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Multimedia Smart Teaching of Blockchain and Interactive Teaching Nanomaterial Devices

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Abstract: The blockchain and interactive teaching nanomaterial device refers to a device that combines blockchain technology with nanomaterials. This paper aims to apply it to multimedia smart teaching to solve the existing development problems of the interactive teaching market. This paper first introduces the meaning of nanomaterials and how their mechanisms are characterized, and then gives an overview of the theory of blockchain technology, and finally compare and test the multimedia smart teaching and traditional teaching based on blockchain and interactive teaching nanomaterial devices. The results showed that the teaching method proposed in this paper achieves more than 8 points in the experience score of both teachers and students, which verifies its feasibility.

1. Introduction

The rapid improvement of the social and economic level makes the science and technology continue to improve, which accelerates the development process of industrial informatization. The market has put forward higher requirements for the future development of various industries, especially in the field of education. At present, many schools have begun to try to inject new technological elements into traditional education, making it attractive on another level. Although education caters to the characteristics of the times and continues to develop in the direction of intelligence, it has also achieved some results to a certain extent. However, there are still many problems, which have become a major obstacle to the sustainable development of education. As an important part of social development, education is inextricably linked with the rise and fall of a country. A good education can not only create countless valuable material and spiritual wealth, but also promote the prosperity and development of a country and a nation. Therefore, how to alleviate the contradictions existing in the education market at this stage is a question worth pondering for everyone.

Blockchain is an emerging technology that has been excavated during the in-depth development of the currency economy. With the continuous promotion and popularization of blockchain technology in countries all over the world, blockchain technology has begun to extend outward from the economic field, and has continuously penetrated into various fields with its unique high-tech nature. In the development of educational informatization and intelligence, it can improve the sharing and security of educational resources. It only needs to access any node with authority to realize the sharing of all resources within the system, and there will be no inconsistent information differences between nodes and between nodes and systems. Nanomaterials are new organic materials developed by scholars in the 1980s, with good light and heat energy. And when it is used as a supercapacitor electrode material, it has excellent capacitance characteristics. Using it in the multimedia smart teaching system can improve the system performance and improve the operating efficiency of the system.

Based on blockchain and interactive teaching nanomaterial devices, this paper explores the innovative development of multimedia smart teaching, which can promote the education industry to meet the characteristics of the times and achieve sustainable development. This has practical guiding significance and practical significance for interactive teaching, and can also provide new ideas for the application research of blockchain and nanomaterials.

2. Related Work

In recent years, many scholars have conducted research on blockchain and nanomaterials. Zhang W took the blockchain interactive information as the research object, and discussed how the intervention of official information on investors affects the stock price trend, and then predicted the stock price according to the emotional trend of the interactive information [1]. Zhang J proposed an interaction design method based on big data rule mining and blockchain communication technology, which mainly solves the optimization problem of blockchain data transmission performance [2]. Zhang Z proposed a quality traceability system framework for prefabricated components based on blockchain technology. The system framework adopts a hybrid blockchain architecture and dual storage mode, which can effectively achieve the goal of decentralization and has efficient traceability [3]. Based on the development of fibrous electrodes, Jingxia summarized the latest progress of carbon nanomaterials in flexible fibrous energy storage devices, including diversification of electrode preparation, functionalization and intelligence of device structures, and large-scale production equipment for fibrous electrodes[4]. Lin Y outlined progress in nanomaterial printable strategies to revolutionize the fabrication of power devices and integrated systems with attractive form factors [5]. Dinh NN introduced a group of organic optoelectronic devices designed using nanomaterial devices. The presence of inorganic nanoparticles in the polymer matrix of organic optoelectronic devices strongly affects all physical properties of the polymer [6]. To sum up, after several years of exploration, blockchain and nanomaterials have been deeply studied by many scholars, but there are not many researches on linking them into multimedia intelligent interactive teaching. Therefore, in order to promote the in-depth development of multimedia intelligent interactive teaching, the practical research on the integration of the three is urgent.

3. Multimedia Smart Teaching Based on Blockchain and Interactive Teaching Nanomaterial Devices

3.1. Overview of Nanomaterials

Nanomaterials are new materials developed under the background of the in-depth development of science and technology. It has been widely concerned by the whole society since its birth, and has a very considerable business prospect and future development [7]. In the classification of nanomaterials, nanocarbon materials have very excellent stability, which are often used as one of the industrial manufacturing materials of capacitors in the market in recent years. This paper mainly applies it to the system device of multimedia intelligent interactive teaching to improve the energy density of the system. There are many ways to characterize the structural components of carbon nanomaterials, as shown in Table 1:

Table 1. Structural composition characterization of carbon nanomaterials

Material range	Sequence	Types
Carbon nanomaterials	1	X-ray diffraction analysis
	2	Raman Spectroscopy
	3	Inductively Coupled Plasma Luminescence Spectroscopy
	4	Nitrogen adsorption isotherm analysis
	5	X-ray Photoelectron Spectroscopy
	6	X-ray absorption fine structure analysis

This paper mainly introduces the X-ray diffraction analysis method and nitrogen adsorption isothermal analysis method in detail.

