

# *Research on Problems and Improvement Strategies of Learning Achievement Certification Based on Block-Chain Technology*

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**Abstract:** Promoting the digital learning achievement certification system of higher education will help improve the lifelong learning system and accelerate the construction of a learning society. This paper takes higher education digital learning achievement certification as the research object. This paper analyzes the problems existing in higher education learning outcome certification, such as low adaptability of recognition concept due to the prevalence of academic education standards, low participation of stakeholders, single composition of recognition subject, delayed construction of laws and regulations, ambiguous recognition process, lack of organizational experience, poor flexibility of recognition method, and weak liquidity of recognition results. Therefore, based on the "14th Five Year Plan" development plan and the "China Education Modernization 2035" development goals, this article suggests the formulation of sound laws and regulations to provide a solid rule system for the recognition of learning outcomes; And it is also recommended to establish a sound organizational structure to provide reliable organizational support for the recognition of learning outcomes; And it is recommended to have stable financial investment to provide a substantial material basis for the recognition of academic performance. It is also suggested to establish a comprehensive quality monitoring system to provide effective and accurate guidance for the recognition of learning outcomes. It is hoped that strict information disclosure can be carried out to provide a reliable dispute resolution mechanism for the recognition of learning outcomes, as well as five party linkage guarantee measures.

## 1. Introduction

In recent years, China has developed rapidly in the depth integration of information technology and education and teaching practice. In April 2018, the Ministry of Education issued the Education

2.0 Action Plan, pointing out that "we will actively explore effective ways to record, transfer, exchange, and authenticate intelligent learning effects based on new technologies such as block-chain and big data, form a ubiquitous and intelligent learning system, and promote the deep integration of information technology and intelligent technology into the whole process of education and teaching" [1]. In February 2019, the "China Education Modernization 2035" issued by the Central Committee of the Communist Party of China and The State Council further emphasized the "establishment and improvement of the national credit bank system and learning achievement certification system." In recent years, the certification system of non-formal learning outcomes such as higher education and community education (credit bank) has been paid more and more attention by scholars at home and abroad, and has achieved certain results, but the reliability, timeliness, credibility and fairness of the certification of higher education learning outcomes have not been satisfactorily improved. What are the reasons that restrict the effectiveness of higher education learning outcome certification? How to improve the reliability and validity of higher education learning outcome certification to better meet the needs of building a lifelong education system and promoting the construction of a learning society? Because of its characteristics of collective maintenance, non-forgery, full traceability, openness and transparency, block-chain has laid a solid foundation of "trust", created a reliable "cooperation" mechanism, and has broad application prospects. Therefore, promoting the application of block-chain in education and teaching undoubtedly has positive practical significance. We expect block-chain technology to expand innovative ideas and approaches for the certification of learning outcomes in higher education. The research content of this paper is shown in Figure 1.

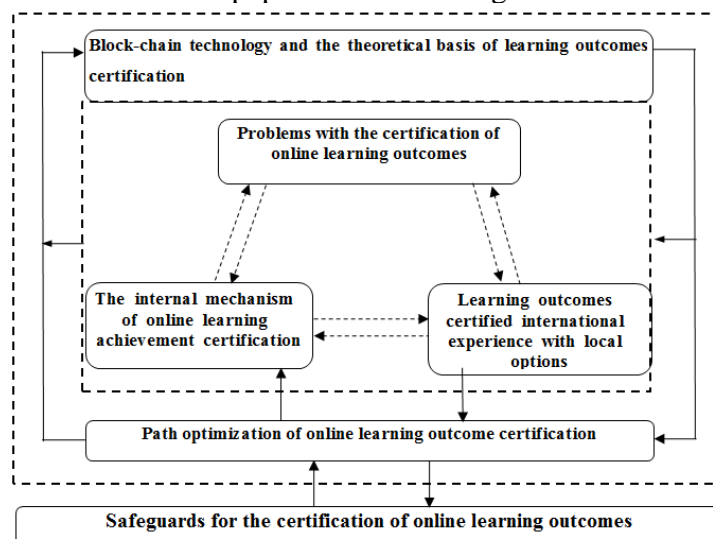


Figure 1: The research content of this paper

## 2. Problems in the Certification of Learning Outcomes in Higher Education

### 2.1. The Prevalence of Academic Education Standards Has Resulted in Low Adaptability of the Recognition Concept

On the one hand, the concept of identifying informal learning outcomes is not clear. At present, in the concept of learning achievement recognition in Chinese colleges and institutions, the subjective status of students is not understood enough, and the evaluation standard of academic education is still used [2]. The evaluation standards and methods of academic education are not suitable for the identification of skilled talents, so it is urgent for colleges and institutions to reform

