Research on Application of Block Chain Technology in Graduate Practical Teaching

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Abstract: As a comprehensive learning method, graduate practical teaching is facing many difficulties in its implementation. As an integrated application of technologies such as distributed databases, point-to-point transmission, consensus mechanisms, and encryption algorithms, Blockchain technology has gained much attention in the education field in recent years. This article first sorts out the four major characteristics of the Blockchain and then explores the value reconstruction of the four perspectives of graduate practical teaching based on the Blockchain technology. Finally, from the perspective of top-level design, this article proposes the development path of using Blockchain technology to promote graduate practical teaching innovation, to explore the deep integration of modern information technology and graduate practical teaching, and to provide a reference for informatization to lead educational concepts and educational mode innovation

1. Introduction

At present, many universities have explored a set of practical teaching system for graduate students, but the practical teaching is also faced with the inconsistent demands of multi-subject interests, difficulties in synchronizing the practical teaching of various disciplines, the uncertainty in the number of students in each major, and the difficulty of standardization of evaluation criteria. This study is intended to discuss the change brought about by the Blockchain technology for graduate practical teaching and how to use Blockchain technology to promote the innovation of graduate practice teaching, so as to promote the development of graduate practical teaching.

2. Practical Teaching and Dilemma of Graduate Students

2.1 Postgraduate Practical Teaching System

The practical teaching system of graduate students mainly refers to all practical teaching links in the whole process of graduate students' study. Some scholars attribute practical teaching objectives to four aspects: inheriting practical knowledge, promoting practical rationality, optimizing practical strategies and generating practical wisdom [1].

2.2 Difficulties in Practical Teaching for Graduate Students

2.2.1 The Interests of Different Subjects Are Inconsistent

As a whole, the practical teaching of graduate students includes different types and many subjects. The concerns and objectives of different subjects in the practical teaching show different characteristics, and the interests of all parts are difficult to unify. Schools consider their training goals, graduate students pay attention to their own skill improvements and practice units focus on labor price and quality. If the practice unit neglects the student's actual demand, the students will not be well-trained. This condition would obviously be contrary to the original intention of practical teaching.

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2.2.2 Difficulties in Synchronization of the Practical Teaching between Different Subjects

Taking a 211 university A in southwest China as an example, there are 19 first-level doctorate authorization points and 39 first-level master's degree authorization points in its graduate school. The transportation engineering ranks as the top 2% in China with the evaluation grade A+, while the public management of this university ranks only top 40%~50% with grade C+. Because of the different properties and requirements of each subject in the practical teaching, it is difficult for the training goals of graduate students to be consistent, and the practical teaching between different subjects are in low synchronization with each other.

2.2.3 The Number of Students in Each Major is Uncertain

For the long-term operation of practice units, the demand for interns is expected to be stable. However, due to the change of economic and political conditions and the variation of need of graduate students, the number of graduate students tend to fluctuate. Thus it is difficult to keep the balance between the demand for interns of practice units and the number of students a university can supply.

2.2.4 Difficulty in Forming a Standard Criterion for Performance Evaluation

The evaluation of the internship performance for graduate students is made by their practice units, and it can also be made by the heads of the department. However, it is hard to be free from bias in both ways. If there is no significant relationship between the income of the practice unit and the improvement of the practical skills of graduate students, then the high scores the students get cannot represent their real practical ability and the their gains during the practical teaching.

3. Blockchain Overview

3.1 A Brief Introduction of Blockchain

Blockchain is a core technology proposed by Satoshi Nakamoto in 2008 to create encrypted currency through immutable distributed records on thousands of nodes [2]. A simplified Blockchain structure is shown in Figure 1.

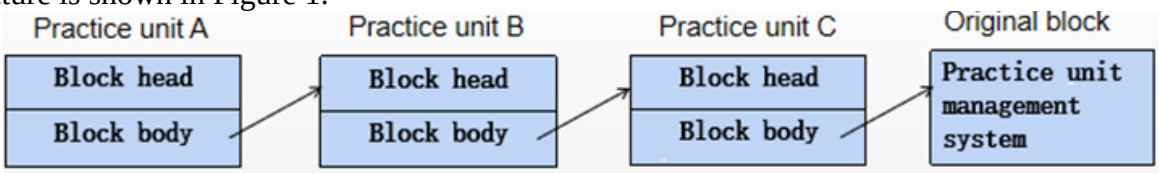

Figure 1 Data Block and Blockchain Schematic

If the practice unit A initiates a transaction to the school through the Blockchain network, the network uses encrypted authentication to uniquely identify users, and the transaction will be broadcast to the network memory pool. New blocks are generated by obtaining a certain number of approvals, and then the consensus is achieved. Then, a new block is formed, and each node will be updated.

3.2 Blockchain Characteristics

3.2.1 Decentralization

The process of verification and transmission of data based on distributed system in Blockchain is decentralized. In this structure, trusted connections between distributed nodes are established by mathematical methods rather than centralized organizations. Each node in the network trusts each other and exchanges resources directly, and no longer depends on the central server or mechanism.