(1) X-ray diffraction analysis

When a beam of monochromatic X-rays strikes the crystal surface formed by the regular arrangement of atoms, the X-rays scattered by different atoms of the crystal material interfere with each other to produce strong X-ray diffraction in a special direction, as shown in Figure 1. X-ray diffraction analysis is to analyze the phase composition and nanomaterial size of the material based on the position of the diffraction peak and the intensity of the crystal sample [8]. X-ray diffraction analysis is simple and fast, but the method has low sensitivity and can only detect crystal phase components with a content of more than 1%.

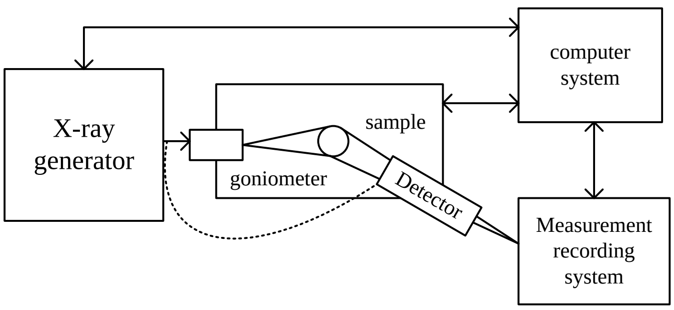

Figure 1. Example of X-ray diffraction analysis

(2) Nitrogen adsorption isothermal method

When nitrogen is in contact with the material, a portion of the nitrogen is trapped by the nanomaterial. If the gas volume is constant, the pressure drops; if the pressure is constant, the gas volume decreases. When gas molecules disappearing from the gas phase are attached to the surface of the material, it is called adsorption, as shown in Figure 2. Nitrogen adsorption and desorption curves are used to analyze the porous structure of nanomaterials, and to distinguish the types of materials, such as microporous, mesoporous, macroporous and other types of materials. The specific surface area of the material can also be obtained from the nitrogen adsorption-desorption curve.

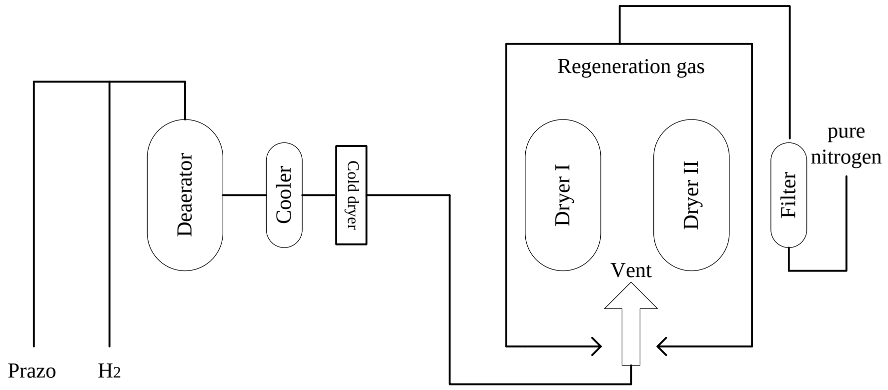

Figure 2. Nitrogen adsorption isotherm analysis

3.2. Overview of Blockchain

Blockchain maintains a distributed ledger jointly in a peer-to-peer network through timestamping and consensus protocols [9]. This article introduces blockchain in terms of basic concepts and technical characteristics.

3.2.1. Blockchain Definition

The structure of the blockchain is mainly composed of three parts, as shown in Table 2.

Table 2. Components of the blockchain structure

Scope	Sequence	Component
The structure of the blockchain	1	transaction
	2	block
	3	blockchain

A blockchain is essentially a distributed ledger that operates in a distributed network. All nodes participating in the consensus in the network will package a certain number of transactions into blocks and stamp them with timestamps [10]. The transactions in the block are verified by the consensus protocol, the blocks are linked by hash encryption in the order marked by the timestamp, and each block header will record the hash of the previous block. Changes to any block information will affect all subsequent blocks generated by the block. Since the subsequent block stores the hash of the previous block, the modification of a single block requires a lot of computing power, which is not only worth the loss, but also theoretically impossible. The consensus protocol in the blockchain can ensure that any two nodes in the network will not generate two different blocks at the same block height. The blockchain data structure of Bitcoin is shown in Figure 3.

