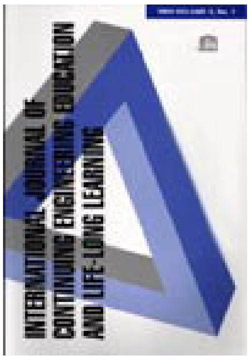

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The impact of blockchain big data algorithm technology on the interactive intelligent teaching mode of Chinese language and literature courses

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Abstract: With the advancement of curriculum reform, the teaching objectives of Chinese language and literature courses have gradually shifted to cultivating students' practical application abilities and personalised learning. Interactive teaching provides students with more opportunities for self-expression, which is conducive to their development. This paper studies the evaluation and scoring of live teaching and recorded teaching by students majoring in Chinese language and literature through questionnaire survey, and sets up a simple group and a live teaching model group under the interactive intelligent teaching mode. The questionnaire data were analysed using big data decision tree technology. The results showed that about 58.5% of the students were delighted with the live teaching and believed it was effective. Their learning attitude and results had been significantly improved. However, more students disagreed with the recorded teaching mode.

Keywords: interactive intelligent teaching mode; hash algorithm; decision tree; SHA256 algorithm.

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1 Introduction

The discipline of educational technology is dedicated to the deep integration of information technology and topic courses in order to support the transformation of classroom teaching and educational systems, given the ongoing advancements in this field. In this regard, the teaching profession has steadily incorporated blockchain big data algorithm technology, opening new avenues for creative teaching model development. The practicality of the interactive intelligent teaching mode of Chinese language and literature courses has significantly improved with the gradual application of algorithms to teaching brought about by the ongoing study and development of blockchain big data algorithm technology. Teachers and students echo each other in the classroom because interactive, intelligent teaching naturally unifies teaching and learning. Teachers must record unforeseen teaching factors, teaching situations, and other information and use the resources that can be created for instruction. Under the interactive teaching mode, teaching Chinese language and literature involves more than just conveying the book's content to the students; it also consists of combining the students' prior knowledge, the teacher's knowledge, and the knowledge in the book and encouraging the integration, correction, growth, and development of knowledge through their interactions and collisions. The classroom environment naturally becomes more dynamic, the gap between teachers and pupils is reduced, and it is more favourable for the mutual benefit of both teaching parties.

This study employs an empirical approach to examine the impact of interactive intelligent teaching in Chinese language and literature courses and investigate the educational application potential of blockchain big data algorithm technology. In addition to increasing students' interest in and impact on their learning, this offers fresh concepts and approaches for modernising the conventional teaching approach. Consequently, this study is significant for encouraging the advancement of educational technology and raising the standard of instruction for Chinese language and literature courses.

The main contributions of this paper are as follows:

1. Examining how blockchain big data algorithm technology might be used in the educational sector: This study examines how blockchain big data algorithm technology can facilitate intelligent interactive teaching modes in Chinese language and literary courses. Students' assessments of interactive teaching modes, particularly their responses to live and recorded instruction, are assessed and analysed using big data decision tree technology, underscoring the technology's enormous potential for innovative classroom instruction.

2. Making suggestions and confirming the impact of the interactive intelligent teaching mode: Through empirical study, this paper examines the application of interactive intelligent teaching mode in Chinese language and literature courses. The findings demonstrate that the live teaching mode can successfully raise students' learning outcomes and attitudes, suggesting that interactive teaching can strengthen the drawbacks of conventional teaching techniques and increase students' sense of involvement and initiative.

3. Offering fresh concepts and approaches to improve how Chinese language and literary courses are taught: This study analyses student comments to offer fresh theoretical underpinnings and real-world experience for reforming how Chinese language and literature courses are taught. The interactive intelligent teaching mode has a greater educational impact than the traditional mode, particularly when developing students' individualised learning and practical skills.

4. Maximise teacher-student interaction and utilise instructional resources: This article highlights how two-way communication between teachers and students is crucial to increasing teaching efficacy in the interactive intelligent teaching approach. Teachers can more successfully integrate teaching resources, modify their methods in real-time, and improve the activity and effectiveness of classroom instruction by getting real-time teaching data and conditions.

5 Encourage the creative use of educational technology by offering technical assistance and practical experience for the field's future development. Research indicates that integrating blockchain big data algorithms and intelligent teaching models enhances students' learning outcomes and interest while encouraging the creative use of educational technology.

2 Related work

Since modern teaching models do not meet the needs of society, researchers have studied the interactive and intelligent teaching model for Chinese language and literature courses. Liang et al. (2020) studied and examined traditional teaching models among them. He created an AI course teaching model. Zhang (2021) researched the interactive intelligent education system and used control experiments to evaluate the algorithm model's performance. Ran (2018) created a brand-new teaching method that compensated for the drawbacks of conventional classroom instruction. In addition to raising the teaching standard, it offers a three-dimensional platform for college English instruction. Three distinct classes were combined in An et al.'s (2020) study of the intelligent teaching paradigm. Shu and Gu (2023) investigated the impact of the innovative education model made possible by Edu-Metaverse on enhancing students' learning outcomes using a mix of qualitative and quantitative research techniques. According to the study, students using the Edu-Metaverse innovative education model outperformed those receiving traditional instruction in oral communication, vocabulary and grammar, reading comprehension, writing, and translating between English and Chinese. Dai et al. (2023) developed an ecological model and conceptual model of learning space preference based on the theory of learning environment ecology and the findings of previous studies. They also carried out empirical research to investigate the influence of sociodemographic factors on individual space preferences. The findings demonstrated that teachers and students had a favourable opinion of the innovative learning environment and that space preferences were not significantly impacted by gender, age, grade, or subject category. But they still haven't solved the problem of teaching mode.

Several researchers have also investigated blockchain big data algorithm technology. Among them, Yang et al. (2020) proposes a framework for transactions on top of the big data of blockchain and uses it to prevent the process data of transaction data from being tampered with by some users. Kang et al. (2018) analysed the possibilities of cryptocurrency and blockchain technology and examined the use of blockchain technology to protect one's private data. Yu et al. (2018) studied the big data sharing blockchain technology, and researched the medical aspect through this technology. But their technical design is more difficult.

