Research on the Application of Block Chain Technology in Primary and Secondary Education

Jing LI

Intelligent Science & Information Engineering College, Xi'an Peihua University, Xi'an, China
28328715@qq.com

Keywords: Block chain; Primary and secondary education.

Abstract. In October 2016, the Ministry of Industry and Information Technology promulgated the White Paper on the Development of Block Chain Technology and Application in China, pointing out that "the transparency of Block Chain System and the data cannot be tampered with are completely applicable to student credit management, entrance employment, academic, qualification certification, production-teaching cooperation and other aspects, which are of great value to the healthy development of education and employment". It is found that the educational application of block chain technology at home and abroad is in the embryonic stage, and a few educational institutions have carried out active exploration. Internet + education is the general trend of global education development and transformation. Its purpose is to transform the traditional educational ecology with internet thinking, technology and mode, and realize the structural transformation of the educational system. In this paper, the application of block chain technology in primary and secondary education is studied, and a mechanism of primary and secondary education based on block chain technology is constructed. This mechanism strengthens education quality and ability training, changes the traditional education model, reduces students' schoolwork burden to a certain extent, and promotes the healthy development of primary and secondary education.

Research Status at Home and Abroad

Development Status of Block Chain Technology at Home and Abroad

In recent years, the development and application of block chain technology has become more and more in-depth and extensive. Many countries recognize the great application prospect of block chain technology, and begin to design the development path of block chain from the national level. China and Europe are gradually leading the world in the industrial policy of block chains. In February 2018, the European Union has set up the European Block Chain Observation Forum. Dubai is the leader in the Middle East to lead the trend of block chains. The government is the leader, and enterprises cooperate to explore new technology applications of block chains. Japan and South Korea are relatively active in the Asia-Pacific region.

China attaches great importance to block chain technology. The State Council of China has issued the National Informatization Plan for the 13th Five-Year Plan. New technologies such as block chain and big data, artificial intelligence, machine in-depth learning have become the focus of national layout. In recent years, block chain technology has been initially developed in the field of education. In the White Paper on the Development of Block Chain Technology and Application in China (2016), published by the Ministry of Industry and Information Technology in October 2016, it is pointed out that "incomplete student credit system, lack of historical data information chain and limited data dimension are painful points in the education industry. Block chain technology is used to optimize the deficiencies of the existing operation schemes. It can effectively simplify the process and improve operational efficiency, and avoid the problem of information opacity and tampering in time. [1] Block chain technology is expected to play an important role in the construction of the Internet + education ecosystem.

Current Situation of Primary and Secondary Education at Home and Abroad

Overseas primary and secondary education is developing toward a "wide" direction, focusing on
the cultivation of children's habit of independent thinking and practical ability to solve problems, focusing on teaching students better learning methods, focusing on the cultivation of literacy. The U.S. government has proposed that primary and secondary school students need to have three major qualities, namely, learning and innovation qualities (critical thinking, communication, cooperation and creativity), information, media and technology qualities, and life and professional qualities (flexibility and adaptability, autonomy and self-awareness, social and cross-cultural understanding, output and accountability, leadership and responsibility) [2]. Foreign primary and secondary education attaches great importance to protecting children's imagination and encouraging self-experience and self-exploration. Foreign education takes the world as its textbook, pays attention to cultivating the spirit of innovation and creativity, pays attention to teaching students in accordance with their aptitude, stimulates students' interest, and protects students' learning enthusiasm.

In 2013, the Ministry of Education of China promulgated the Opinions of the Ministry of Education on Promoting the Comprehensive Evaluation Reform of Primary and Secondary Education Quality, which put forward the Reform Opinions on the traditional evaluation methods of students' learning quality. It is suggested that the evaluation of students' learning quality should not only refer to the level of academic development, but also take into account the development of their specialties and academic burdens, so as to achieve a joint qualitative and quantitative evaluation. However, at present, the connotation of primary and secondary education quality in China's educational circles has not been unified, which makes some schools fall into a misunderstanding in improving the quality of education, and affects the promotion of the overall education reform.

Constructing the Education Mechanisms of Primary and Secondary Schools Based on Block Chain Technology

The main content of this paper is to study the application of block chain technology in primary and secondary education, and to construct a mechanism of primary and secondary education based on block chain technology combined with advanced computer information technology. This mechanism uses block chain technology to record students' learning situation and comprehensive performance in the whole stage of primary and secondary schools. By building a consensus mechanism, formulating intelligent contracts, scientifically certifying the learning process, reducing
the proportion of achievements in cultural courses, increasing the proportion of quality training and ability training, calculating the scores of students' learning and various aspects of performance according to the proportion, the final comprehensive evaluation of the whole process of primary and secondary education stage is presented. The evaluation results truly record learning. The whole process of students' learning and the automatic generation of student files can provide important basis and reference for the university to recruit students in the important entrance interview such as "elementary entrance examination" and the entrance examination. The application of block chain technology in primary and secondary education mechanism can be divided into three layers, namely data layer, authentication layer and application layer, as shown in Fig. 1.