the traditional evaluation concept. In the reform and expansion plans of colleges and institutions, it has been clear that the admission examination method should be reformed, and the "cultural test + skill level test" is used for social students. On the other hand, there is no informal learning outcome recognition system. The implementation of the achievement recognition of non-academic education in colleges and institutions will have a particular impact on the evaluation concept of teachers in colleges and institutions. Teachers who are accustomed to the evaluation mode of academic education often measure students based on the mastery of the subject knowledge system, which will lead to non-standard evaluation standards for skilled talents and unscientific evaluation results. First, the main body is identified as school teachers, lacking the participation of other stakeholders. Second, it is difficult to accurately evaluate the results of non-academic education because the identification criteria are mainly academic education standards. Third, the identification method is single and rigid, lack of flexibility and richness. Fourth, the social recognition of the identification results is low, and it is difficult to achieve mobile transformation across the country.

## **2.2. Low Stakeholder Participation Results in a Single Identification Body**

On the one hand, there is a lack of government personnel involved. It is mainly manifested in two aspects: the lack of government department personnel to determine the identification standard and the lack of unified identification level of government department personnel. Therefore, China's vocational colleges need to enrich the composition of the identification group, should attract government personnel to join, and carry out overall management of the identification work. At the same time, we should strengthen communication and coordination with human-created departments and industry departments, give full play to the functions and roles of various stakeholders, and form a work pattern of joint governance of multiple social subjects [3]. On the other hand, the lack of industry personnel participation. It is mainly manifested in two aspects: the lack of professional personnel to control the identification process and the lack of industry personnel to participate in the evaluation process. Therefore, in the identification materials evaluation team, it is necessary to set up a 3-7 expert review panel according to the different qualification levels of the applicant. The review panel is composed of academic personnel and external experts, and the personnel from the industry and enterprises should be kept in a certain proportion to join the identification team [4].

## **2.3. The Delayed Construction of Laws and Regulations Causes the Identification Process to Be Ambiguous**

On the one hand, relevant national legislation is lacking. It is mainly manifested in the lack of provisions on credit accumulation and transfer in the national education law and the lack of provisions on credit accumulation and transfer in the national specialized law. In foreign countries, a special law on credit recognition has been formed, but China has not yet issued a special law on this aspect. This has resulted in different regions and universities in our country, and flexible identification principles and policies have been set up around the needs, but it has brought about the problem that the national identification standards are not uniform, the identification results cannot be circulated, and the quality of the identification results lacks legal protection, and the recognition degree is low in the society [5]. On the other hand, the relevant national policies are lacking. It is mainly manifested in the lack of clear requirements for qualified developers and the lack of quality supervision and management rules for the identification of results. Policy is the government's intention to solve public problems and the expression of actions to achieve these intentions. The implementation of the recognition system of informal learning outcomes in colleges and institutions needs a comprehensive policy and system guarantee, that is, through various rules, regulations, laws, orders, legal case rulings, administrative decisions, etc., to provide operable action guidelines for

various stakeholders. In recent years, in order to promote the formation of the accumulation mechanism of learning achievement recognition, China has issued many policy documents [6].