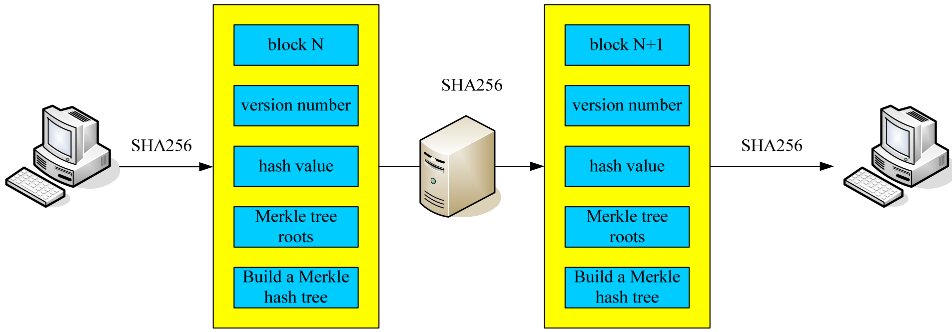
3 Blockchain big data algorithm technology

3.1 Blockchain

Blockchain, Bitcoin's effective underlying technology, is a distributed database that can only be added to and not altered. It is the composition of the blockchain, as illustrated in

Figure 1. Blockchain features include immutability, decentralisation, traceability, openness, and transparency.

Figure 1 Blockchain structure diagram (see online version for colours)



One of the block structures in Bitcoin is shown in Table 1.

Table 1 Block structure in Bitcoin

Size	*Field*	*Describe*
4bytes	Block size	The size of the memory space occupied by the block
80bytes	Block header	The information is as follows: hash value, parent block hash value, difficulty, etc.
1–9 variable integer	Trading calculator	Number of transactions
Variable	Trade	The information of the transaction

Some nodes in the blockchain network will gather transactions that are made between nodes. Then, by increasing the random number of the previous block header and counting the hash of the previous block header, the nodes will compete to create new blocks. Using the PoW consensus process as an example, Figure 2 illustrates how the miner would create a new block with the transactions made after the previous block was formed only when the hash value satisfies the difficulty value.

After that, every node in the blockchain network receives the updated block. All nodes accept the new block and add it to the local blockchain after confirming that the received hash value satisfies the designated difficulty value. Furthermore, the blockchain employs MHT to guarantee transaction data security and ECDSA to guarantee communication security (Bellini, 2019). Based on this, Figure 3 clearly depicts the blockchain network's topology.

Figure 3 shows that there are two kinds of computer nodes in the network topology diagram: computing nodes and storage nodes. All nodes in the network topology graph are divided into two layers, which is mainly because the functions they teach are not the same.

The traditional blockchain-layered architecture model typically consists of six layers, as shown in Figure 4.

Figure 2 Schematic diagram of blockchain network based on PoW consensus mechanism

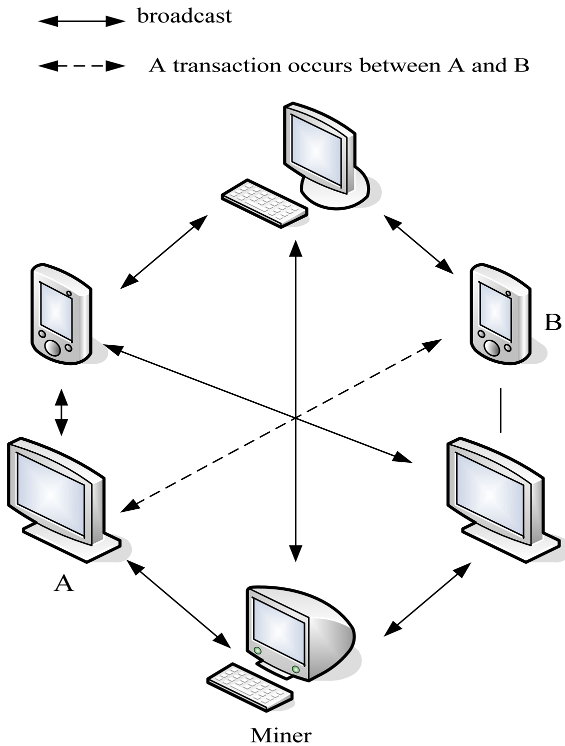


Figure 3 Blockchain network topology (see online version for colours)

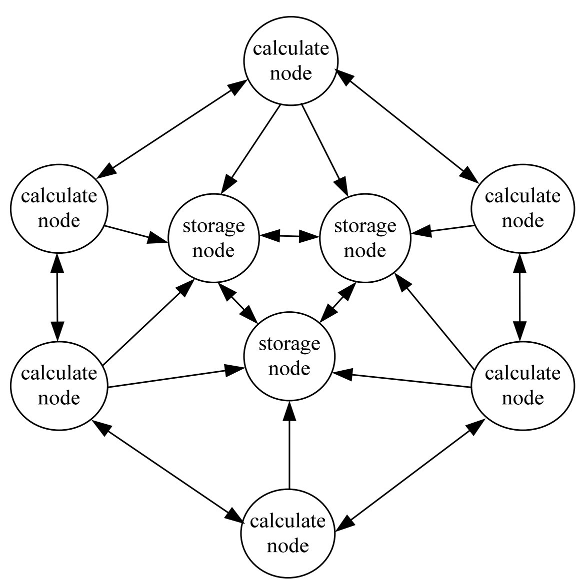


Figure 4 Blockchain infrastructure model (see online version for colours)