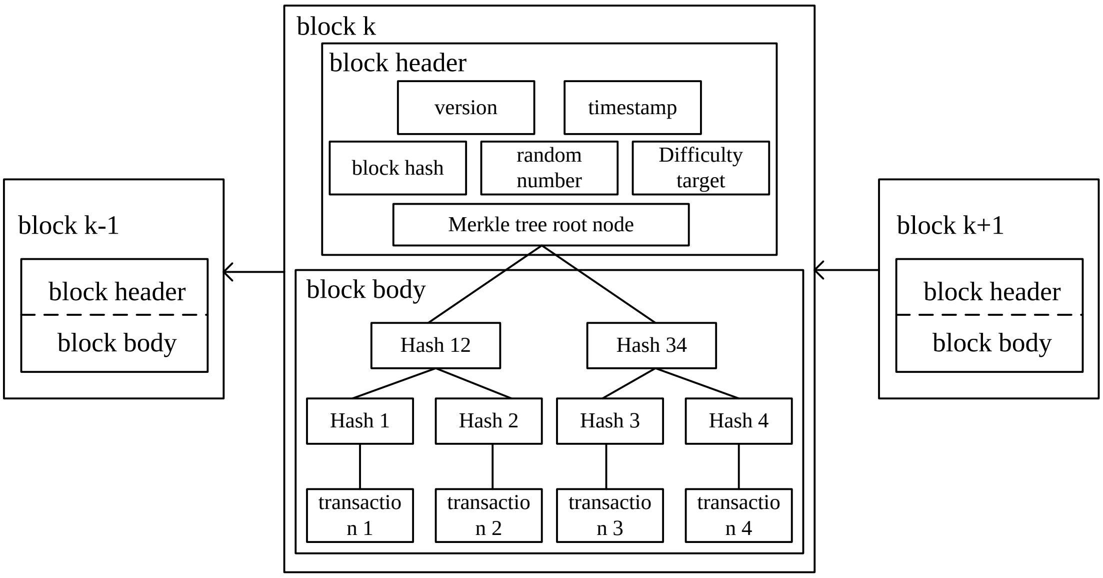

Figure 3. Bitcoin's blockchain data structure

A single block consists of a block header and a block body. The blocks included in the block header are shown in Table 3:

Table 3. The composition of the block header

Scope	Sequence	Chunks
Chunks contained in the block header	1	The hash value of the predecessor block
	2	Block timestamp
	3	Version number
	4	Random number
	5	Difficulty target
	6	Merkle tree root node

Among them, the root node of the Merkle tree consists of the hash values of all transactions in the block body; the timestamp is the generation time of the block to ensure that the block cannot be forged; the predecessor block hash is used as the connection index between blocks to combine blocks into a chain in the order of timestamps; the random number and difficulty target are determined by the consensus protocol, which affects the frequency of block generation.

3.2.2. Blockchain Classification

According to different access mechanisms, blockchain can be divided into public chain and alliance chain. The public chain allows anyone to access and maintain the distributed ledger, and any participant has the authority to verify the integrity of the ledger through consensus. Therefore, the public chain is a completely open network, and anyone can join and leave the network freely [11]. When building a consortium chain, some authorized nodes need to be verified and initialized, and these nodes are responsible for maintaining ledger information through consensus.

The alliance chain and the public chain system have certain similarities, which can be summarized as: First, decentralization is achieved to a certain extent; second, the data consistency of distributed ledgers is maintained through consensus protocols; third, when some blockchain nodes fail, the security of ledger data is not affected.

3.2.3. Features of Blockchain

According to the summary of previous research, there are three major characteristics of blockchain, namely decentralization, immutability and traceability.

(1) Decentralization

In a peer-to-peer network, services are carried out among distributed nodes, and when some nodes are down due to malicious attacks, the entire system services will not be affected. The consensus protocol in the blockchain ensures that transaction data can only be written to the local ledger after a majority of nodes have completed correctness verification.

Similar to distributed databases, blockchain nodes not only need to record transaction data, but also need to update the stored data in real time to ensure data consistency. When a single or partial node fails, the data security in the entire system will not be affected. After the failed node resumes operation, it can re-participate in data storage by synchronizing the data of other nodes.

(2) cannot be tampered with

Blockchain uses digital signature and hash encryption technology to ensure that data cannot be tampered with. On the one hand, all blockchain nodes jointly maintain the ledger, so that the correctness of the ledger data will not be affected by a small number of dishonest nodes. On the other hand, tampering with blockchain data requires the consent of the majority of nodes in the entire network, and consumes a lot of computing power, which is not only worth the loss, but also theoretically impossible.

(3) Traceability

Since each block stores the hash of the predecessor block, this not only ensures that the data cannot be tampered with, but also ensures that each log has a trace.

3.2.4. Validity and Security of Blockchain

The validity and security of the blockchain can be analyzed through some formula algorithms. First, we propose several useful lemmas for the function [12]:

$$y = C_n^{kn} \cdot \frac{1}{2^n} \tag{1}$$

Among them, $1 > k > 1/2$, kn are integers and n is large enough, then y decreases as n increases.

First use the Stella approximation, that is, when n is large enough, there is [13]:

$$n! \approx \sqrt{2\pi n}\left(\frac{n}{e}\right)^n \tag{2}$$

So [14],

$$y(n) = \frac{n!}{(kn)!(n-kn)!} \cdot \frac{1}{2^n} \approx \frac{1}{\sqrt{2\pi k(1-k)n}k^{kn}(1-k)^{(1-k)n}2^n} \tag{3}$$

Then we need to prove that for any $n = n' + 1$, there is a $y\left(n'\right) > y(n)$, which means we only need to prove:

$$2 \cdot \sqrt{\frac{n^{'}+1}{n^{'}}} k^k(1-k)^{(1-k)} > 2 \cdot k^k(1-k)^{(1-k)} > 1 \quad (4)$$