#### **2.4. The Lack of Experience of Organizational Personnel Causes Poor Flexibility in the Identification Method**

On the one hand, the personnel were identified as inexperienced. At present, the time for the implementation of informal learning results in colleges and institutions in China is short, and the implementation experience is insufficient, which is mainly manifested in the lack of learning advanced foreign experience and regular training of certified personnel. On the other hand, the identification method values a single. According to the status quo of informal learning achievement recognition in colleges and institutions in China, about 74.69% of the students think that the recognition method adopted by their colleges and universities is reasonable, and about 75.93% of the students think that the recognition method adopted by schools tests the real level of learners. It can be seen that the student group is still satisfied with the choice of the informal learning outcome recognition method of each college or institution. However, from the perspective of the teacher questionnaire, only 38%, 42%, 38% and 48% of the subjects in the selection of identification methods (interview method, portfolio method, test method and portfolio method) respectively believe that the school adopts such identification methods [7]. It can be seen that most colleges and universities fail to comprehensively apply multiple evaluation methods to display and measure the accumulated learning results of students. In addition, the construction of relevant information platform is not perfect. Learners can accumulate their bank credits, and when they meet the credit requirements of relevant academic education or non-academic education, they can apply for withdrawal and conversion into the corresponding academic certificate or non-academic qualification certificate after certification. However, from the actual situation, credit banks need to further develop the function of storage of learning results, which needs to be combined with the labor market talent files to record learners' training experience, award experience and work experience in real time, so as to facilitate further extraction and identification of learning results.

#### **2.5. The Weak Operation Foundation of the System Leads to Weak Liquidity of the Identification Results**

On the one hand, it is difficult to build cooperative mechanisms between regions and departments. The recognition of informal learning results of colleges or institutions is a nationwide recognition system, which should cover 34 provincial administrative regions, but it requires regional administrative departments to strengthen cooperation with regional credit banks and national credit banks, and form integrated policies to promote credit accumulation from the school education management system to the regional education administrative system. Implement national policy documents on credit recognition and accumulation. From the aspect of departmental cooperation mechanism, create institutional conditions for the recognition of informal learning results. On the other hand, each college or institution credit management is difficult. At present, our country is actively practicing the national qualification framework system and the national credit bank system, which needs the reform of credit management system in our education system. The implementation of credit management in colleges or institutions requires the educational system of colleges or institutions to cooperate with credit bank reform, which is to form a unified system of credit management from curriculum to teaching and learning evaluation. Under the credit management mode, teachers in colleges and institutions are required to reform the previous curriculum system and construct a modular curriculum system. At the same time, reform the teaching mode to form a flexible project teaching; The most important thing is to reform the way of

teaching evaluation, from the previous point-only theory to the evaluation of learning results. However, this reform is not done overnight, but based on the introduction of credit banks, strengthen the application of block-chain technology in credit banks, and deposit students' learning experiences such as academic results, internships, training experiences, and work experiences into national credit banks, so as to facilitate learners, educational institutions and employers to view relevant information anytime and anywhere.

### **3. Safeguards for the Certification of Digital Learning Outcomes in Higher Education**

The implementation of the recognition of learning results needs the cooperation between public education and market education, higher education and education, certification agencies and certification agencies. Without a guarantee mechanism, the recognition of learning outcomes can be said to be disorganized. In recent years, in order to ensure the effectiveness of the recognition of learning outcomes and the maintenance and coordination of the learning outcomes conversion system in the later stage, various countries and regions have made continuous efforts from the aspects of laws and regulations, organizations, funding investment, quality control, etc., and built a relatively comprehensive guarantee mechanism for the recognition of learning outcomes.

#### **3.1. Sound Laws and Regulations Provide a Solid System of Rules for the Recognition of Learning Outcomes**

The establishment of learning achievement recognition system is a top-down government project, and the standard system of credit recognition and transfer must be promoted and implemented throughout the country. At the same time, the conversion of credit is related to the awarding of degrees and the recognition of academic qualifications. Therefore, credit recognition transfer must be established and operated under the national legal framework. All countries in the world also promote the implementation of policies through legislative reform. From the construction process of the learning achievement recognition system in various countries, we can find that laws and regulations are the embodiment of the national will to allocate, guide, control and coordinate the educational power and the development trend of the educational cause [8]. Without the restriction of relevant legislation and policy documents, the recognition of learning outcomes loses its rationality, legitimacy and effectiveness. Therefore, whether it is the establishment of a national credit bank or the establishment of a national qualification framework, the establishment of a unified standard qualification framework, the clarification of the authority and responsibility of various organizations, the coordination of human, material and financial resources to promote the construction of the platform, legislation is the premise of institutionalizing the guarantee mechanism.

