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Research Article

Innovation and Design of Physical Teaching Resource Intelligent Distribution Platform Based on Blockchain Technology

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This article aims to study the innovation and design of an intelligent distribution platform for physical teaching resources based on blockchain technology (BT). With the continuous shrinking of teaching, the problem of balanced shrinking of teaching has become a hot issue in the field of teaching. In the distribution of physical education resources, there are problems such as lack of physical equipment and not fully open teaching, which as an important and shrinking point in the overall shrinking of society, will inevitably be included in the ranks of the overall shrinking of urban and rural areas. Physical teaching should be mentioned in the proposal as an important content of the school's teaching. It can make teaching resources more distinctive and personalized, closer to life, and can also make more sports resources become school materials. School physical teaching resources are the basis for all school physical teaching. However, for historical and practical reasons, the gap in the allocation of physical teaching resources in urban and rural primary and secondary schools is gradually increasing. This problem has always restricted the modernization of school sports. To achieve the coordinated shrinking of urban and rural school sports, the balanced shrinking of urban and rural school sports resources is a prerequisite. It enables users to build portrait and content intelligent recommendation algorithms to build a cross-platform and geographic one-stop teaching resource intelligent distribution platform. Through experiments, the statistical data of the questionnaire survey results after the design and test show that 80% of the primary and middle school students are satisfied with the subplatform and believe that the design of this platform has a role in enhancing physical exercise.

1. Introduction

1.1. Background. Physical teaching is an important part of school teaching and a prerequisite for students to improve their cultural scores. Physical teaching reform is the key to continuously improve the quality and effectiveness of physical teaching, and physical teaching resources affect the progress and quality of physical teaching reform to a large extent. Therefore, the design of an intelligent distribution platform for physical teaching resources can reasonably allocate physical teaching resources and promote the reform of how physical teaching is taught in the elementary and secondary schools.

1.2. Significance. At present, in China's physical teaching system, more and more physical teaching teachers are unable to conduct physical teaching. Even if they have better teaching methods and teaching concepts, they do not have a good platform. The distribution of teaching resources can fully implement the modernization of physical education teaching in the general direction. It can cultivate students' physical education literacy, integrate teaching resources, optimize teaching structure, reflect school teaching characteristics, and improve teaching efficiency.

1.3. Related Work. Sikorski et al. and other scholars highlighted BT's research and application potential in relation to the fourth industrial revolution [1]. Zhang and Wen proposed a IoT e-commerce model specifically designed for IoT e-commerce, redesigned many elements in the traditional e-commerce model, and finally realized it on the IoT with the help of P2P transactions based on blockchain and smart contracts for smart property and payment data transactions

[2]. Their research has played a pivotal role in my country's e-commerce industry, but their research has not been implemented in the teaching industry. The reforms have led to a gradual increase in the relative performance of students in low-income school districts, which is consistent with the goal of increasing teaching opportunities for these students. The hidden influence of school resources on teaching achievement is great. Researchers such as Lafortune *J* found that reforms have led to a gradual increase in the relative performance of students in low-income school districts, which is consistent with the goal of increasing teaching opportunities for these students. School resources have a great influence behind the scenes of teaching achievements. The school has abundant teaching resources, which is also conducive to teachers' teaching. Teaching resources are integrated with teaching results. If the teaching resources cannot be satisfied, the teaching results will also be affected [3]. But they have not conducted in-depth analysis and research on the intelligent distribution of physical teaching resources.

1.4. Innovation. This paper proposes an innovative design of an intelligent distribution platform for sports resource based on BT. The focus of this model is decentralized/intermediate blockchain trust, collective maintenance, smart contracts, security, and reliability. The system itself does not need external access to ensure the reliability and authenticity of the data, and the data are stored, transmitted, and verified in a distributed structure, so the node can still operate normally if the data are lost, which helps to solve the problem of different regions and regions under the traditional model. The problem of the uneven distribution of school physical teaching teachers and the serious imbalance of teachers provides a transparent and fair circulation environment for the distribution of physical teaching resources.

2. BT and Teaching Related Professional Concepts

In this paper, the POW algorithm and the POS algorithm in the BT technology are mainly explained, and the two algorithms are explained in the teaching resources. The two methods are described below.