Then

$$f(k) = 2 \cdot k^k(1-k)^{(1-k)} \quad (5)$$

Its derivative shows that when $1/2 \leq k \leq 1$, $f(k)$ is monotonically increasing, thus [15]:
$f(k) > f(1/2) = 1$ (6)
As for the function,

$$y = \sum_{i=kn}^{n} C_n^i \cdot \frac{1}{2^n} \quad (7)$$

Where $k > 1/2$, kn is integers and n is large enough, then y decreases as n increases.
Only the proof [16] is needed here:

$$\sum_{i=kn}^{n} C_n^i \cdot \frac{1}{2^n} > \sum_{i=k(n+1)}^{n+1} C_{n+1}^i \cdot \frac{1}{2^{n+1}} \quad (8)$$

Combined with the previous proof analysis, there is [17]:

$$2C_n^{kn} > C_{n+1}^{k(n+1)} + C_{n+1}^{k(n+1)+1} \quad (9)$$

So this lemma also holds.
Similar to this analysis, the conclusion can also be extended from $1/2$ to $1/3$, namely [18]:
For functions:

$$y_1 = C_n^{kn} \left(\frac{1}{3}\right)^{kn} \left(\frac{2}{3}\right)^{n-kn} \quad (10)$$

And the function:

$$y_2 = \sum_{i=0}^{kn} C_n^i \cdot \left(\frac{1}{3}\right)^i \left(\frac{2}{3}\right)^{n-i} \quad (11)$$

The proof analysis here is similar to the previous two, we can notice the function [19]:

$$f(k) = k^k(1-k)^{(1-k)} \quad (12)$$

It is actually a symmetric function, and its axis of symmetry is $k = 1/2$, so we can know:

$$3k^k(1-k)^{(1-k)} > 3f\left(\frac{1}{3}\right) > 1 \quad (13)$$

In addition, an important lemma [20] needs to be introduced here:

$$\lim_{n\to+\infty} \sum_{i=0}^{\lambda n} C_n^i \left(\frac{1}{2}\right)^n = 0 \quad (14)$$

Where $0 < \lambda < \frac{1}{2}$, but λ is not infinitely close to 0 or 1/2, and λn is an integer.
Using the previous conclusion, for the function [21]:

$$f(n,k) = \sum_{n=0}^{k} C_n^i, 0 \leq k \leq n \quad (15)$$

Then,

$$f(n,k) \leq C_n^k \frac{n-(k-1)}{n-(2k-1)} \quad (16)$$

For arbitrarily fixed k and $n \to +\infty$, note:

$$\frac{C_n^k + C_n^{k-1} + C_n^{k-2} \ldots}{C_n^k} = 1 + \frac{k}{n-k+1} + \frac{k(k-1)}{(n-k+1)(n-k+2)} + \cdots \leq 1 + \frac{k}{n-k+1} + \left(\frac{k}{n-k+1}\right)^2 + \cdots \quad (17)$$

The right-hand side of the inequality in Equation 17 is equal to $\frac{n-(k-1)}{n-(2k-1)}$, therefore:

$$f(n,k) \leq C_n^k \frac{n-(k-1)}{n-(2k-1)} \quad (18)$$

So there is:

$$F(n,\lambda) = \sum_{i=0}^{\lambda n} C_n^i \left(\frac{1}{2}\right)^n \leq \left(\frac{1}{2}\right)^n C_n^{\lambda n} \frac{n-(\lambda n-1)}{n-(2\lambda n-1)} \quad (19)$$

Using Stirling's approximation, the right-hand side is equal to:

$$\frac{1}{\left(2\lambda^{\lambda} - (1-\lambda)^{1-\lambda}\right)^n} \cdot \frac{1}{\sqrt{2\pi\lambda(1-\lambda)n}} \frac{n-(\lambda n-1)}{n-(2\lambda n-1)} \quad (20)$$

From the analysis here, we can conclude that as long as the parameter values are within a reasonable unit, the validity and security of the blockchain can be guaranteed.

3.2.5. Blockchain and Education

With the change of the form of knowledge dissemination and the medium of knowledge attachment, the business model of Internet products is gradually dominated by the production of user content. The development of information technology has enriched the medium of knowledge dissemination, improved the quality and efficiency of knowledge dissemination, and brought about a surge of knowledge content. As the representative of knowledge sharing virtual community, multimedia smart teaching needs to integrate more users into the environment of knowledge sharing. At present, the multimedia smart teaching in the market still faces many problems and challenges.

From the perspective of multimedia smart teaching users, first of all, the problem of information overload is serious. Although most educational platforms support multiple terminals, the cost of interactive teaching for users is greatly reduced, but due to the huge information content, the quality of courses in educational platforms is uneven. How to quickly and accurately filter high-quality content has become a difficult problem; secondly, as content providers of educational platforms, some users are difficult to obtain "knowledge remuneration" in the platform, which will inevitably lead to low participation of content creators, thus causing content creators to gradually lose their enthusiasm for creation. To solve the above two problems, it is urgent to adopt a scientific and feasible knowledge sharing incentive mechanism in the platform. On the one hand, the incentive mechanism needs to motivate content creators to produce high-quality course content; on the other hand, it also needs to make it easier for learners to eliminate information noise and quickly and effectively find the knowledge content they need.

