature of learning is unchanged, so it shows the characteristics of lifelong. Moreover, the development of learning activities is inseparable from education, and in different learning stages, education plays different roles. For example, in the compulsory education stage and higher education, in addition to teaching knowledge, it also focuses on shaping people's character and moral quality, laying the foundation for their social learning. Thus, the lifelong learning system of the whole population runs through and connects.

The third aspect is diversification; learning styles are diverse, and there are various ways to participate in learning. In society, education has formal and informal education, and learning also has formal and informal learning. Regardless of the type of education and form of learning, they are of equal importance, and lifelong learning needs to be completely integrated to achieve the goal of lifelong learning for everyone. School education is typically considered formal education and can be further categorized into in-school and out-of-school education. Additionally, learning activities undertaken by students can be classified as in-school and out-of-school learning, encompassing school learning and social learning. Furthermore, school education can be distinguished from social education, which takes place outside of the school environment.

III.   THE REFORM OF NATIONAL LIFELONG LEARNING SYSTEM IN THE ERA OF "AI"

A.   Background of the Reform of the National Lifelong Learning System in the Era of "AI"

The emergence of lifelong learning is mainly due to social changes and transformation factors. In order to adapt to the rapid changes in society, some countries pay more attention to the development of lifelong learning, and building a lifelong learning system for all has become an important task. The construction of the national lifelong learning system needs to disrupt various learning types and resources one by one, then carry out systematic and integrated reconstruction according to people's current learning needs in order to create more and more effective learning opportunities for learners so that learning resources are reasonably allocated, so as to provide guarantee for people's comprehensive and sustainable development. The reconstructed lifelong learning system includes various institutions and organizations that can provide learning opportunities in society, specifically formal education in the regular education system, informal education in training outside the education system, and community, work, and other informal education. In the past, the content of the education system was relatively simple, mainly relying on formal education, and both informal and informal education were in the form of compensation, in a relatively weak position. Under the lifelong learning system for all, formal, informal, and informal education are balanced, and educational activities are more vital to meet the learning needs of different groups fully. [4]

In the era of "AI," the reform and construction of the national lifelong learning system are affected by internal and external factors. [5] From the perspective of internal factors, people's learning needs in the new era have become diversified and personalized, and the traditional education system obviously cannot meet the learning needs of contemporary people, resulting in the contradiction between supply and demand. The formal school education model first appeared in the first industrial revolution, and the talents cultivated under the model were more suitable for the needs of society at that time. With the development of the times and technology, the demand for the quantity and quality of talent in society increased, showing the characteristics of diversity, individuality, and openness. The learning service carrying capacity of the formal education model needed to be more vital to provide support and guarantee the quality of learning to some extent; it also affects social and economic development. Therefore, the lifelong learning system of the whole population needs to be reformed to meet people's diverse, personalized, and flexible learning needs.

Regarding external factors, the emergence of modern multiple information technologies promotes the change of learning methods and impacts the learning environment. Learning appears more active and selective based on the change in student ecology. Information technology assists in the change of learning, and it is precisely under the joint action of internal and external factors that the construction of the lifelong learning system for all has changed under the support of information technology, highlighting individuality and diversification.

B. The Reform Characteristics of the National Lifelong Learning System in the Era of "AI"

The reform of the national lifelong learning system in the era of "AI" has broken the limitations of the traditional education model, optimized the entire learning ecology and made learning services innovative. [6] The characteristics of the reform are as follows:

The first is diversification, covering formal, informal, and other learning modes. The learners' diversified learning needs and personalized learning preferences can be met, and the learning needs of learners from diverse groups can also be met to achieve multidimensional development without absolute advantage. In the face of diversified learning modes, learners can also selectively transform and obtain vertical expansion based on institutional guarantee, and the diversified information technology of AI can also provide more resources and better services for learners' diversified needs and obtain horizontal development.

Second, openness is the fundamental reason why the lifelong learning system for all plays a functional role. All kinds of knowledge and information in the system flow with each other and can also exchange information with the external environment. Such a system has stronger adaptability and can meet all kinds of learning needs of learners. The infrastructure and innovation elements of the lifelong learning system for all mainly include various types of educational resources and Internet technology, which are no longer limited by the limitations of time and space. [7] All kinds of learning resources will be integrated to form a more open and targeted learning format and further improve the quality of the lifelong learning system for all.