2.1. PoW Algorithm. The shape of the block H supplied by the node must meet the following requirements: H (A) target, where B is a specified hash algorithm, and T is a defined integer [4, 5]. That is, the hash value in its entirety. The block must be less than the supplied amount and include a predetermined number of targets [6, 7]. If the node finds such a lawful zone, it will reward the mines excavated with a particular digital money [8, 9]. The hash function is proper and random. The hash value may be substantially different than earlier in the event of slight modifications to the source data [10, 11]. The hash value may appear out of the predicted range, or the value may be too large, which may make the calculation impossible. The probability P of discovering a valid block in each test is as follows:

$$P = \frac{T(\text{target})}{H(\max)}. \tag{1}$$

The following formula will be used to change the value of T in Bitcoin:

$$T(\text{new}) = \frac{T2016}{2W}.T(tar). \tag{2}$$

Formula (3) may be used to calculate the difficulty value of the created block.

$$D(\text{difficulty}) = \frac{T1}{T(\text{current})}. \tag{3}$$

2.2. PoS Algorithm. Finding a legal block in PoW requires a lot of calculation, a lot of energy, and time. In order to speed up the creation of blocks, PoS also considers the node's share in the digital currency.

$$H(B, \text{t}) \leq \text{b} * T(\text{target}). \tag{4}$$

2.3. The LFM Recommendation Algorithm

$$m(x, y) = m_x^T n_y = \sum_{i=1}^{I} m_{xi} n_{yi}, \tag{5}$$

m (x,y) represents the pair of user and item. If the user clicks on the item, then m (x,y) is 1, otherwise it is 0. The model finally outputs the user vector and the item vector, namely Mu and Ni. The *i* in the formula represents the dimension of the vector, which is the number of factors that affect whether the user likes the item or not [12, 13]. Supplement: This formula is to calculate user m's interest in item *n*, which is a certain value of a matrix, and *i* is the number of hidden categories.

The LFM loss function

$$L = \sum_{(\text{x,y})\in D} \left(\text{m}(x, y) - m^{LFM}(x, y)\right)^2,$$

$$L = \sum_{(\text{x,y})\in D} \left(\text{m}(x, y) - \sum_{\text{i}=1}^{I} MxiNyi\right)^2 + \beta|Mx|^2 + \beta|Ny|^2. \tag{6}$$

In the formula, m (x, y) is the label of our training sample, which means that if the user clicks on the item, then the label is 1, otherwise the label is 0. The latter item is the user-to-item estimated by our model. The degree of preference is the product of the transposed parameters M (x) and N (y) of the model output, where D is the set of all training samples [14, 15]. It can be seen that if the product evaluated by the model is close to the label, the value of the loss function is small, and vice versa. In the second formula, the model estimation type is expanded according to the LFM modeling formula, where β is the normalization factor, which is used to balance the secondary loss and normalization conditions. If the type evaluation is the same as the label, then the value of the function-valued loss is almost 0.

The purpose of normalization is to simplify the model so that M (x) and N (y) match the data in the training sample, which will make the model parameters more complicated and weaken the normalization ability. In this paper, the two algorithms are used to explain the calculation of the internal operation of the platform. Through these two calculations, the required resources can be determined for reasonable allocation.

2.4. Physical Teaching Resources. So far, the concept of physical teaching resources has not been clearly defined, and they are all derived from the concept of teaching resources [16]. All the resources that can be used in teaching practice can be called teaching resources. That is to say: teaching resources are the general term for various resources needed in teaching practice. Therefore, it can be seen from the above fact that physical teaching resources refer to all kinds of resources required for physical teaching practice. At present, domestic physical education resources are insufficient superficial inquiry learning, physical education is too relaxed, and students are too obedient. By comparing the research results of physical teaching resources at home and abroad, it can be seen that the outstanding advantages of foreign elementary school physical teaching are mainly concentrated in different aspects, such as lifelong, healthy, individualized, and innovative. In terms of material resources, foreign sports venues are rich in resources, which can not only meet the needs of daily teaching but also advocate reasonable and full use of existing resources in society, schools, and so on and continuously improve the utilization rate of sports resources. For physical teaching teachers' resources, foreign countries advocate that physical teaching teachers have multiple skills, understand multiple fields of knowledge, and are good at adjusting teaching content flexibly according to the school's geographic conditions and teaching needs [17].