Blockchain technology brings new possibilities to improve the efficiency of knowledge sharing in virtual communities. Steemit is flourishing as a representative of a knowledge sharing platform developed by blockchain technology. The platform uses its unique reward distribution mechanism to enable users to actively participate in the construction and development of the platform. Building a platform, creating content, and actively discovering high-quality content can allow users to get economic and reputational rewards. Such an incentive mechanism not only improves user participation, but also improves the efficiency of knowledge sharing.

3.3. Interactive Teaching System Based on Blockchain and Interactive Teaching Nanomaterial Devices

The interactive teaching system based on blockchain and interactive teaching nanomaterial devices can be operated in the educational alliance chain jointly constructed by various universities, as shown in Figure 4:

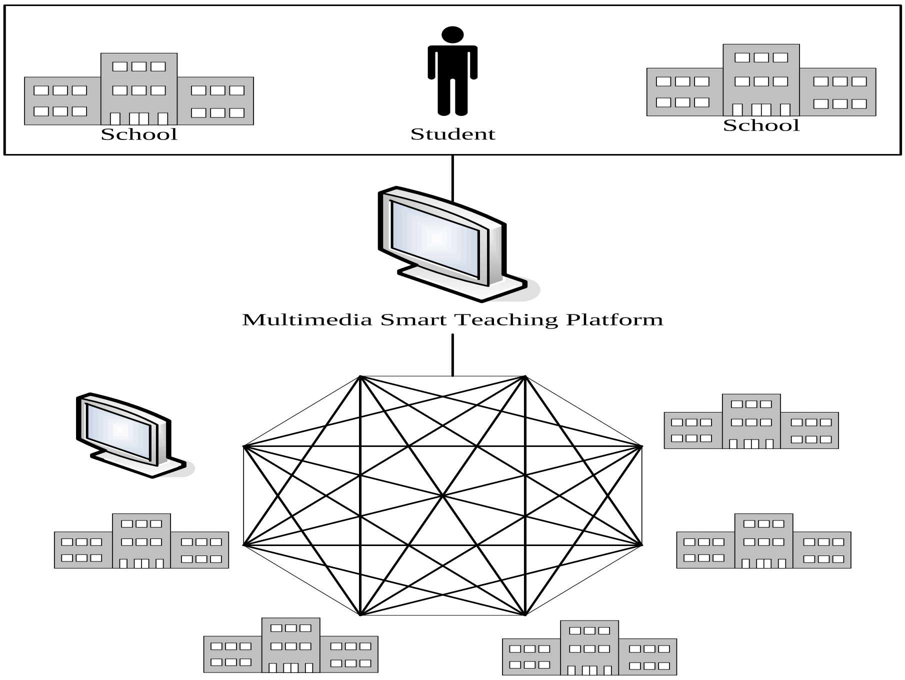

Figure 4. Multimedia smart teaching system model

When a new university joins the education alliance chain through the application provided by the smart education platform, its business process is shown in Figure 5. First, the smart education platform will authenticate the applicant to check whether the applicant meets the requirements for joining the education alliance chain. If the authentication is successful, a new consortium node is created, and this node, as a participant in the distributed ledger record, will obtain the distributed ledger data from the blockchain. And it sets up the local node according to the Fabric requirements and initializes the service. After the node initialization is completed, it will participate in the generation and recording of blockchain transactions, and maintain the security of the ledger together with other nodes.

In order to obtain the credits of a certain course, the student user first needs to take the corresponding course, and when the student completes the corresponding course, he can apply for credit settlement. The application settlement operation will call the final grade assessment contract, which is used to determine whether the student meets the academic requirements. If it is not satisfied, the score cannot be obtained; if it is satisfied, the platform will notify the course owner to issue the credits in time. After receiving the notification, the course owner will transfer the credits initialized during the course selection to the student's blockchain digital wallet in the form of digital assets. The process is shown in Figure 6.