3.2.2 Openness

The point-to-point transmission of Blockchain systems enables people to obtain information through an open interface. System participants can know the operation rules and content of the system, and the data exchange between nodes is verified by the digital signature.

3.2.3 Independence

The essence of Blockchain is point-to-point trading, which means that all transactions require no participation of third parties. In Blockchain applications, the combination of government activities and others can make these non-financial activities independent [3].

3.2.4 Safety

Blockchain uses shared public ledgers stored on thousands of nodes, and the ledgers synchronizes in real time. Successful tampering requires changing more than 51% of the ledgers stored in the network, which enables the Blockchain to balance between efficiency and security [4].

4. Reconstruction of the Value of Blockchain to Postgraduate Teaching Practice Course

4.1 School-Based Central Ledger

In the field of practical teaching for graduate students, we can construct an intelligent contract system of practical teaching through Blockchain technology. For example, universities can enter into a contract with practice units to clarify their respective responsibilities, so that graduate students can easily study in a practice unit. After finishing practical study, only schools, graduate students and practice units need to share data in networks of different geographical locations or multiple nodes.

4.2 Public Blockchain with Discipline as a Unit

The point-to-point transmission technology of Blockchain system is applied to the practical teaching, so that the graduate students of each subject can query information in the system through the open interface. Data blocks for each subject are maintained collectively by all graduate students of the subject [6]. Graduate students are able to know the requirements of the corresponding subjects. The data of any practical activities is verified in the subject data block by digital signature technology and follows the established rules of the system to form a public Blockchain with discipline as a unit.

4.3 Private Blockchain with the Practice Unit as the Main Part

In the network of the Blockchain of graduate practical teaching, each practice unit and the graduate student are in different nodes. Through the consensus mechanism, the nodes form a wide range of practical requirements and guidelines to ensure the universality and homogeneity of practical teaching, and constantly adjust the development direction of new technologies in the industry to meet the real needs of enterprises and the future needs of the industry.

4.4 Standardization of Performance Evaluation Criteria by Scale

The Blockchain network of practical teaching uses a one-way hash function to link between blocks, which is a mathematical function that accepts variable length input strings and converts them into fixed length binary sequences, and the newly generated blocks strictly follow the linear time series [5]. When a graduate student submits his work to the platform through a unique account, the smart contract running on it will automatically review the performance. All behaviors of this student during the contract period will be saved into the block as evidence for the later evaluation.

5. The Innovation of Using Blockchain Technology to Promote the Development of Graduate Practical Teaching

5.1 Improving the Service of Graduate Practical Teaching Using Blockchain

In the Blockchain system of graduate practical teaching, universities should formulate policies related to the practical teaching, forming a central ledger with universities as the main body, to coordinate the practice teaching work of the whole school. The intelligent contract originally signed by the university with the practice unit will automatically verify all practical teaching aspects and

find the problems in time to ensure the smooth development of practical teaching.

5.2 Forming the Hierarchical Model of Graduate Practical Teaching Using Blockchain

The point-to-point transmission technology of Blockchain system makes graduate students able to query data through the open interface. Under the Blockchain system, practice elective courses can be set up between different practice participating nodes to provide technical support for students with high comprehensive quality ability to take cross-disciplinary elective practical courses to meet the individual needs of different students, cultivating the habits and ability of graduate students to actively carry out creative learning.

5.3 Realizing the Seamless Interface between Graduate Practical Teaching and Industry Needs

The university and practice units sign smart contracts, in which the needs of the practice unit and the training objectives of graduate students in each discipline are clearly defined, and the adaptability of graduate students' practical activities and industry development is automatically verified within the contract period. This will ensure a seamless integration between graduate students training and social needs. Universities can use distributed ledgers to show graduate students' academic achievements and professional skills to practice units, and build bridges between students and enterprises to establish a new model of university-enterprise cooperation [7].

5.4 Improving the Learning Record of Postgraduate Teaching Practice Course by Using Blockchain

Using Blockchain to record cross-regional, cross-college, and even cross-national learner information, the learners in different environments can access equally effective learning records [8]. Because of the excellent security mechanism of Blockchain, universities and practice units can quickly realize the record and inquiry of graduate students' practical learning in low coat. Cooperating with the system of mutual recognition of achievements, practical learners can obtain the certificate of practice easily. Because of the decentralization property of Blockchain, there is no need to build a central system for trading and no need to worry about fairness.

6. Conclusion

In summary, colleges and universities can improve the organization and management of graduate practical teaching through Blockchain technology, including: by signing the central ledger of the smart contract, strengthening the guarantee of the practice teaching service for graduate students, forming a practical teaching hierarchical model that integrates “teaching, learning and doing” through the private Blockchain, realizing the seamless connection between the graduate practical teaching and the needs of the industry through distributed ledger, and improve the learning record of the practical teaching through blockchain encryption. It can be seen that the Blockchain technology has great potential for application in the field of education, which helps to build a more open and credible education system [7]. This will promote the deep integration of modern information technology and graduate practical teaching courses, and provide reference for the innovation of information-led educational concept and educational mode.

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