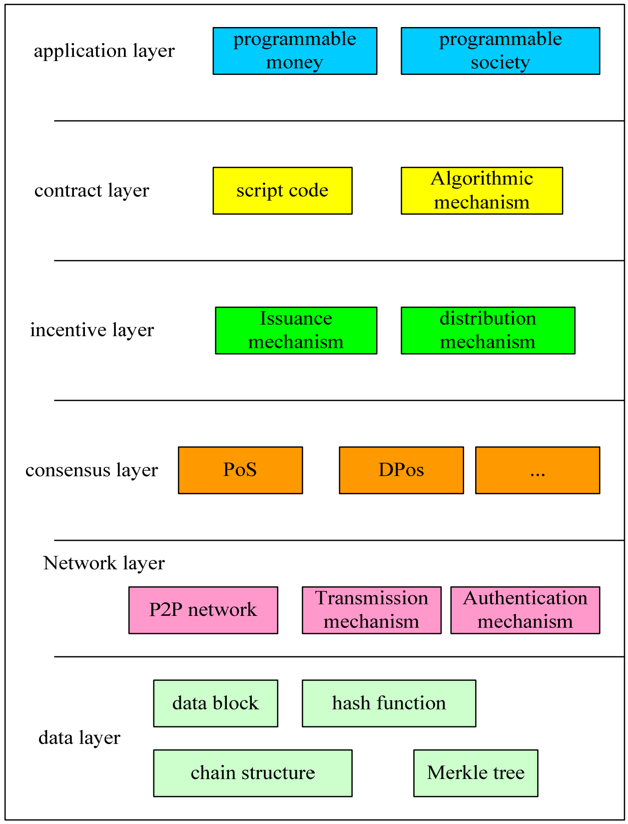
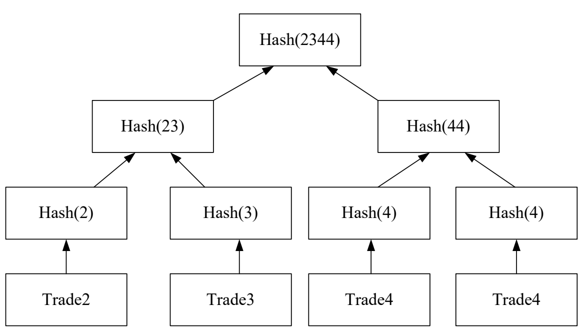


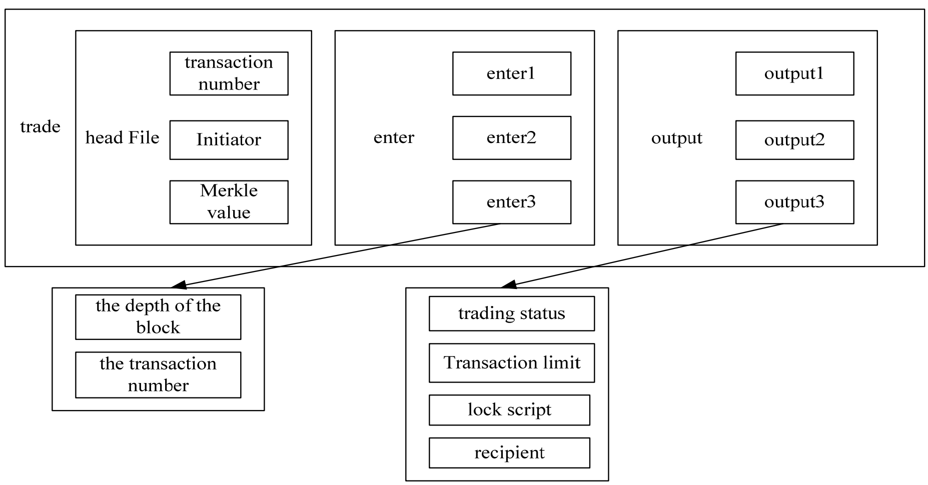
Figure 5 Merkle tree of storage structure (see online version for colours)



The data layer of the blockchain is used to encapsulate the data of the chain structure at the bottom of the blockchain, which is the basis for the non-tampering and traceability of the blockchain data. This includes two blockchains, the transaction blockchain and the calculation result blockchain. Each block in the calculation result blockchain must have a corresponding transaction block, and the blockchain network allows free transactions. Free transactions also generate corresponding transaction blocks, so not every block in the transaction blockchain has a corresponding calculation result block (Zhang et al., 2021; Xiang et al., 2017). The block body of each transaction block contains multiple transactions, which are stored in the leaf nodes of the Merkle tree data structure. When the total number of transactions in the block is even, the Merkle tree structure can be directly constructed. When the total number of transactions in the block is odd, the last transaction will be copied to form an even number of leaf nodes, as shown in Figure 5.

Figure 6 displays the structure of the transaction within the transaction block. All of the originator's outputs are contained in the outputs of other transactions, of which every input is an output. The transaction status, transaction amount, lock script, and receiver are all included in each output. The transaction status provides information on the transaction's availability. The two values for the transaction status are 0 and 1. Available is denoted by a 1 and unavailable by a 0 (Lin and Hao, 2017). The recipient's address is the output's recipient.

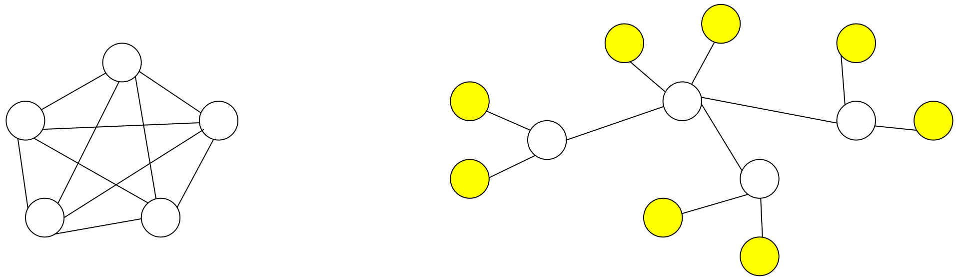
Figure 6 Structure of transactions in a transaction block



The network layer mechanism of blockchain includes P2P networking mechanism, data dissemination mechanism and data verification mechanism, and the data verification mechanism has been improved. Authentication mechanisms are different for computing networks and storage networks. The P2P network diagram is shown in Figure 7.

The distribution nodes complete the verification mechanism of the computing network, and the object of verification is the subtask results of the distributed computing type in the computing result block. The distribution node will open up an array storage space for the results of each subtask, and subtasks with the same number will be distributed to multiple different computing nodes. The condition for a subtask to be considered complete is that the subtask must receive the calculation results of more than three other nodes, and at least half of the results are the same. If this condition is not met, the distribution node will continue distributing these unfinished tasks to other nodes until the completion condition is met. The distribution node will record the first node that calculates the correct result as the executor of the subtask, and the executor can get a certain amount of reward. Any storage node can complete the verification mechanism of the storage network, and the verification object is the result of the workload proof corresponding to the received new block (Sharma, 2021).