**Data Layer**

**Study in School.** Block chain technology is used to record students' learning situation in school, including daily performance, classroom learning, course content, examination type, examination results, homework completion, and related extracurricular activities or practical activities. Once the record is generated, it cannot be tampered with, and it is true and reliable.

**Study Online.** Online education resources are abundant. Students can learn online through various learning platforms provided by the network, share excellent teaching resources, improve learning effect and alleviate the contradiction of unbalanced teachers. Students can not only learn cultural courses online, but also learn music, art, computer programming online, so as to cultivate good personal sentiment and interests. Block chains can provide immutable distributed data records, which can be used in the teaching field. They can record learners' activities in the software system, organize and store learners' achievements, and allow learners to permanently save learning records and data through the network.

**Social Learning.** Primary and secondary schools should gradually cultivate students' abilities, including self-care ability, social ability and so on. Students can take part in various social practice activities to exercise their abilities of dealing with problems and communicating with others. The decentralization of block chains allows any educational institution and learning organization to record learning behavior and learning outcomes across systems and platforms. Students' performances in participating in social practice activities are recorded truthfully and stored permanently through the network.

**Other Manifestations.** Students' achievements in competitions, performances, activities and so on, or in learning and life, which they have participated in in primary and secondary schools according to their personal strengths and interests, can also be recorded by the organization through the block chain online platform. Block chain technology can record the whole process of students' learning and life in primary and secondary schools.

**Authentication Layer**

Using block chain technology to develop decentralized education system will help break the monopoly of educational rights by schools or government agencies, bring non-school educational institutions into the market, participate in the formulation of educational content with multiple themes, and conform to the concept of training all-round development students in compulsory education stage. Block chain technology has the characteristics of distributed recording and storage. If this feature can be applied in the field of education, it will allow any educational institution and platform to carry out cross-system and cross-platform learning behavior and learning results recording. By establishing consensus mechanism, formulating intelligent contracts, scientifically certifying students' learning in school, online learning, social learning and other performance, reasonably allocating the proportion of each learning link, automatically calculating students' comprehensive evaluation scores in the whole stage of primary and secondary education.

**Application Layer**

**Comprehensive Record of Learning Process.** Block chain technology is used to record the whole process of students' learning from all angles. This record not only records the learning process of cultural courses, but also records the whole process of quality training and ability
training. It can truly reflect the comprehensive education that students receive in primary and secondary schools.

**Automatically Generate Real Student Files.** Using the verifiable and tamper-proof storage system of block chain, the whole learning process of students in primary and secondary schools is recorded on the public chain. Student's learning archives are stored in the block chain database, which can ensure the authenticity of learning archives. This will be the perfect solution to solve the falsification of student's archives and greatly enhance the recognition of student's archives.

**Providing Important Basis and Reference for "Interview" for Further Education.** Students can use the data and documents provided in the block chain database to prove their learning experience, as an effective proof of interview and study. These block chains, which contain detailed learning information for students, will provide one-stop license-based services for students and schools, facilitate access, sharing and verification, and ensure that the information has high credibility. According to the records of students' files in the block chain database, the recognition map of students' study, interest and comprehensive performance can be drawn. The school can fully understand the real situation of students in all aspects, which is conducive to better realizing the two-way choice between schools and students.

**Summary**

Block chain is a decentralized distributed database system, which is participated by all nodes. It can be understood as a public accounting mechanism based on the Internet. All users in the network are responsible for bookkeeping and checking together. The information has authenticity and cannot be tampered with. Block chain technology has the characteristics of distribution, decentralization and traceability. If block chain technology is applied in primary and secondary education, it can increase diversified education mode in the traditional paper textbooks and chalk-and-blackboard education mode, combining with advanced information technology, greatly improve the educational effect, comply with the call of "burden reduction" of the state, and reduce the "bags" of primary and secondary students.

The application mechanism of block chain technology in elementary and secondary education, which combines computer information technology and Internet technology, will deeply integrate school learning, online learning, social learning, other performances and block chain technology. The whole process of students' learning in elementary and secondary schools will be recorded truthfully. Through the consensus mechanism and the scientific certification learning process of intelligent contract, the comprehensive evaluation score is finally calculated. In view of the existing problems in primary and secondary education, applying block chain technology in primary and secondary education can change the traditional education mode, strengthen quality education and ability training, lighten students' schoolwork burden, and promote the healthy development of primary and secondary education.

**Acknowledgement**

This work is supported by the “Project of Social Science Planning Fund of Xi'an City in 2019”, the topic name is “Research on the Application of Block Chain Technology in Xi’an Primary and Secondary Education” and the project number is 19Y84.

**References**