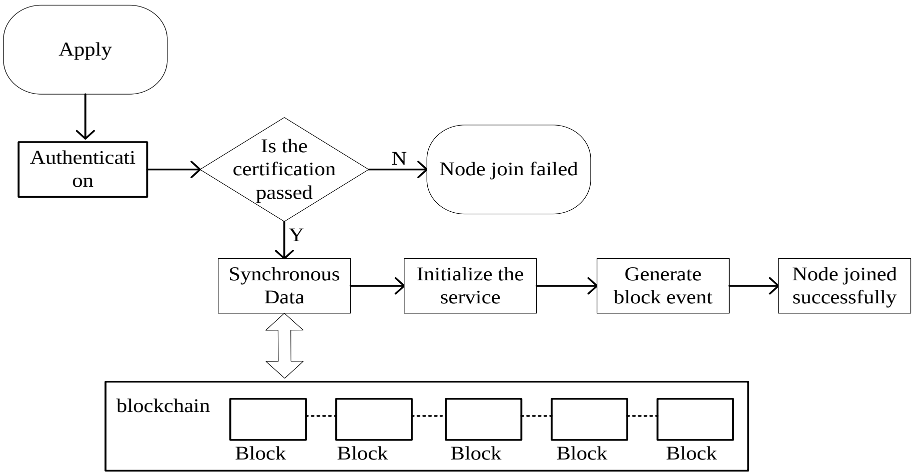

Figure 5. Join the business process of the node

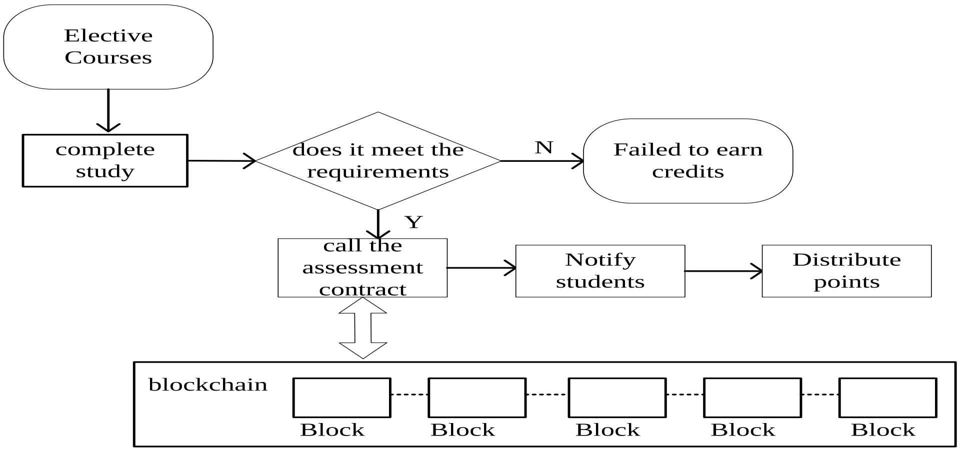

Figure 6. Process of issuing credits

In the contribution integral incentive block, the distribution of points is settled by the cycle. When a settlement cycle ends, the platform invokes contribution points to issue smart contracts. Each user's point bonus card is distributed to its blockchain digital wallet.

In order to get contribution rewards, content creators first need to publish teaching content on the platform. The platform records the number of likes, electives, positive reviews and credits issued by content creators during a settlement period. From this data, the platform contribution of the content creator can be calculated and at the end of the settlement cycle. It rewards the user by invoking the "Contribution Points Distribution" smart contract, which is stored in the blockchain digital wallet.

It should be noted here that in the credit issuance, the platform will notify the content creators to issue the credits after the certificate is approved. Because the points awarded by content creators are related to the number of credits issued. In order to get more points for the reward, credit will inevitably be issued in time.

The process of content learners receiving contribution points is basically consistent with that of content creators. The number of points awarded depends on the number of likes, electives, comments, and points the user gets during a settlement cycle. In order to avoid content learners maliciously refreshing likes and comments to get more rewards, the behavior system requires that a single user should make likes, comments and elecno more than 3 times in a settlement cycle.

The cooperative mechanism of virtual knowledge community is generally divided into three parts: social system, knowledge system and collaborative mechanism. Social systems are composed of users with different knowledge structures, which essence is the user system; the knowledge system is the knowledge content to form an objective knowledge system.

In this paper, the education system is divided into three parts: user subsystem, knowledge subsystem and incentive subsystem. There are correlation and feedback relations between the three systems, and the system indicators will also be selected from the three subsystems. The structure and indicators of the educational platform are shown in Table 4.

Table 4. Education platform structure and indicators

System level	System metrics		
Multimedia Smart Teaching System	1	User subsystem	Number of new registered users, number of viewers, number of content learners, number of content creators, number of transformed content learners, number of transformed content creators
	2	Knowledge subsystem	The number of new teaching content, the number of new course selections, the total number of platform course selections, the total number of teaching content, and the quality of teaching content
	3	Incentive Subsystem	The total amount of reward points for content creation and the total amount of reward points for content learning.

The user subsystem is the foundation of the education platform, which has a direct impact on the development of the blockchain education platform through the total number of users and the number of users participating in knowledge sharing. Its main indicators include the number of newly registered users, the number of viewers, the number of content learners, the number of content creators, the number of transformed content learners, and the number of transformed content creators.

The main indicators of the knowledge subsystem include the number of new teaching content, the number of new course selections, the total number of course selections on the platform, the total number of teaching content, and the quality of teaching content. These indicators influence the development of educational platforms through the quantity and quality of teaching course content releases.

The incentive subsystem promotes the healthy development of the education platform through a point distribution scheme that symbolizes contribution value.

4. Multimedia Smart Teaching Simulation Test

In this paper, the simulation test of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices will be carried out, which are respectively in the aspects of the number of courses selected within the system, the quantity of teaching content, the quality of teaching and learning, the internal security of the system and the sense of user experience. Checking the teaching mode, that it is compared with the traditional teaching mode to verify the effectiveness of the teaching method proposed in this paper.