Figure 7 P2P network structure diagram, (a) random network (b) hybrid network (see online version for colours)



(a) (b)

The consensus layer of the blockchain encapsulates the consensus algorithms in the network, and these consensus algorithms determine which nodes can generate new blocks. The consensus algorithm in the blockchain network is executed by storage nodes, which create new blocks. They compete for new blocks based on a customisable proof-of-work consensus algorithm, and continuously package the calculation results from the computing network into new blocks and store them in the blockchain (Hassani et al., 2018). The customisable proof-of-work consensus algorithm used by storage nodes is user-defined. Users can write custom distributed algorithms through the open-source algorithm community. However, there is a slight difference between the custom consensus algorithm and the custom distributed algorithm: the custom consensus algorithm is the consensus algorithm applied to the storage network, and only the custom consensus algorithm with the highest number of votes will take effect in the entire network. The custom distributed algorithm is a distributed algorithm applied to the computing network. The effective condition of the algorithm is that more than 20% of users vote for the algorithm and the affirmative votes reach 80% of the total number of votes. As long as the algorithm takes effect, the algorithm's calculation can be initiated in the computing network at any time. The custom consensus algorithm in the storage network must meet two conditions:

1 it is difficult to calculate, but easy to verify

2 the workload progress can be quantified, and the reward obtained by the storage node is related to its progress percentage of completing the workload proof.

The incentive layer of the blockchain is used to formulate reward rules for participating in distributed computing, big data processing and opening new block nodes in the blockchain. The reward rules in the blockchain network are as follows:

1 When a node in the computing network actively initiates distributed computing or big data processing, a certain amount of account gold coins will be deducted, and the deducted value is equal to the number of subtasks in the calculation.

2 80% of the deducted account gold coins are used to reward computing nodes that have completed the subtasks in this calculation. The reward amount is proportional to the number of completed subtasks. To prevent the excessive concentration of computing power from creating a 'mining pool', it causes most of the rewards to be obtained by the 'mining pool', making it difficult for ordinary users to get rewards.

At the same time, in order not to reduce the computing speed of distributed computing, this paper stipulates that any node in this computing task obtains more than 50% of the computing reward. The excess of 50% will be returned to the distribution node.

3 It uses 20% of the gold coins deducted by the initiating node as the fee for the storage network, and the storage node that generates a new block gets 90% of the fee as a reward. The remaining 10% of the handling fee is allocated to at most five storage nodes that have executed this proof of work according to the percentage of completion.

Such an incentive mechanism overcomes the disadvantage of unfair property distribution in the traditional blockchain model. In the blockchain incentive mechanism, for computing nodes, as long as the nodes have participated in computing, they can get rewards. The reward value is approximately equal to the ratio of the node's computing power to the total computing power in this calculation. Still, once the node's computing power is too strong and the computing power is too concentrated, its reward will be limited. For storage nodes, nodes with more gold coins will wait longer to open new blocks, and the probability of getting rewards will also decrease. Such an incentive mechanism not only achieves more for more work, but also inhibits the emergence of mining pools. It dramatically reduces the risk of a widening gap between the rich and the poor. It can be seen from the reward rules that there are two ways to generate new gold coins in this blockchain model by adding new nodes and publishing new algorithms. This guarantees benign inflation of the currency in the network, while encouraging users to remain active. It ensures the continuous update and operation of the algorithm in the network.

The role of blockchain technology in the interactive intelligent teaching model of Chinese language and literature courses is mainly reflected in the improvement of data security and transparency. Through the decentralised characteristics of blockchain, data in the teaching process, such as students' learning records, homework submissions, and evaluation results, can be stored securely and tamper-proof to ensure the authenticity and reliability of the information. This not only protects students' privacy, but also enhances the credibility of teaching data and avoids the risk of data leakage or tampering.

In addition, blockchain can promote the sharing and collaboration of teaching resources. During the teaching process, teachers and students can interact and share knowledge based on the blockchain platform, and course content, learning materials, and teaching results can be automatically managed and distributed through smart contracts. Through blockchain technology, students' learning achievements can be displayed openly and transparently, realising fair evaluation and traceability of knowledge, and promoting fair and efficient use of educational resources.

3.2 Hash algorithm

Hash functions are an important part of many cryptographic algorithms, and for SHA1, a 160bits message digest can be generated when the message does not exceed 512bits. When SHA1 processes plaintext, it first groups the plaintext. It applies for 5 link variables at the same time (denoted as a, b, c, d, e), and pre-defines a function $f(t, b, c, d)$, $0 < t < 89$, which represents the processing of steps 0 to 89 respectively, and generates a 32-bit output.

$$f(t,b,c,d)=\begin{cases}(b\wedge c)\vee(\sim b\wedge d) & 0\le t\le 21\\ b\oplus c\oplus d & 22\le t\le 44\\ (b\wedge c)\vee(b\wedge d)\vee(c\wedge d) & 45\le t\le 67\\ b\oplus c\oplus d & 68\le t\le 89\end{cases} \tag{1}$$

At the same time, a predefined 32-bit constant $K(t)$ is used, and the hexadecimal value is as follows

$$K(t)=\begin{cases}0x58279941\\ 0x6ED5E5A1\\ 0x8F1BBCCD\\ 0xCA25C1D7\end{cases} \tag{2}$$

Initialise 16 32-bit packets $\omega[15:0]$ to

$$\begin{aligned}&H0=0x26481561;\\ &H1=0xABDE2549;\\ &H2=0x17BCDA12;\\ &H4=0xC3D2E1F0;\end{aligned} \tag{3}$$

Formula (3) is the initial value, and iteratively calculates the five variables a, b, c, d, and e. The iterative formula is

$$A=A\_next;\, B=A;\, C=B\_next;\, D=C;\, E=D \tag{4}$$

$$A\_next=\{A[28:2],\, A[32:26]\}+F+E+kt+\omega t \tag{5}$$

$$C\_next=\{B[2:1],\, B[32:1]\} \tag{6}$$

f denotes a non-linear function, kt denotes a constant, and ωt denotes a data block. Finally, the 160-bit hash value is output in formula (7).

$$A=A+H0;\, B=B+H1;\, C=C+H2;\, D=D+H3;\, E=E+H4 \tag{7}$$

And SHA256 has higher complexity and security than SHA-1, SHA256 can process very long information, output a 256 bit long hash value, and then use this hash value as a message digest. A hexadecimal string usually represents it. a, b, c, d, e, f, g and s are assigned the initial value $h_0 - h_7$, then updated and iterated 64 times. The specific processing process is shown in Figure 8.