The third is collaboration. There is usually a direct or indirect relationship between learning and learning service subjects, which mainly includes various institutions, groups, and individuals that provide learning services and have learning capabilities. They can provide a wealth of available resources for the lifelong learning system of the whole population and form an interconnected network. In this interconnected resource network, the core is not formal learning, and the places where learning can be carried out are not just schools. Informal learning gradually balances formal learning, and their status and role gradually converge. No matter school learning or family, society or enterprise learning, the same learning effect can be obtained. Therefore, the main body of learning services also shows systematic and rigorous characteristics. [8]

The fourth is systematization. In the comprehensive lifelong learning system, various learning and learning service subjects, learning resources, etc. are integrated as a whole to form a connection between them. In fact, this has enabled the optimization of the allocation of learning resources, fundamentally changing the nature of resources. Instead of belonging to a particular institution or person, it has added a public attribute, became a public learning resource and flowed according to the learning needs of learners. The characteristics of publicity also make the learning environment of resources change. They independently compare the advantages and disadvantages, eliminate the inferior parts, and achieve the development of autonomy. This ensures a balance between the quality and distribution of learning resources and promotes systematic development, forming a spiral promotion between each other.

IV. THE OPPORTUNITY OF LIFELONG LEARNING SYSTEM FOR ALL IN THE ERA OF "AI"

Under the development background of the new era, the emergence of "AI" empowers the lifelong learning system for all. Relying on information technology is the inevitable development direction of educational intelligence system reform. [9] Information technology provides support for the resources and systems of lifelong learning for all. In the era of "AI", it also brings many opportunities for the lifelong learning system of the whole population and provides rich internal drive.

A. Policy Opportunities

Some policies issued by the state provide external power support for the construction of a lifelong learning system for all. In 2035, China's Education Modernization 2035 mentioned an important strategic goal of education development: further accelerating the educational reform in the information age and building a lifelong learning system for the whole population. Also, it mentioned that information technology plays an important role in improving the learning-sharing mechanism. Thus, various information technologies play a driving role in the construction and development of the lifelong learning system for all. Based on these policies and discussions, it can be clear that integrating national lifelong learning and information technology is the main trend of its future development. That is, "AI" has become an indispensable element in the national lifelong learning system. For example, the integration of big data technology and the national lifelong learning system has been applied to collect, analyze, and govern learning appeals. It has been integrated with learning qualification certification, a learning tracking service and a learning personality push to provide more convenient learning services for learners. In

addition, with the support of Internet technology, online learning platforms, learning squares for all, and other methods have also become more widely used education models to improve the informatization level of the lifelong learning system for all and promote education modernization. [10]

B. *Digital Resource Opportunities*

In the era of "AI", the national lifelong learning system has access to digital resources. The popularization and application of information technology have enriched personal and data information, providing resources for constructing the national lifelong learning system. Based on information technology, big data platforms and data governance for lifelong learning for all have been formed, reflecting the characteristics of intelligence and openness. [11] The role of information data is shown as follows: first, basic elements provide support for data collection, information storage, analysis, services, and other links, and provide support for data detection and analysis, which can better meet the actual learning needs of various learning groups and various learning fields. The second is the key resource, which regulates and supervises the sharing and operation of the learning platform, converts the data into visual images, grasp the clear learning behavior trajectory, and promotes the learning platform in the national lifelong learning system to carry out comprehensive ability evaluation from multiple dimensions and directions, providing a reference for decision-making, and improve the evaluation ability and decision-making level, At the same time, it is also able to estimate the trend of lifelong learning for all with the support of big data technology, understand the potential risks, develop a more comprehensive and feasible implementation plan, so that the learning content can be updated in a timely manner, and the learning resources can be distributed evenly. [12]

C. *Technological Development Opportunities*

Under the premise of continuous innovation and development of science and technology, it provides opportunities and impetus for constructing the national lifelong learning system and plays an important role. From the perspective of the development process of lifelong learning for all, its integration with information technology has gone through different stages, and each stage is driven by development based on the support of information technology. For example, at the beginning of the 21st century, the Open University established a relatively sound digital education system and learning mechanism, namely the national lifelong learning card system. Later, a public lifelong learning service platform relying on information technology emerged, which turned from student-oriented learning services to public-oriented learning services. At the same time, a public education service system focusing on township, enterprise, community and other digital learning was built. The promulgation of China Education Modernization 2035 further clarified the need to build a lifelong learning system for all based on digital technology. [13] It mentioned that distance education, online education, rational integration, and use of lifelong learning platforms, curriculum resources and interactive functions for all with the support of information technology so as to form a lifelong learning system for all based on diversification of participants, popularization of service objects and personalization.