(1) The number of course selections and the incremental test of teaching content

In this paper, Vensim software is used to simulate and test the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices and the traditional interactive teaching system. When initializing the software, in order to examine the operation of the system in a long development period, the time span is set to 12 months, and the simulation results are shown in Figure 7:

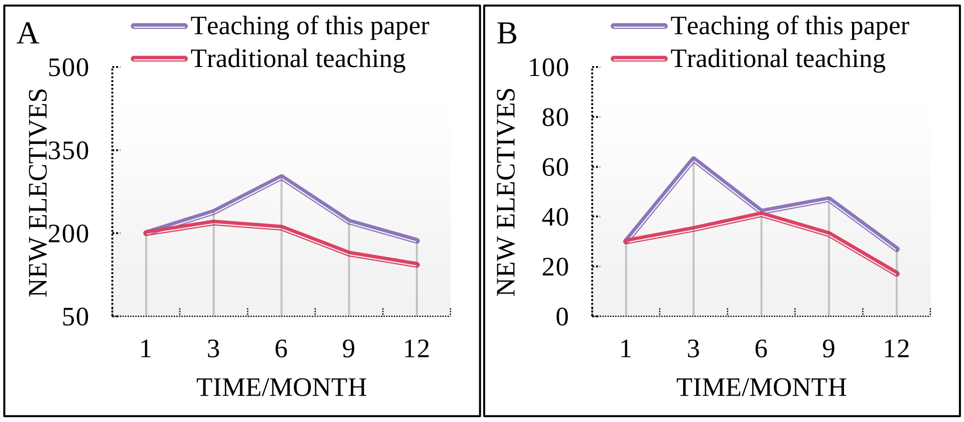

Figure 7. The number of courses selected and the incremental test of teaching content

Figure 7A is the incremental test of the number of elective courses

Figure 7B shows the incremental test of teaching content

It can be seen from Figure 7 that under the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices, the number of courses selected increases by 229 times per test cycle on average, and the teaching content is increased by 187 times per test cycle on average. The number of courses selected in the traditional teaching system is increased by 42 times per test cycle on average, and the teaching content is increased by 31 times per test cycle on average.

(2) Teaching quality and learning quality test

The quality of teaching and learning adopts a scoring system, with a full score of 10 points, and a test cycle of 3 months. The results of the four tests are shown in Figure 8:

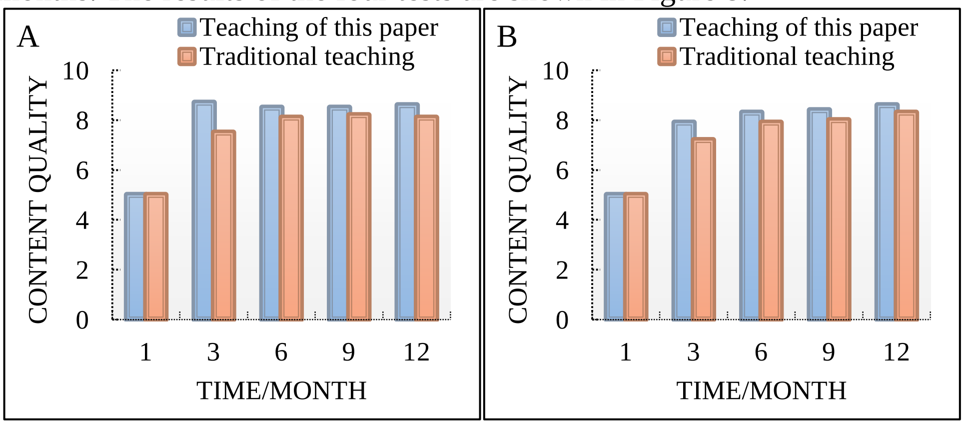

Figure 8. Teaching quality and learning quality test

Figure 8A shows the teaching quality test

Figure 8B is the learning quality test

It can be seen from Figure 8 that under the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices, the average teaching quality score for 12 months is 8.58 points, and the average learning quality score is 8.3 points. The average 12-month teaching quality score of the traditional teaching system was 7.96 points, and the average learning quality score was 7.85 points.

(3) Security and stability testing

The safety and stability test of the teaching system takes the transaction delay data as the evaluation parameter, and considers the situation of no malicious node and the existence of malicious nodes respectively. The comparison test results are shown in Figure 9:

