Research on the Development and Application of “Blockchain+” Education

Li Jiayan
China Armed Police Academy Hangzhou 310012

Abstract: As Internet technology registers rapid development, “Blockchain+” comes into being and is considered to be one of the most important inventions in the Internet era. “Blockchain+” has found its way into various fields, such as education, finance, economics, music, culture, management and other fields, thus changing the working methods in these fields considerably and leading to fruitful results. “Blockchain+” Education is a combination of the blockchain technology with education, featuring uniqueness, openness, and security. This study briefly introduces the blockchain technology and its development status in education, analyzes the classification of “Blockchain+” and its application value in education, with specific focus on its application in education.

1. Introduction
As education and educational reforms develop in China, the blockchain technology is introduced into the field of education to form a new education mode called “Blockchain+” Education. It is widely extended to higher education teaching activities, university teaching management and software engineering education, which fully reflects the advantages of application and promotion of “Blockchain+” Education. Through continuous practice and exploration, it can be found that the distributed ledger, consensus mechanism, asymmetric encryption and authorization technology, smart contract and other functions in the “Blockchain+” Education system can further promote the development of digitalization and networking in China's education industry. The blockchain technology can effectively solve the problem that the knowledge and skills of learners cannot be accurately verified in the current education process. On this ground, in order to further promote “Blockchain+” Education, we must solidly deepen education reform, constantly innovate the education system, optimize the practice method of “Blockchain+” Education, and give full play to the development of blockchain technology for China's education industry enhancement.

2. Blockchain technology and its development in education
With the continuous deepening and development of China's education reform, the relationship between the Internet and education is getting closer. Various forms of modern education models, such as “flip classroom”, “mu class”, “air class”, have come to view, revealing people with diverse, diversified, open, and decentralized learning courses. And the education field is gradually showing the development trend of opportunity democratization. It can be said that the application of educational technology led by blockchain technology has further promoted new learning changes. Nowadays, “Blockchain+” education is mainly embodied in the forms of blockchain teaching, blockchain teaching platform and blockchain communication[1].

2.1 Blockchain Education – Take the Degree Program of Blockchain Technology at Nicosia University as an example
In 2019, “Introduction to Digital Currency” (Figure 1), “Bitcoin Encrypted Electronic Currency Technology”, “CS251 Bitcoin and Encrypted Electronic Currency” organized by famous universities such as the Nicosia University and Princeton University in the United States were formally entered into
students' curriculum, and Internet technology provides students with free learning opportunities in the form of “Mu Class”. These courses on “blockchain” have wide-ranging contents, including: currency market, destructive innovation principles, international finance, global financial supervision, distributed system architecture and other fields of knowledge, and involves computers, finance, information systems, management and other majors. These courses help students further master the construction of digital currency system, so it becomes an effective learning channel for talents in blockchain technology. Combining with the construction and development of the “Blockchain+” curriculum in famous foreign universities such as the Nicosia University, it can be found that the society yearn for blockchain technical talents, and lack for a systematic and standardized training model for blockchain talent and education service system. Chinese colleges and universities should closely seize this opportunity, combine with the actual situation in China, innovate the formation of “Blockchain+” Education, and finally build a “Blockchain+” Education with Chinese characteristics and college-running characteristics.

2.2 Blockchain teaching platform – the application of blockchain technology in university construction

With the continuous improvement of socioeconomic level, blockchain technology has gradually integrated into various fields and industries. The social demand for blockchain technology talents continues to rise in an explosive growth. Some colleges and universities at home and abroad have seized this opportunity and put forward the concept of “blockchain technology university” with the aim to cultivate more highly qualified and professional blockchain technology professionals for the society and cultivate more software engineer with practical ability and rich application experience.

Combining the article “Precisely grasping blockchain technology and solidly promoting the construction of a powerful country in the network” (Figure 2) published by Director Shen Yi in the Cyberspace Governance Research Center of Fudan University, we can find that the construction of blockchain technology universities has become a major development trend. Some colleges and universities have introduced the “school-enterprise cooperation” model and launched course teaching activities in the form of projects or “orders”. The specific contents of the courses include: Bitcoin protocol, database construction, transaction types, Bitcoin applications, etc. These colleges and universities also invited well-known blockchain managers such as Chain Net and Monetization participate in the course explanations. Therefore, students gain an in-depth understanding of blockchain technologies such as smart contracts and distributed digital assets through immersive experience learning and practical exercises[2].