The algorithm is more complex to update the a, e values as follows:

$$a_{t+1}=s_t+\sum_1 e_t+CH(e_t,f_t,g_t)+K_t+W_t+\sum_0 a_t+Maj(a_t,b_t,c_t) \tag{8}$$

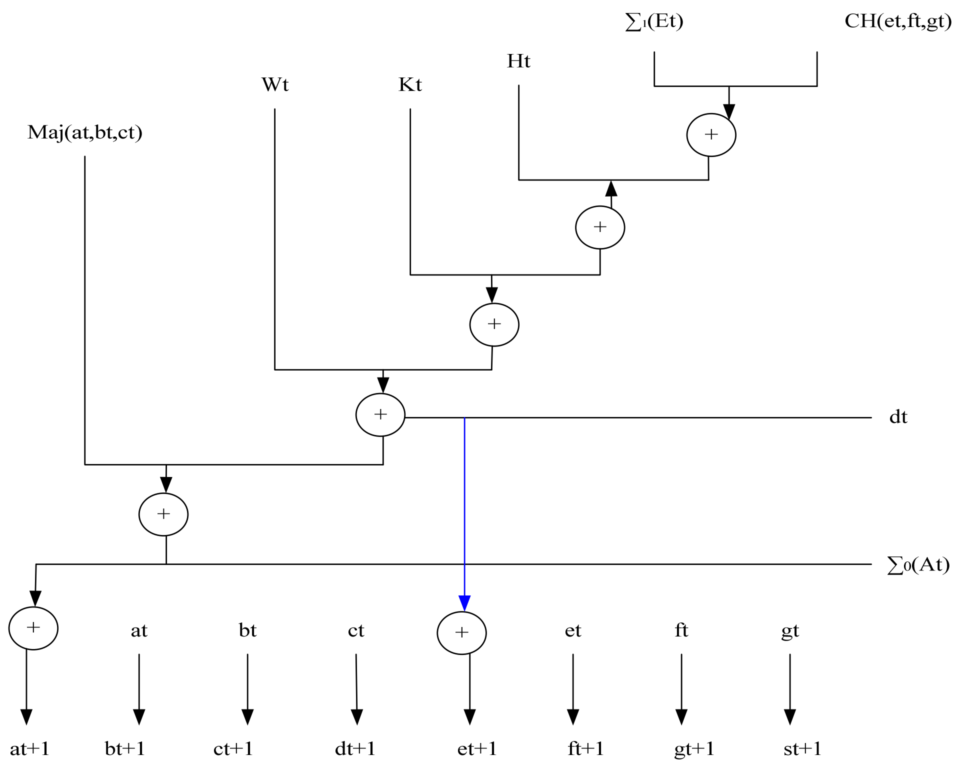
$$e_{t+1}=s_t+\sum_1 e_t+CH(e_t,f_t,g_t)+K_t+W_t+d_t \tag{9}$$

$\sum_1 e_t, CH(e_t,f_t,g_t), \sum_0 a_t, Maj(a_t,b_t,c_t)$ are the logical function, then W_t is updated as follows

$$W_t = \begin{cases} M_t & 0 \le t \le 16 \\ \sigma(W_{t-2}) + W_{t-7} + \sigma_0(W_{t-16}) + W_{t-17} & 17 \le t \le 64 \end{cases} \tag{10}$$

The input data is divided into 16 groups, $M_0 - M_{15}$ respectively, and then $h_0 - h_7$ $A_{63} - H_{63}$ are added correspondingly to output a 256-bit hash value we want to get.

Figure 8 SHA256 update calculation structure diagram (see online version for colours)



Because the simple use of the SHA-256 algorithm will generate a relatively large error, this article optimises the hash algorithm. It mainly uses pre-computation and CSA strategies to optimise the hash algorithm. The principle of optimisation is to reduce the delay of the critical path. The optimisation graphs of these two methods are shown in Figure 9.

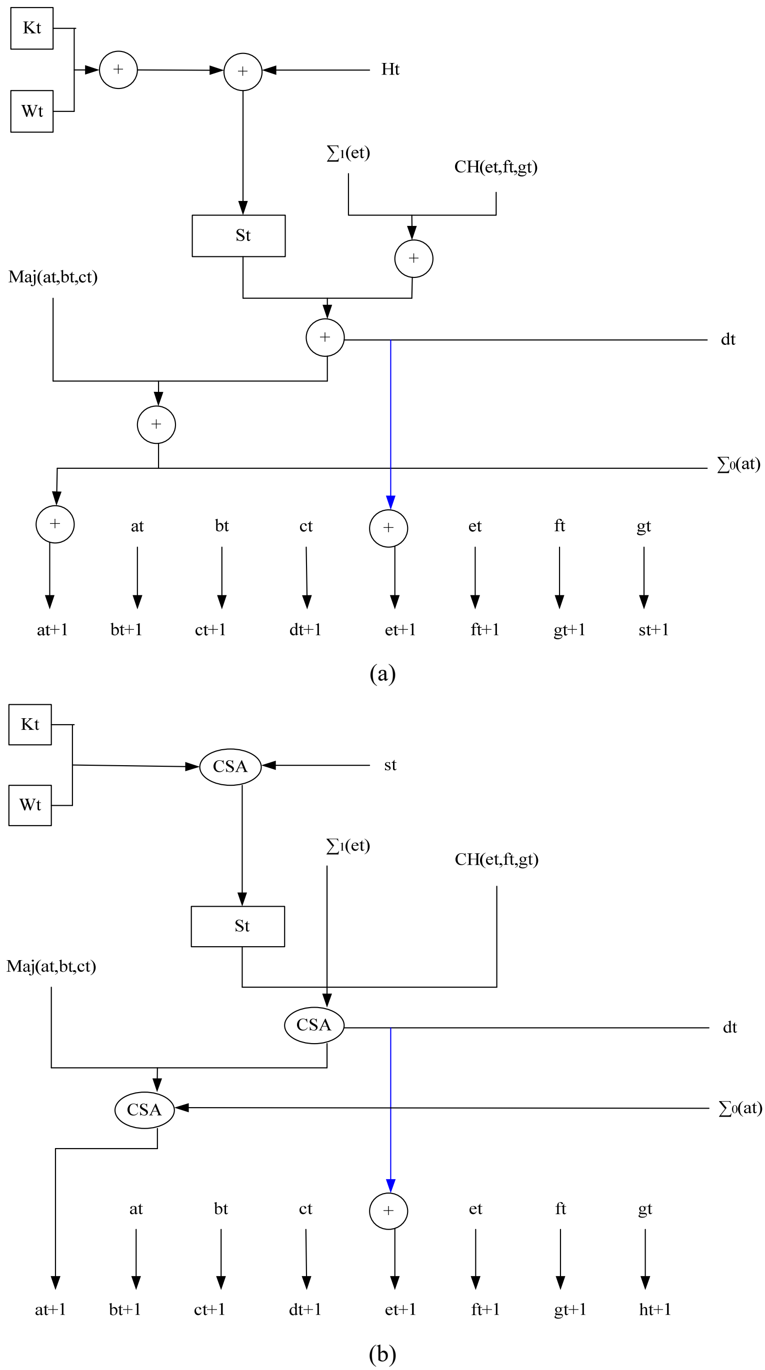
It is not difficult to find that it uses the pre-computing optimisation method, and H_t, K_t, W_t can be obtained through t rounds of calculation. In the calculation process, the values of A and E are updated, and the calculation formula is