2.5. BT. The so-called blockchain technology, referred to as BT, also known as distributed ledger technology, is an Internet database technology that is characterized by decentralization, openness, and transparency, allowing everyone to participate in database records. BT is an emerging technology in recent years. Its application fields have completely exceeded finance and digital currency and have stepped into other fields. The application of BT to the field of teaching BD is a new kind of try. The application of BT in the field of teaching, due to its own characteristics, makes it possible to build a high level of confidentiality, not easily tamper with, and to record a series of data collected by the subject.

The data owner's ownership of the data is guaranteed, and the owner can decide with whom his data can be shared. These can promote the wide sharing and dissemination of teaching resources in society, ensure that teaching resources are not lost, and improve resource utilization [18].

However, due to the immature shrinking of BT, it is just starting to get involved in the nonfinancial field. Judging from the present level of technological shrinking and actual conditions, there will be some shortcomings and problems:

(1) Security issues. BT will publish the collected data in the entire network, that is, each block will record and store the data, which on the one hand ensures the safety and nonloss of the data; but on the other hand, whether it is students, teachers or teaching institutions such as schools, their basic information and related data will be recorded in public accounts.

(2) The problem of data storage space. The blockchain database records every transaction from the genesis block, and every new node needs to participate in the chain, download and update the data package that has been continued since the beginning [14]. The BT itself cannot be deleted. On the one hand, its nondeletable and unalterable characteristics lead to learning records and learning behavior data that can only be increased and cannot be modified. There are great requirements for storage capacity and search capacity, which will restrict its key issue of shrinking.

(3) The issue of technology landing. BT has always been used in the financial and currency fields, and the application of blockchain is still in its infancy. To implement it into real-world applications, a lot of technical details need to be considered. At the same time, the shrinking of big data technology (BDT) in the teaching field is not yet fully mature. The construction is also in the preliminary stage.

The shortcomings of blockchain technology are that it cannot be tampered with, can be cancelled, and the transaction ledger is easy to disclose. The larger the data, the higher the performance requirements and the delay.

2.6. Information Security Technology. Information security is very important in all aspects of the cloud platform software system, especially in the field of unified-identity authentication. Once the user identity information is leaked, the less serious it will cause personal privacy leakage, and the more serious it will cause serious damage to the entire cloud platform, because the first consideration in cloud platform design is information security. The information security of the cloud platform must ensure the confidentiality of the data, ensure the integrity of the data in the transmission process, in order to ensure the consistency of the user's identity and its declaration, and the nonrepudiation of the user's operations on the data. The information security technology used by the cloud platform is accepted below [19].

2.6.1. Assertion Information Is Transmitted in the Single Sign-On Systems, We Need to Encrypt the Assertion to Achieve Confidentiality of the Information. The so-called encryption is to organize the original plaintext information according to a certain algorithm and transform the plaintext information into an unrecognizable code, that is, ciphertext. Except for the legal recipient, no one can obtain the original information (plain text), nor can they read the encrypted information (ciphertext). On the contrary, we call the process of recovering the ciphertext into plaintext through a

specific algorithm as decryption. Both data encryption and decryption require keys, and they are called encryption keys and decryption keys, respectively.

2.6.2. Symmetric Encryption Algorithm. If the encryption key and the decryption key are the same, or if the decryption process can be derived from the encryption process, we call it a symmetric encryption algorithm. Commonly used are AES, RC4, and DES. Key management is the biggest problem of symmetric encryption algorithms. Firstly, the key is only how to ensure the security of the key transmission channel, how to ensure that both parties can ensure that the key is not leaked; secondly, if you send a message to multiple people, you need to make sure if the message is encrypted multiple times, so multiple keys will be generated. The encryption algorithm runs fast and does not consume much computer memory, avoiding a series of problems caused by computer heat.