Regarding “precisely grasping blockchain technology and solidly advancing the construction of a powerful country in the network”, the specific contents are as follows:

1. Accurately grasp blockchain technology and promote the construction of network power
2. On the afternoon of October 24, the Political Bureau of the CPC Central Committee conducted the
18th collective learning on the current situation and trend of blockchain technology development. Xi Jinping, general secretary of the CPC Central Committee, stressed that the integrated application of blockchain technology played an important role in new technological innovation and industrial transformation. General secretary Xi Jinping clearly pointed out that we should regard the blockchain as an important breakthrough in the core technology of independent innovation, clear the main direction of attack, increase investment, focus on tackling a number of key core technologies, and accelerate the development of blockchain technology and industry innovation.

This collective study and the important speech delivered by Xi Jinping immediately aroused great concern from all sides. This not only reflects the hope of blockchain technology in a specific historical period, but also reflects the importance of accurately grasping the integrated application of blockchain technology. As Xi Jinping pointed out in his speech, the relevant departments and their leading comrades should pay attention to the current situation and trend of the development of the blockchain technology, and improve the ability to use and manage the blockchain technology, so as to make the blockchain technology play a greater role in building a network power, developing the digital economy, and helping the economic and social development.

From the perspective of ontology, blockchain refers to the underlying technology of bitcoin. It is a series of data blocks generated by using cryptography methods. Each data block contains a batch of bitcoin network transaction information, which is used to verify the effectiveness of its information (anti-counterfeiting) and generate the next block. But soon, blockchain and cryptocurrency (virtual currency) represented by bitcoin have an important distinction: compared with the ups and downs of payment and the practice of cryptocurrency, more researchers focus on blockchain itself, hoping that this kind of convergence of distributed data storage, point-to-point transmission, consensus mechanism, encryption algorithm and other computers The new application mode of technology can become a breakthrough of the information technology revolution and the sound integration of the real economy and social change. It can contribute more to the sustainable development of the real economy and the substantive breakthrough of the digital economy, rather than the virtual financial hype.

2.3 Blockchain communication – the application of blockchain technology in software engineering education

In 2015, the Huberton Software Engineering School was founded with the purpose to take blockchain technology as the core course and dedicate to cultivate blockchain technology professionals and finally provides more experienced software engineers for the society. In the Internet era, online fraud incidents have occurred frequently, and the normal operation of personal credit reporting has been affected, especially the student's credit information, which is prone to involve data manipulation and false certificates propagation. On these grounds, the Huberton School of Software Engineering uses blockchain technology as one of the important technical contents of learning certification. While issuing the certificate, the school creates a digital authentication certificate through blockchain technology, so as to facilitate the enterprises to check the student's learning conditions and learning experience, ensure the integrity and authenticity of the academic information, and effectively eliminate the fraud of learning certification. According to the above, it is found that the “Blockchain+” Education can be used not only to set up training courses for blockchain technology talents, but also to apply to learning certification, learning sharing, etc. Therefore, the colleges and universities should realize the important value of “Blockchain+” Education, tightly grasp this opportunity, and combine the concept of blockchain and blockchain technology to provide assistance for the development of education in China.

3. Classification of “Blockchain+” and its application value in education

3.1 Classification of blockchain

According to the network organization structure and management conditions of the blockchain, as well as the application mode of the blockchain technology, it can be found that blockchain is mainly divided into the following categories (Table 1): The first type is public chain. This type of blockchain does not
have an official organizational structure and central server. Users can join the network autonomously according to the basic rules of the blockchain system or they can independently launch the network. There is equal data storage and access rights between each node, and each node is independent of each other and does not require mutual trust. Its main representatives are Bitcoin and Ethereum. The second type is the private chain. In general, the private chain is built by a specific organization or enterprise. Nodes need to be authorized by the builder to enter the network. Different nodes have different data access and accounting rights while few nodes have global management authority. The operating rules of the network can be changed by the builder. Its main representative is Quorum. The third type is the alliance chain. In general, the alliance chain is jointly managed by multiple organizations or enterprises, so the nodes belong to different organizations, and they can enter and exit the blockchain through the admission mechanism. The alliance chain has the characteristics of the public and private chains mentioned above. The main representatives are Hyperledger Fabric and Hyperledger.