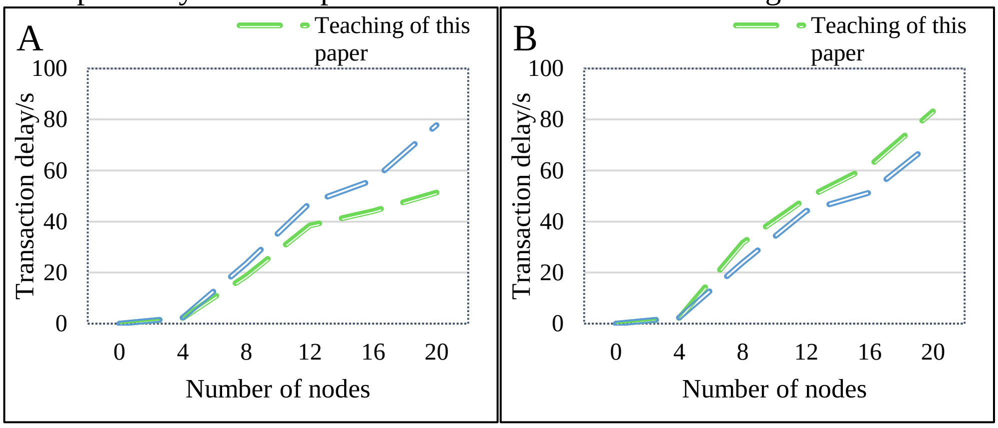

Figure 9. Security and stability testing

Figure 9A shows the transaction delay without malicious nodes

Figure 9B shows the transaction delay in the presence of malicious nodes

It can be seen from Figure 9 that in the absence of malicious nodes, the maximum transaction delay of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is 51.4/s, while the maximum transaction delay of the traditional teaching system is 77.8/s. In the presence of malicious nodes, the transaction delay of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is significantly higher than that of the traditional teaching system.

(4) User experience test

The test objects of user experience are teachers and students. After the teaching system experience for each test cycle is completed, the user experience is investigated and scored. The scoring results are shown in Figure 10.

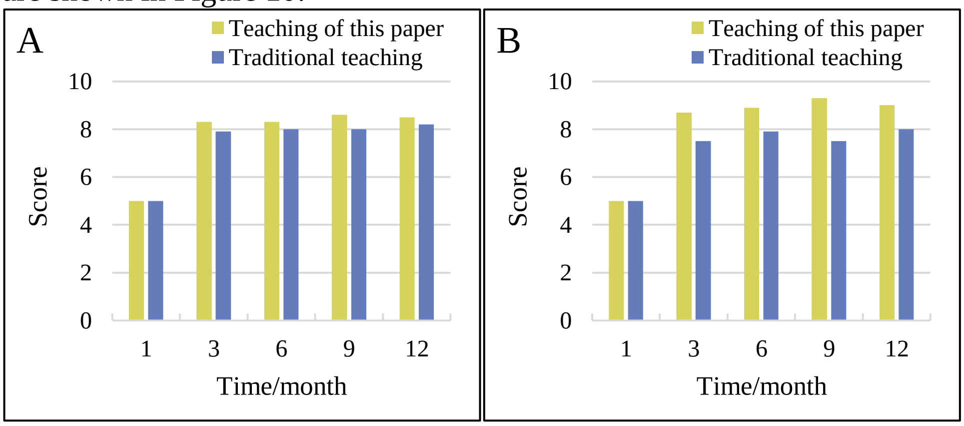

Figure 10. User experience test

Figure 10A shows the score of teachers' experience

Figure 10B shows the scores of students' experience

It can be seen from Figure 10 that after the 12-month system course, the average score of teachers and students of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is 8.43 points and 8.98 points. In the traditional teaching system, the average score of teachers was 8.03 points, and that of students was 7.73 points.

5. Discussion

Through the comparative experimental data between the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices and the traditional teaching system, the following conclusions can be drawn:

(1) In terms of the increment of teaching content and the increment of elective courses, the number of each test cycle of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is five times that of the traditional teaching system. This shows that the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is more attractive to users and has considerable development prospects.

(2) In terms of teaching quality and learning quality, the overall quality score of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is 0.53 points higher than that of the traditional teaching system, which shows that the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is effective in improving the quality of interactive teaching and learning effect.

(3) In terms of system security and stability, the transaction delay of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is significantly smaller than that of the traditional teaching system without malicious nodes. In the case of malicious nodes, the transaction delay of the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is relatively high, which can enable malicious nodes to be discovered quickly, improve the consensus efficiency of the system, and maintain system security and stability.

(4) At the level of user experience of the system, the average score of teachers and students in the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is 0.83 points higher than the average score of the traditional teaching system.

The entire comparative experimental data shows that, under the condition of keeping other experimental conditions the same, the multimedia smart teaching system based on blockchain and interactive teaching nanomaterial devices is ideal, both in terms of teaching system performance and in terms of curriculum mode. This shows that the multimedia smart teaching using blockchain and interactive teaching nanomaterial devices is feasible.

6. Conclusion

Interactive teaching plays a very important role in the development of education field in the Internet information age. At present, the multimedia intelligent teaching in the market has also made some new attempts and efforts in the interactive teaching, but there are still many defects. Blockchain technology plays an effective role in maintaining information and data security and improving system performance. The application of nanomaterials in system configuration also has a great space for development. The combination of the two to multimedia intelligent teaching can effectively improve the teaching quality and enhance the experience of interactive teaching. This can be continuously transported to the nodes under the premise of ensuring the safety of educational resources. Even if it has not been widely concerned yet, it is believed that under the continuous progress of the era, the application of blockchain and nanomaterials in multimedia intelligent teaching will become more and more mature.

Although this paper uses blockchain and nanomaterials to conduct a profound study on multimedia intelligent interactive teaching, there are still many shortcomings. In the future work, the appropriate research methods and means will be studied from more angles according to the existing technology and level, to continuously improve the quality of research work.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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