#### **3.2. A Sound Organizational Structure Provides Reliable Organizational Support for the Recognition of Learning Outcomes**

Learning outcome recognition is a complex system, in order to ensure its authority and credibility, in addition to the establishment of a special system, but also need to set up a special organization and personnel, in order to clarify responsibilities, overall coordination. The establishment of specialized organizations and personnel in the following aspects ensures the equivalence of qualifications from different educational institutions. First, establish a quality supervision agency. Many countries, such as the United Kingdom, Korea, Japan, New Zealand, Norway, etc., have established national Superintendents of Quality of Education, whose function is to assure stakeholders that even if graduates complete their awarded qualifications at different

educational institutions, they will achieve learning outcomes commensurate with the level of qualification through consistent assessment criteria. Second, establish an inter-institutional relations committee; At the same time, each institution and personnel performs their own duties and responsibilities, with a clear division of labor, which can meet the consultation needs of educational institutions and learners, promote information exchange and interoperability, and play a pivotal role in the process of learning outcome recognition [9].

### **3.3. Stable Funding Investment Provides a Substantial Material Basis for the Recognition of Learning Outcomes**

The effective operation of the learning achievement recognition system cannot be separated from the financial support. The establishment of evaluation institutions and personnel, the operation of credit information platform, and the credit loss subsidy caused by credit transfer between universities all require a large amount of funds. International experience shows that government, social self-financing and individual tuition are the three main sources of funding. First, the government takes responsibility. As the technical support of the lifelong education system, the learning outcome system has the nature of public welfare, and the government should bear most of the expenditure to reduce the cost barrier of learning for adults. The second is social self-financing. For example, in Mexico, France and other countries, vocational training projects are financed jointly by social organizations and the state in the form of joint funds for job security. Third, individual tuition. Personal tuition is an important source of funding in the recognition of higher education learning outcomes. Almost all students have to pay higher education tuition, and family education expenditure accounts for a large proportion of public education budget.

### **3.4. Comprehensive Quality Control Provides Effective and Accurate Guidance for the Identification of Learning Outcomes**

Quality control is the key and prerequisite for the circulation of learning results, and improving the transparency and recognition of education quality is the core task of quality assurance. The establishment of the quality control system should be carried out in accordance with the principle of "combining internal and external, regular and irregular". On the one hand, the formation of institutions self-rated core internal quality supervision. Self-designation represents the transfer of responsibility for quality control from external quality assurance agencies to educational institutions themselves, which have the right to self-review school programs without having to be audited by the national Education Quality Supervision Authority. On the other hand, external quality supervision with the third sector review as the core should be formed. European universities consider quality assurance to be one of the most important reforms of the Bologna process. Almost all countries focus on teaching, research, student services, admissions systems, internal governance of institutions, etc., with greater emphasis on disclosure of negative content in audit reports, and greater attention to the degree of participation of employers and students [10].

### **3.5. Strict information disclosure provides a credible dispute resolution mechanism for the recognition of learning outcomes**

Whether the results of learning outcome recognition are fair and just, and whether its gold content is equal to the results of formal education, is a great challenge to the departments of learning outcome recognition in colleges and universities. In order to make the learning results can be recognized by the public, educational institutions and employment units, it is necessary to establish a strict information disclosure system from two aspects to ensure the standardization of the

learning results recognition process. First, strict information disclosure is an important principle for the recognition of learning outcomes. For formal learning achievement recognition, course credit recognition is mainly based on standardized curriculum and teaching syllabus. Secondly, a multi-body determination panel promotes dispute resolution. In theory, the identification department of educational institutions should make a differentiated identification of the level and level of informal learning outcomes, but from the practical point of view, it has a very high requirement for the quality of the identification technicians and the improvement of the identification standards [11].

#### 4. Conclusions

The article discusses the benefits of promoting the certification system of digital learning achievements in higher education for the lifelong learning system and the construction of a learning - based society. Then, various problems in the certification of educational achievements are analysed, such as the limited adaptability of recognition concepts due to standards, etc. Then it is mentioned that based on China's plans, it is necessary to establish and improve laws and regulations to provide a framework for achievement assessment. It is also necessary to improve the organizational structure, ensure capital investment, and conduct comprehensive quality monitoring, etc. To promote the coordination of all parties and promote the certification of digital learning achievements.

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