| Classification of blockchain |
|-----------------------------|
| Participants                | Anyone can enter and exit freely | Individuals or the company Alliance members | Alliance members |
| Consensus mechanism         | PoW/Pos/DPoS                      | Distributed consensus algorithm                | Distributed consensus algorithm |
| Bookkeeper                  | All participants                  | User-defined                                    | Alliance members discuss and decide together |
| Incentive mechanism         | necessary                         | unnecessary                                     | Optional |
| Degree of centralization    | Decentralization                  | (multiple) Decentralization                     | Multicentralization |
| Characters                  | Self-creation of credit           | Transparent, traceable                          | Optimization of efficiency and cost |
| Carrying capacity           | 3-20 deals /s                     | 10 million ~ 100,000 deals /s                   | 10 million ~ 100,000 deals /s |
| Typical scenario            | Virtual currency audit            | Audit, issue                                   | payment, settlement |

3.2 The application value of “Blockchain+” in education
In the past two years, our country has devoted itself to education reform, insisted on “students as the main body”, and advocated to stimulate students' independent learning ability, among which student learning evaluation is an extremely important part. In general, there are many students in various colleges and universities, and the student information is relatively complicated. If a teacher wants to evaluate each student in a comprehensive, systematical, and effective manner, he needs to conduct educational statistics such as fully grasp the learning information of the students, and also consider the evaluation and assessment structure of the students. Under the “blockchain” + education background, if blockchain technology could be integrated with education statistics, it will provide teachers a strong reference through its distributed storage and accounting functions as well as fully protect student data, and finally establish an open, fair and open management and the query system for student learning information. In addition, colleges and universities can use blockchain technology to master important nodes and display these complex data in a distributed and transparent form, which can further promote China's education reform and improve the ability to coordinate the allocation of educational resources.

3.3 Application features of “Blockchain+” Education
The first feature is distributed ledger. The distributed ledger completes the collection and storage of educational data through the combination of multiple nodes distributed in different regions. In this
process, each node can completely record the teaching data. Therefore, colleges and universities can use distributed ledgers to allow different institutes and majors to use distributed ledgers to record teacher data completely and carry out data supervision. The distributed ledger could assist colleges and universities to identify the real data, complete education statistics work and improve the efficiency of education statistics. Compared with traditional education statistics, it is relatively independent with its different nodes record education data separately so as to avoid data confusion which could be caused by single node operation errors, and finally improve the safety of education data statistics[5].

The second type is the consensus mechanism. This function refers to the use of educational statistics information nodes to reach a consensus and identify information and data through effective records, so as to avoid student data information being tampered. Combining Internet technology and “Blockchain+” Education, four different consensus mechanisms can be basically established, which can be flexibly applied to different occasions and eliminate fake data.

The third type is the asymmetric encryption and authorization technology. The encryption and authorization technologies are to disclose educational data information on the blockchain network, set access and read permissions, and conduct encryption processing. At the same time, the user must be an authorized data owner. This technology can effectively protect personal privacy and data security [6].

The fourth type is smart contract. This is a digital contract form, similar to a business rule. During the transaction process, the system can automatically run according to a pre-set program, which has strong adaptability to match any blockchain data structure. Under the supervision of multiple parties, if the script code of the smart contract meets the set conditions, it can be automatically operated, and cannot be tampered with or intervened in the middle, so as to ensure the reliability of the program operation.

4. Application exploration of “Blockchain+” in education

4.1 Flexibly use blockchain technology to build a modern teaching platform
Combining the above, the most common application method of “Blockchain+” Education at this stage is “learning certification”. Under the traditional educational concept, the students' learning process is rather complicated. Teachers set “score” as a standard to measure students’ abilities, and evaluate students' learning results through tests. Qualification examinations of various majors have become an important evidence for proving students' learning abilities.

With the gradual deepening of education reform in China, the connection between educational institutions has gradually strengthened, and talent training such as “inter-school resource sharing”, “school-enterprise cooperation” and “school-area cooperation” have emerged. Therefore, various educational institutions can flexibly use blockchain technology, build a modern education and teaching platform, and share resources and courses about certification exam; they can also build a “learning certification” system to share student information with enterprises or regional departments to optimize the allocation of talent training resources and avoid uneven demand for talents in various regions.