2.6.3. Asymmetric Encryption Algorithm. Anyone can use the public key to encrypt the plain text. Because the private key cannot be inferred from the public key, the ciphertext is safe even if someone else obtains the public key. Only the person who owns the key can decrypt the ciphertext. The biggest problem with the asymmetric encryption algorithm is that its operation speed is thousands of times slower than that of the symmetric encryption algorithm, which increases the computing load of the server.

3. Design of an Intelligent Distribution Platform for Physical Teaching Resources

3.1. Architecture Design of the Intelligent Distribution Platform of Physical Teaching Resources. The intelligent distribution platform of sports resources adopts a content distribution method based on BT, which changes the existing pooling model of teaching resource platforms and solves the problem of author positioning, distribution, and delivery of high-quality content. Even content consumers, viewers, and others can obtain the corresponding profit share through activities such as promotion and sharing, interactions such as reviews and polls and the intelligent allocation of sports resources encountered by all users. Therefore, the architecture of the intelligent sports resource allocation platform is shown in Figure 1.

3.2. Intelligent Distribution of Physical Teaching Resources. According to the layout of the interface, the content delivery of teaching resources can be divided into two parts: intelligent recommendation and attention. Followed content will only display a list of the latest works of authors that the present user is following and will be distributed in the order of release time. The "smart recommendation" part is based on matching user portraits with content portraits, realizing

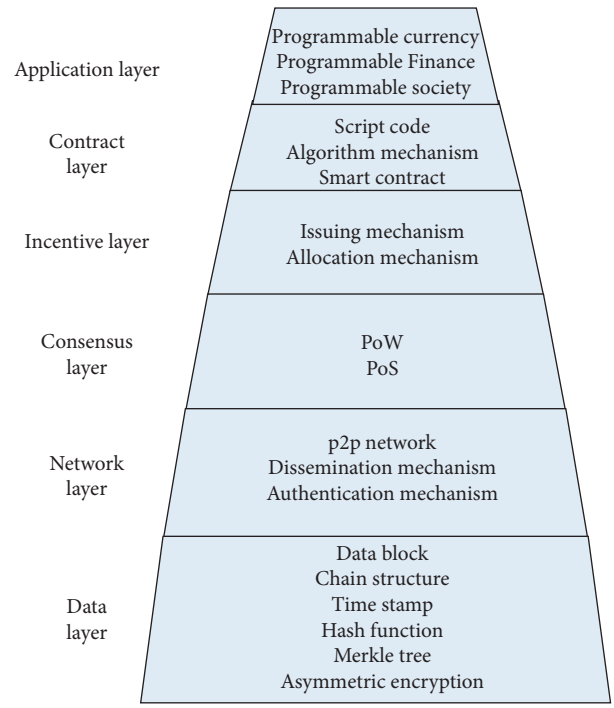

Figure 1: An architecture diagram of the intelligent distribution platform for physical teaching resources.

the personalized distribution of physical teaching resources, and noting that the implementation of the module is relatively simple and nonrepetitive, but the implementation of smart recommendation is relatively complex. The specific algorithm mechanism is as follows:

3.2.1. Build User Portraits. A detailed implementation document is required for the data product before starting to build the user portrait. If the user portrait planning document is about what to do, then the user portrait implementation document is to explain how to do it so that the developer knows the specific logic to proceed. Implementation, such as the weight of each factor of the label affected by multiple factors so that the final label value can be calculated. The tag value determines the weight of the influencing factors, and the user portrait can be established only through the tag value. Figure 2 shows the construction process of the user portrait.

3.2.2. Build Content Profile. The basic principle of the content-based recommendation algorithm is to obtain the user's preference for the type of sports based on the user's previous behavior and recommend sports curriculum resources similar to the sports curriculum that the user is interested in. Readers can intuitively understand the algorithm flow chart of base content recommendation from Figure 3.

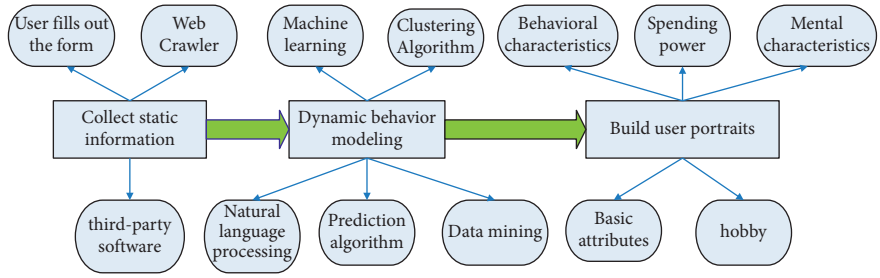

Figure 2: Construction process of a user portrait.