$$S_t = s_t + K_t + W_t \tag{11}$$

$$a_{t+1} = \sum_1 e + CH(e_t, f_t, g_t) + S_t + \sum_0 a + Maj(a_t, b_t, c_t) \tag{12}$$

$$e_{t+1} = \sum_1 e + CH(e_t, f_t, g_t) + S_t + d_t \tag{13}$$

Figure 9 SHA-256 algorithm optimisation, (a) precomputed optimisation graph (b) CSA optimisation graph (see online version for colours)



The CSA strategy optimisation method takes advantage of the FPGA. In the operation, the addition operation is reduced, and the minimum path length is used to improve the operation efficiency of the hash algorithm. The following formula mainly calculates it:

$$S(x, y, z) = x \wedge y \wedge z \tag{14}$$

$$Cx(x, y, z) = \left[(xy)\middle|(yz)\middle|(xz)\right] << 1 \tag{15}$$

$$CSA(x, y, z) = S(x, y, z) + Cx(x, y, z) = x + y + z \tag{16}$$

x, y, z are binary numbers. It can also be seen from its optimisation diagram that the adder CSA significantly reduces the addition operation and increases the number of operations. The operations of a_{t+1} and e_{t+1} are optimised, and the optimised calculation is

$$S_t = CSA(s_t, K_t, W_t) \tag{17}$$

$$a_{t+1} = CSA\left(CSA\left(\sum_1 e, CH(e_t, f_t, g_t), S_t\right), \sum_0 a, Maj(a_t, b_t, c_t)\right) \tag{18}$$

By converting students' learning records, homework content and other data into unique hash values, the Hash algorithm ensures that the data is not tampered with or forged during transmission and storage. This method effectively improves the information security in the teaching process, ensures the authenticity and consistency of the data, prevents data loss or illegal modification, and provides an unalterable foundation for the blockchain, enhancing the trust of the entire teaching platform.

3.3 Big data algorithms

Big data algorithms are important in the interactive intelligent teaching model of Chinese language and literature courses. Analysing and mining massive teaching data, they help teachers accurately identify students' learning needs and personalised problems. Using data mining and machine learning technology, it is possible to analyse students' learning behaviors, performance changes, and interaction patterns, thereby optimising teaching content and methods, and achieving dynamic adjustments and personalised recommendations. This not only improves teaching effectiveness, but also promotes the intelligence of the learning process, enhances the pertinence and adaptability of education, and helps create a more efficient and personalised teaching environment.

Big data is a huge collection of data that is difficult to process efficiently. It mainly analyses problems from four aspects: 1 scale, 2 high speed, 3 diversity, and 4 value. It is used in many areas.

Big data has created a comparatively autonomous knowledge system and a new thinking style. Big data analysis is a scientific and practical answer for situations where the data's size, shape, and nature change, making it difficult or impossible to use traditional analysis techniques. The system frequently produces big data and represents its properties and rules of operation. Complex networks use nodes to model individuals in a complex system and edges to describe individual interactions. In big data, data entities can represent individuals in complex systems, and relationships between entities can describe the interactions between individuals in complex systems. Among them, the most used method of big data is the decision tree method.

A decision tree is a tree structure. The non-leaf nodes represent the tests in it, the branches represent its outputs, and the leaf nodes hold the corresponding data.

Let Y be the division of training tuples, then the entropy of Y is expressed as

$$\inf o(Y) = -\sum_{i=1}^{n} p_i \log_2 (p_i) \tag{19}$$

Among them, p_i indicates the probability of occurrence. If the training tuple Y is divided according to the attribute X, the expected information of the division of X to Y is:

$$\inf o_X(Y) = \sum_{j=1}^{v} \frac{|Y_j|}{|Y|} \inf o(Y_j) \tag{20}$$

The difference between the two is the final required information gain.

$$gain(X) = \inf o(Y) - \inf o_X(Y) \tag{21}$$

The specific steps of big data algorithms include data collection, data preprocessing, feature selection and extraction, model training and evaluation. In the data collection stage, a large amount of teaching data is first obtained. Then the noise and missing values are removed through data preprocessing steps to ensure the accuracy and completeness of the data. In the feature selection and extraction process, the features that significantly impact the teaching effect are selected from the original data to simplify the data further. Next, models such as decision trees are used for training, and the information gain is calculated by dividing the dataset to determine the optimal division attributes. After the model training is completed, the model performance is evaluated to ensure its predictive ability and effectiveness. Finally, the model is applied to actual teaching to achieve personalised recommendations and dynamic adjustments.