4.2 Display the function of learning storage and build a rich learning material system
Combining the above, in order to make full use of the application value of “Blockchain+” Education, the concept of “learning storage” should be put forward on the base of its function of data storage. The meaning of this concept is to allow students to record and store their own learning process and learning experience in the blockchain network to build their own autonomous learning system.

Combined with the characteristics of the blockchain, it can be found that each educational activity can be called a complete educational block, and the blockchain technology can be used to record and analyze these educational blocks. If students participate in some training or internship activities, international competitions, social practice activities, etc., they can use their mobile devices to record their experiences at any time and place, thereby establish learning data and credit information. After the student graduates, these data will form a data package, as a proof of the student's learning experience, so as to improve the student's competitiveness during employment.
4.3 Establish a large database of academic credit and strengthen the training of talents
Combining the above, to fully utilize the application value of “Blockchain+” Education, it is necessary to make full use of distributed records to further improve the existing academic credit system. By building a sound, complete and reliable academic information database, various colleges and universities could further strengthen the talents training. In the application process of “Blockchain+” Education, it is suggestive to use the function of distributed records – allow various educational institutions to record students' learning behaviors and processes across regions and platforms, and keep these data permanently on the server. This information forms a learning database which could be used as one of the important modules of the existing academic information network. Colleges and universities can also use this credit information database in the evaluation of talents training effects and the evaluation of students’ comprehensive abilities. This database is also an important basis for cultivating students’ comprehensive abilities, practical abilities, as well as innovation and entrepreneurship capabilities. Thereby, colleges and universities can provide students with more targeted suggestions for learning and development so as to achieve a precise connection between society and school.

4.4 Facilitate the intellectualization of education platforms and promote independent consumption of education
Combining the above, if one wants to give full play to the application value of “Blockchain+” Education, this person can also use the smart contract to build an intelligent education platform and formulate effective educational smart contracts. These smart contracts encourage students to purchase courses independently and obtain corresponding learning materials, thereby promote the independent consumption of education and the development of education industrialization. In the intelligent platform of “Blockchain+” Education, a virtual intelligent education system is constructed through combining with educational deposit and contract, and various service permissions and purchase transaction conditions are set in advance. After the student sends out the purchase information, the system runs automatically, and sends the learning materials and courses to the student. At the same time, the system dynamically monitors the logistics information and usage information of these learning document. After ensuring that the student have received, the system would confirm the payment and no longer require manual operation. In addition, this function can also reflect on downloading online learning tool and learning guidance. Students can order various learning software and functions in the platform according to their actual needs. They can also purchase online courses which can automatically operate and record their online course interaction and feedback information. Therefore, the intelligent education system can formulate more targeted course purchase plans for students, promote students' independent consumption, and provide assistance for the development of China's education industry.

5. Conclusion:
In summary, as an important technological fruit of the Internet era, “Blockchain+” Education is the result of the integration of the blockchain technology with education, and is one of the keys that can promote the reform and development of modern education. To fully utilize the application advantages of “Blockchain+” Education, it is necessary to flexibly use blockchain technology, make full use of the learning storage function of “Blockchain+” Education, establish a large database of academic credit and an intelligent education platform, and comprehensively construct a modern education system against the backdrop of “Blockchain+” so as to provide a strong guarantee for training more high-quality talents.

References:
[1] Tang Jianhong. Research on the Development of Higher Intelligent Education from the Perspective of Multiple and Shared —— Block Chain [J].] Think tank era ,2020(16):192-194.
[2] Yang Xuliang. Application of blockchain technology in education [J.] Computer Products and Circulation ,2020(04):184-185.
[3] Howard. Discussion on the Development and Application Value of "Block-chain" Education [J.] Journal of Jincheng Vocational and Technical College ,2019,12(05):67-69 72.
[4] Mengshasha. Exploration on the New Model of Geriatric Education Based on Block-chain "Cultivation and Education "[J]. Fujian Tea ,2019,41(10):23-24.
[5] Chen Lulu. Block chain technology and its application in higher education [J].] World Education Information ,2019,32(19):7-11.
[6] Huang Daming. Application status and prospect of blockchain technology in education field [J].] Journal of Nanjing University of Information Engineering (Natural Science Edition),2019,11(05):541-550.