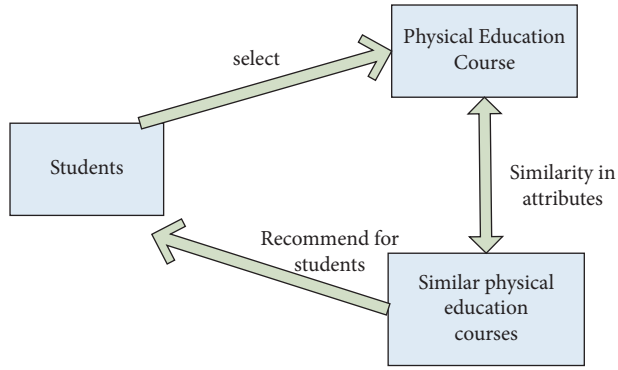

Figure 3: Basic principle of content recommendation algorithm.

Table 1: Primary and secondary school students' satisfaction with platform design.

Satisfaction/number of people	Boys	Girls
Very satisfied	40	35
Quite satisfied	12	16
Dissatisfied	6	6

Table 2: Primary and secondary school students' opinions on the revision of the platform design.

Insufficiency/number of people	There are fewer types of platform sports courses	The platform page design is not beautiful enough	The interactive function of the platform needs to be improved
Boys	22	15	5
Girls	21	10	8

4. Platform Innovation and Design Feed

After the design of the platform, Lee invited 120 middle school students to conduct a questionnaire survey on the design of the intelligent distribution platform for physical teaching. A total of 120 questionnaires were recovered, including 115 valid copies and 5 invalid surveys. Table 1 and Table 2 exhibit statistical findings of the statistical analysis of the feedback form.

It can be seen from Tables 1 and 2 that 80% of primary and middle school students are satisfied or relatively satisfied with the physical teaching resources recommended by the distribution platform and are willing to use the platform as an auxiliary tool for online physical teaching courses. 10% of elementary and middle school students are dissatisfied with the platform design and believe that the functional design of the platform is not perfect. Most students said that the platform sports curriculum resources are too few, and they do not have a sports curriculum they like, and some students think that the platform page design is not beautiful enough.

5. Conclusions

This article designs a brand-new smart distribution platform for physical teaching resources based on BT through the description of the POW algorithm and POS algorithm, as well as the introduction of physical teaching resources and information security technology and passes the

questionnaire investigation and performance test. It found that this system has good performance, which can improve the efficiency of physical teaching resource allocation, and make full use of scarce physical teaching resources. As a new model of distributed encrypted storage technology and applications, blockchain undoubtedly provides unprecedented opportunities. Blockchain can optimize and reshape the distribution system of physical teaching resources through strong security and decentralization. Based on the analysis of the correlation between BT and physical teaching courses, a blockchain-based intelligent distribution platform for physical teaching resources is being researched and designed. The platform uses artificial intelligence algorithms to create content and user portraits and uses related intelligent recommendation algorithms. Resource content transactions are automatically completed by the system in the form of smart contracts, thereby minimizing content delivery costs. By issuing and distributing encrypted digital currency on the side chain, people who publish content and those who watch courses can be encouraged and authorized to voluntarily create and distribute high-quality content in a decentralized manner. User interaction behaviors such as user likes, sharing, and comments will not only affect the matching of sports curriculum resource pushes but also the platform will respond based on the traffic value generated by these behaviors and provide them with rewards. Therefore, in order to make incentives fairer and effective, monitoring measures will further study effective content authentication mechanisms and effective traffic authentication mechanisms. For example, consider using large-scale data analysis techniques to mathematically model the content of interactive reviews. Improve the content quality of physical teaching resources; conduct more accurate assessments; and use manual reward policies to clear and filter traffic to avoid the negative impact of malicious traffic.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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