V. RECONSTRUCTION OF THE WHOLE POPULATION'S LIFELONG LEARNING SYSTEM IN THE ERA OF "AI"

A. *Expanding the Main Body of the National Lifelong Learning System*

The main body in the construction of the national lifelong learning system could be better, and the supply system of learning needs to be further improved, that is, to expand the main body. The main body of supply mainly refers to the organization or institution that provides learning services, which is responsible for allocating resources, selecting supply methods, formulating strategies, and evaluating effects. The main body of the lifelong learning system for all should be diversified. The government, market, society, and school institutions should all play their roles, form a joint force based on it, play their respective advantages and complement each other, and give play to the power of multiple main bodies to provide high-quality efficient supply of learning resources to meet their lifelong learning needs.

B. *Building an Intelligent Learning Environment and Learning Space*

In the era of "AI", the construction of the national lifelong learning system should focus on creating an intelligent learning environment and learning space to promote learning. [14] For the design of the learning space and learning environment, it is necessary to consider the learning place, method, process, and result presentation, reasonably integrate information technology, artificial intelligence technology, etc., and ensure that the designed learning space and learning environment are targeted under the guidance of education and teaching theory. For example, physical and virtual learning can provide corresponding learning resources. Considering the learning

methods, fully aware of the learners' experience, follow the principle of individuality to design the guidance scheme, and find more abundant guidance materials with the help of information technology; Consider the learning process, take the learning theories such as the connectionism learning theory as the basis, carry out the personalized design of the learning process, ensure the effective transmission of the learning content, and let the learners grasp the knowledge effectively; Considering the learning results, data obtained from the learning process can be built into a learning model, from which the image of the learner can be portrayed, the specific situation of the learner can be comprehensively grasped, and more accurate education can be carried out.

C. Providing Precise Guidance based on the Lifelong Learning Needs of the Whole Population

The construction of the national lifelong learning system in the era of "AI" should fully grasp the learning needs of individuals and society and provide accurate guidance based on reality. At present, the goal of China's modernization development is to build a socialist modern power with Chinese characteristics. In order to comprehensively improve the national quality and social innovation ability, we need to accurately grasp the following requirements for the construction of the lifelong learning system for all: First, grasp the fundamental education task of building morality and cultivating people, and integrate learning resources from an all-round perspective to promote the all-round development of learners, so that they can master both knowledge and morality, improve the comprehensive quality, cultivate the spirit of innovation, strengthen patriotism, improve the sense of social responsibility, and take the initiative to contribute what you have learned to social development and national construction. [15] The second is to grasp the scientific concept of innovation, openness, and sharing, and from the perspective of national strategy, combine the strategy of strengthening the country through talents, the strategy of rejuvenating the country through science and education with the construction of a lifelong learning system for all, so as to provide human resources and intelligence for learners' learning, and promote learners to form an innovative, open and sharing consciousness. In terms of culture, we should pool the strength of the masses and build and improve the public cultural service system; In terms of economy, optimize and adjust the economic structure, serve the industrial upgrading, and build an open economic system; In terms of society, we will innovate the social governance system, improve the basic public service system, comprehensively improve people's health and provide life security.

D. Building and Improving the Feedback Mechanism of Lifelong Learning for All

In the era of "AI", the construction of the national lifelong learners' system should attach importance to the learning feedback mechanism and grasp the learning participation and satisfaction of learners from the feedback information. [16] This can adjust the allocation of learning resources, further improve the utilization rate of the national lifelong learning resources, and also improve the learning efficiency. The scores in regular learning cannot be used as complete feedback information for reference, and we should fully consider the dynamic nature of learners' learning and adopt a dynamic learning feedback mechanism to achieve an integrated analysis of lifelong learning for all. For example, with the support of information technology and artificial intelligence technology, develop an information system platform to obtain learning feedback from multiple levels, dimensions, and data sources, dynamically integrate and analyze their learning quality through intelligent systems, present visual feedback analysis results, evaluate learners' learning from multiple perspectives, and find out the problems and deficiencies, and provide targeted learning services. [17]

E. Improving the Service Place of Lifelong Learning for All

The service places for lifelong learning for all are mainly offline places. Creating an environment suitable for learners to learn and creating a good learning atmosphere can ensure that learners get a better learning experience. Then, it is easier to mobilize their learning initiative, and the overall planning and planning of lifelong learning service places for all should grasp the characteristics of regional development. All localities should consider the specific situations of all learners to build lifelong learning places and continue to improve with social development, such as serving children, young people, middle-aged and elderly groups. Based on information technology, big data, cloud computing, Internet technology, and other technologies are integrated into the service place. Local governments first provide sufficient funds to support the construction and increase the proportion of scientific and technological equipment in the learning service place, such as personnel identification system, user registration system, various information-based learning software, etc., so that learners can get convenience in the learning service place and facilitate learning naturally.