4 Interactive intelligent teaching mode of chinese language and literature courses

4.1 Interactive intelligent teaching mode

The interactive intelligent teaching mode uses intelligent terminals as the main teaching media, and jointly uses online teaching platforms and social software, including WeChat. However, the medium is not purely based on WeChat, and its usage and scope of application are more flexible. And it emphasises the teaching interaction in the classroom, embeds the classroom interaction design, and moves the front-end analysis to the classroom interaction model. And it lists the existing interactive teaching strategies in detail, and rethinks and recognises the diversified functions of teachers. It has a detailed description of the specific functions and use of teaching media, and finally puts forward the corresponding teaching evaluation methods.

The most important part of the interactive intelligent teaching mode is knowledge interaction, and the process of knowledge interaction includes the following procedures.

1 Knowledge acquisition is the first key link for learners to carry out knowledge interaction, and it is the premise and foundation for the effective development of knowledge interaction.

2 Knowledge dissemination is a process of learning and socialisation activities that transfer knowledge from one part of the disseminator to another part of the knowledge receiver with the help of a particular communication medium.

3 Knowledge sharing refers to the mutual communication of acquired knowledge through various media of knowledge exchange and various methods of knowledge discussion for sharing.

4 Knowledge absorption refers to converting the knowledge passed on by teachers or some learners into the knowledge needed for their own learning, or successfully applying other team knowledge in their own team.

5 Knowledge innovation refers to the pursuit of continuous development of knowledge, continuous exploration of laws, innovation of knowledge, creation of methods, and accumulation of knowledge based on knowledge acquisition, knowledge dissemination, knowledge sharing, and knowledge absorption.

And it applies the continuously innovative new knowledge to new educational fields, so as to promote the reform of education and the progress of national science and technology as the ultimate goal.

The interactive intelligent teaching model realises interactive teaching inside and outside the classroom through various media such as smart terminals, online teaching platforms and social software, and emphasises the combination of classroom interactive design and front-end analysis. This model focuses on the interactive process of knowledge, including five links: knowledge acquisition, dissemination, sharing, absorption and innovation. It aims to promote knowledge exchange and interaction among learners, promote continuous innovation and application of knowledge, and ultimately promote educational reform and scientific and technological progress. In this process, the diverse functions of teachers are re-examined, the tasks of teaching media are described in a comprehensive and detailed manner, and corresponding teaching evaluation methods are also proposed.

4.2 Application of blockchain in interactive intelligent teaching

With the rapid development of information technology, blockchain technology, as a decentralised and tamper-proof data storage method, has gradually shown great potential in education. In interactive computing teaching, blockchain technology can provide efficient and secure data management and promote the sharing of teaching resources, interaction between teachers and students, and transparency of course evaluation.

Applying blockchain technology can promote the deep integration of interactive computing teaching. Teachers first upload the course materials of this semester through the platform, including syllabus, courseware, reference books, homework arrangements, etc. On the blockchain platform, all uploaded teaching content will be encrypted by the hash algorithm to ensure the security and uniqueness of the content. Teachers can also write smart contracts according to the teaching plan to stipulate the task completion requirements, homework submission time, classroom interaction and other contents in the course.

Students sign in to class, submit homework, and interact with teachers and other classmates through the blockchain platform. Every student's learning activity, such as pre-class preparation, classroom speech, homework submission, etc., will be recorded on the blockchain. These records are tamper-proof, ensuring the transparency and fairness of the teaching process.

For example, in class, students can interact with teachers through live video broadcasts, and teachers use real-time data analysis to adjust explanation strategies to ensure that every student can fully participate in teaching. Blockchain technology ensures the authenticity and credibility of student interaction data, providing a reliable basis for subsequent course evaluation.

In the teaching process, the blockchain platform collects students' learning behavior data, such as lecture records, homework scores, interaction frequency, etc., through big data analysis technology to form students' learning profiles. These data can help teachers understand each student's learning progress and mastery, thereby achieving personalised teaching. For example, teachers can provide more learning resources and tutoring for students with learning difficulties, while for students with excellent performance, teachers can recommend more challenging tasks or content. At the same time, smart contracts can automatically adjust teaching plans based on student's learning progress, such as automatically arranging make-up classes, tests, or advanced content based on students' average scores and participation.

The evaluation and feedback links also reflect the application of blockchain technology in interactive computing teaching. Each student's learning behavior is recorded on the blockchain and cannot be modified. Teachers can comprehensively evaluate students based on the data recorded on the blockchain, including class participation, homework submission, learning progress, etc. The evaluation results are automatically generated through smart contracts and fed back to students. In short, the application of blockchain in interactive computing teaching can optimise the management and allocation of teaching resources and promote a more efficient and interactive teaching relationship between teachers and students. These innovative applications improve teaching quality, and the students' learning experience is more personalised, effective and safe.

4.3 Interactive teaching experiment of chinese language and literature courses

The subjects of this experiment are mainly students majoring in Chinese language and literature. Due to the pandemic, the subject's class was changed from offline to online. However, there are no restrictions on online learning platforms and equipment, which are mainly divided into live broadcasts and recorded broadcasts. The method used in this experiment is the questionnaire method. Sending the questionnaires to the students of the school's Chinese language and literature major and asking them to help fill out the questionnaires. This questionnaire does not involve private information such as names. A total of 300 questionnaires were distributed. The questionnaire is shown in Table 2.

The collected questionnaires were analysed using decision tree technology, and the general situation is shown in Table 3.

Table 2 Specific questions of the questionnaire

Question	*Options*	*Overall rating (1–5 points)*
What is the teaching mode of Chinese language and literature?	1 Live broadcast	
	2 Record and broadcast	
A How interesting the class is	a interesting	
	b moderate	
	c not interesting	
B Participation in class	a strong	
	b moderate	
	c weak	
C. The degree of learning of the course	a serious	
	b moderate	
	c not serious	
D The degree of concentration in the course	a attentive	
	b moderate	
	c not attentive	
E Satisfaction with the course	a satisfied	
	b moderate	
	c dissatisfied	
Your gender	1 male	
	2 female	

Table 3 The specific situation of the respondents of the questionnaire

Teaching mode	*Live streaming*		*Record and broadcast*	
The total number of people in the two modes	171		117	
Gender	Male	Female	Male	Female
Number of people	73	98	53	64
Percentage of men and women	42.7%	57.3%	45.3%	54.7%
Teaching mode percentage	59.4%		40.6%	
Total people	288			

Table 3 shows that this time, 288 questionnaires were retrieved, yielding an effective recovery rate of 96%. Additionally, the school uses live broadcasts to teach Chinese language and literary courses in an engaging manner. About 60% of the total, or 171 surveys, are included. Additionally, this questionnaire gathered more information from women than from men. This study uses decision tree technology to examine the categorised questionnaires independently after classifying the particular case. The experimental data is shown in Figure 10, which describes the evaluation of each student.

Capital letters such as A and B in Figure 10 represent the serial numbers of the corresponding questions in the questionnaire, and a, b, and c represent the situations selected by the students in the questionnaire. From Figure 10, it can be seen that the evaluation of the Chinese language and literature course is generally better than that of the recorded broadcast. It adopts the live interactive teaching mode. In the questionnaire, students can choose about 100 copies of their concentration, seriousness, satisfaction, and learning level. It accounts for about 58.5% of the live teaching, and the number of people who do not approve it is only about 10–20, not more than 11%. Conversely, analysing the degree of recognition of students who use recording and broadcasting to explain Chinese language and literature courses, a total of 117 students, only about 20 people approved the recording and broadcasting courses. The peerless students do not like this teaching mode; the main reason is that they feel that this teaching mode is like the teacher is talking about himself, and the learning atmosphere is not very good. Overall, it can be seen that the live interactive teaching mode is helpful in improving students' interest in learning. It creates a good learning atmosphere, allowing students and teachers to integrate. The total scores of students are shown in Figure 11.

Figure 10 Evaluation of the two teaching modes, (a) evaluation of live teaching (b) evaluation of recorded teaching (see online version for colours)

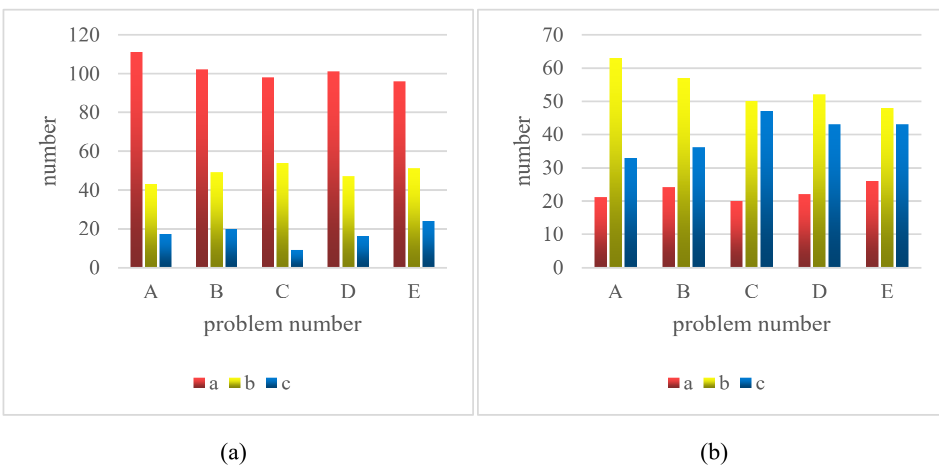
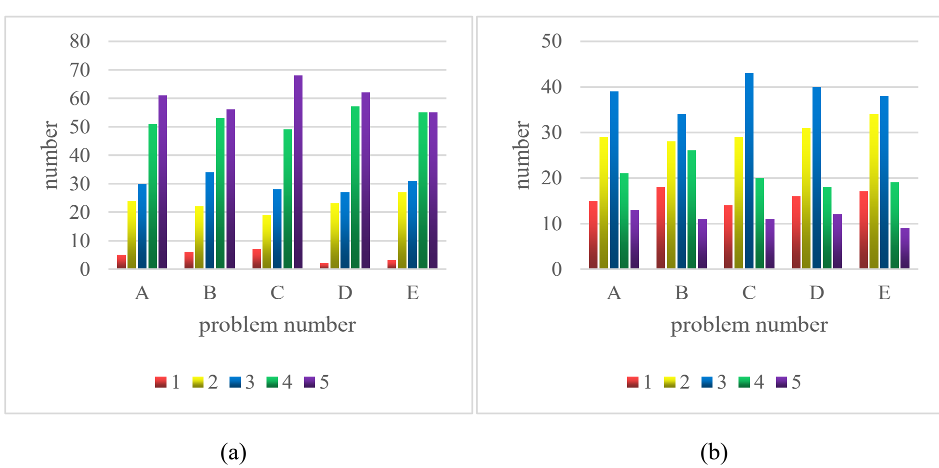


Figure 11 Scoring of the two teaching modes, (a) scoring of live teaching (b) scoring of recorded teaching (see online version for colours)



In Figure 11, ratings for course correspondence are denoted by numbers 1–5. The data indicates that students generally give live teaching high ratings, indicating that they enjoy this style of instruction and that live teaching will be of very high quality. For recorded and broadcast classes, most of the students adhere to the indifferent mentality, but they still do not approve of it in general.

Based on the analysis of experimental data, it can be seen that the interactive teaching mode of live broadcast will greatly improve students' enthusiasm and the quality of learning in the course.

5 Conclusions

This paper mainly studies the working mode of blockchain and applies it to teaching Chinese language and literature courses to promote intelligent interactive teaching. This paper analyses students' evaluation and scores of live teaching and recorded teaching through questionnaire surveys, and comprehensively analyses and summarises the questionnaire data through decision tree technology in big data. Through a comprehensive analysis of the evaluation and scoring of live teaching and recorded teaching by students majoring in Chinese language and literature, it is concluded that live teaching is more popular among students. Most students believe that live teaching can enhance the interaction between teachers and students, improve learning interest, and create a good learning atmosphere. However, this study still has some shortcomings. Due to the limited sample size, it may not fully reflect the opinions of all students; at the same time, the depth of evaluation of the specific interactive strategies and effects of live teaching still needs to be strengthened. Future research can further expand the sample range and deeply explore the exact impact of different teaching interaction strategies on students' learning effects, in order to put forward more targeted teaching improvement suggestions, continuously optimise the teaching mode of Chinese language and literature courses, and improve teaching quality.

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