F. Creating an Online Integrated, Comprehensive Learning Service Platform

In the era of "AI", great changes have taken place in the learning mode. Online and mobile learning are more common learning modes relying on information and Internet technology. The reconstruction of the national lifelong learning system needs to further optimize and innovate the online learning platform, create an integrated comprehensive learning service platform, enable learners to break through the time and space constraints, obtain the required learning resources and learning services from the learning platform anytime and anywhere, and meet various learning needs. Among them, the most important thing is technology to ensure the level of the technical team, develop a more user-friendly platform, reasonable navigation, integrate various information technologies, and ensure the orderly operation of the platform. [18] After the construction of the integrated comprehensive learning service platform, we should do an excellent job in its promotion, improve the utilization of the platform and resources, and play its role in supporting lifelong learning for all and this online learning service platform can also be combined with offline learning service places. Each learning service place independently develops an online learning service platform to form a mutual connection and provide better learning services for the whole population.

G. Establishing a Knowledge-based Organization for Lifelong Learning for All

In the era of "AI", the construction of the whole population's lifelong learning system cannot ignore the establishment of knowledge-based learning organizations. [19] Learning organizations are formed by families, enterprises or schools, which can create a positive learning atmosphere under the joint cooperation of multiple members to promote continuous learning. Members of the organization also ask questions and discuss each other while learning, complementing each other's strengths, and learning from each other's weaknesses. Through further exploration, learners in the organization will be promoted in knowledge and ability. With the help of information technology, knowledge-based learning organizations can form online groups, carry out remote learning even if they are not in the same location, and push rich knowledge resources in groups to achieve knowledge sharing. This cooperation mechanism promotes their learning level and forms high-quality knowledge-based learning organizations.

H. Formulating Sound Laws and Regulations on Lifelong Learning for All

In the construction of a lifelong learning system for all, it is necessary to improve laws and regulations as a guarantee. Relevant departments should legislate according to the lifelong learning system for all, improve existing laws and regulations to provide guarantee for the construction of a learning society and promote the development of the lifelong learning system for all with a more comprehensive rule of law. In order to achieve the goal of lifelong learning for all, we need to deeply grasp the connotation and role of formal learning, informal learning and informal learning and form an open and shared lifelong learning system for all, supported by law. For example, in the Vocational Education Law, it was mentioned that we should improve and build a modern education system for lifelong learning, which is a breakthrough in the development of vocational education, and it coordinated the development of higher education and vocational education from a legislative perspective, and further clarified the importance of lifelong learning for all. Besides, the practice of laws and regulations is more valuable. [20]

VI. CONCLUSION

To sum up, in the era of "AI", the national lifelong learning system is facing new changes and it has developed to a new stage relying on Internet technology, big data, cloud computing and other information technologies. Simultaneously, opportunities such as policy, digital resources, and technology development create new opportunities for the construction of the national lifelong learning system. Under such a premise, the national lifelong learning system in the era of "AI" needs to be reconstructed on the original basis. In this regard, it is necessary to expand the main body of national lifelong learning, create an intelligent learning environment and space, provide precise guidance based on learning needs, improve the learning feedback mechanism, improve the service place of national lifelong learning, and create an online integrated comprehensive learning service platform. In order to establish a knowledge-based learning organization and a corresponding cooperation mechanism, we also need to formulate sound laws and regulations so as to build a high-quality, efficient, and sustainable comprehensive lifelong learning system, form an excellent social learning situation of "everyone can learn, everywhere can learn, always can learn," and cultivate more talent.

In the "AI" era, the education system's lifelong learning component encounters limitations but has promising prospects for the future. Challenges include the complexity of education and the need for responsive offerings. To overcome these, integrating educational technology tools such as virtual reality and artificial intelligence can increase engagement and facilitate interactive learning. Utilizing AI with big data can supply essential perspectives

for individualized learning experiences. The lifelong learning system can progress towards providing inclusive and high-quality educational opportunities to all learners with the gradual permeation of Artificial Intelligence in all sectors of future education.

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