Study on the Teaching Effect Evaluation Based on the Big Data and IOT

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Abstract: To prevent and control the novel coronavirus pneumonia epidemic, the Ministry of Education has issued guidelines for "suspending classes without stopping school". They have called for the use of online platforms for teaching to continue. Implementing an online training learning results certification system can help improve the lifelong learning system and accelerate the construction of a learning society. This article proposes a block-chain based learning outcome certification model to address the practical challenges of online training learning outcome certification. It utilizes a "master-slave multi-chain" data link architecture and chameleon hash technology, integrating common, smart contract, and traceability mechanisms. This mannequin serves as a reference for the orderly improvement of casual studying effect certification.

1. Introduction

Over the past few years, technologies such as Internet +, smart education, cloud computing, and block-chain have rapidly integrated into education and teaching, as depicted in Figure 1. These advancements have significantly impacted teaching activities and led to profound changes in teaching methods, tools, and content, restructuring the education and teaching environment. This has promoted comprehensive innovation in education models, learning environments, and other related fields. The advantages of online learning in terms of time and spatial location allow learners to learn with great convenience and flexibility, which has attracted more and more attention from the education circle. Online learning has become an important way of learning globally, which provides convenient access to the growing scale of higher education and more and more digital learning opportunities. As learning analysis, competency-based education, and adaptive learning are being accepted by today's learners, teaching administrations need to adopt new learning methods to better serve students. Therefore, in order to better promote the effect of learners' online learning, both educators, learners and managers need to change their roles, update their teaching concepts,

use information technology means, improve the quality of online learning environment, mobilize the initiative of learners, and create a "deep and meaningful" online learning atmosphere for learners.
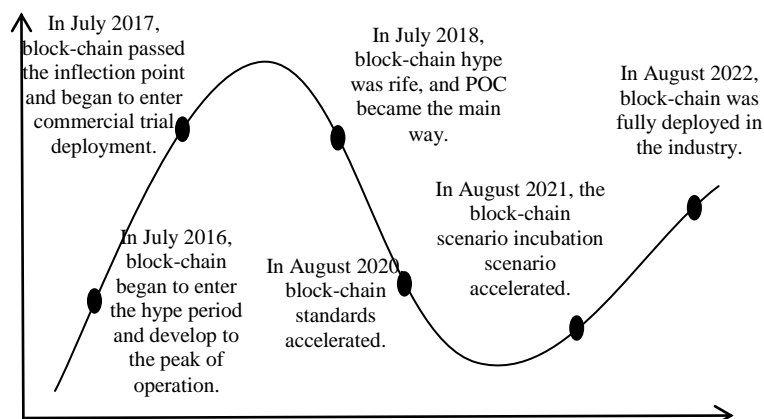

Figure 1. Development history of block-chain technology

2. Literature Review

Since Eisner E. W. first proposed the concept of "learning outcomes" in 1979, it has been more than 100 years since learning outcomes have completed the triple jump from "focusing on the improvement of teaching strategies" to "focusing on the evaluation of educational quality" to "focusing on the connection and integration of education". And quickly rose to the strategic height of "improving the lifelong education system and building a learning society". Recently, both domestic and international scholars have conducted extensive research on the certification and management of learning outcomes, categorizing their findings into the following groups.

2.1. Concept Definition of Learning Outcomes Certification

The existing literature has different definitions of the connotation of learning outcomes certification, and the most representative ones are as follows: (1) From the perspective of the form of outcomes, it is mainly the formal learning outcomes certification based on academic education, the informal learning outcomes certification based on certificate education and the learning outcomes certification based on non-formal education without certificates and credits (Rogers, 2016; Lin and Shi, 2022); (2) From the perspective of achievement structure, it is mainly the certification of cognitive achievements of general education and professional education and emotional achievements of professional choice, attitude and values (Shiet al., 2020).

2.2. International Experience in Learning Outcomes Certification

The development of learning outcomes certification in foreign countries is relatively mature, which mainly has the following characteristics: (1) Most of them adopt national or regional policies and regulations to ensure the legality, effectiveness and authority of learning outcomes certification (Keevy & Chakroun, 2019); (2) Taking the certification of informal and informal learning outcomes as the key research object, while taking into account the mutual recognition of credits of various educational institutions (Wang and Deng, 2019).

2.3. The Future of Research in Learning Outcomes Certification Will Involve Exploring the Impact of Block-chain Technology

It mainly includes three categories: (1) Research on model construction focusing on integrity. Based on the overall perspective, quantitative and non-quantitative learning results were recorded to build a block-chain model (Grather et al., 2018); (2) Development and research for local function realization. Based on the technical perspective, in-depth research on local functions aims to solve prominent problems (Yang et al., 2019).

Based on the above literature review, relevant studies have the following deficiencies: First, from the perspective of research, there is little research on the certification of learning outcomes by integrating consensus mechanism, smart contract and course quality evaluation. Most literature is limited to the certification of learning outcomes by the underlying technology of block-chain, which is too technical and ignores the evaluation of course quality, resulting in low credibility and flexibility of certification results. Second, in terms of research content, most of the relevant research at home and abroad focuses on the storage and recording of learning content and process, and lacks in-depth research on application scenarios, data property rights and stakeholders. In today's continuous iteration of block-chain technology, specifically, building a block-chain learning achievement authentication model that integrates a hybrid common mechanism, "master-slave multi-chain" data chain architecture, and chamole hash technology will be an essential research direction.

3. Background of epidemic prevention and control problems in offline teaching

3.1. The Incidence of Instructional Requirements Has Led to Insufficient Adaptability of the Consciousness Thought

This is due to the lack of clear attention of casual getting to know results and the absence of an hooked up awareness system. In Chinese schools and institutions, the modern-day appreciation of the subjective repute of college students is insufficient. Furthermore, the assessment general for educational training is nevertheless being utilized, and there is a lack of identification standards based on students' development. Consequently, students' technical capabilities and ride can't be utterly recognized, profession improvement planning for freshmen is hindered, and the recognized mastering outcomes cannot be diagnosed in the labor market. Additionally, there is a lack of participation of different stakeholders in the focus process. School instructors are the foremost physique of recognition, and the attention standards notably focal point on tutorial education. The identification approach is single and lacks flexibility. As a result, non-academic education achievements are difficult to evaluate accurately, and the social recognition degree is low, making it challenging for nationwide mobile conversion [1].

3.2. Insufficient Stakeholder Participation Results In a Lack of Diversity in the Identification Process

This is on the whole due to the lack of authorities and enterprise personnel involvement. The absence of authorities personnel participation is especially mirrored in the lack of identification requirements and a unified identification stage for authorities personnel. Similarly, the lack of enterprise personnel involvement is ordinarily due to the absence of expert personnel to oversee the identification procedure and take part in evaluations. To address this issue, it is essential to establish an evaluation group that includes a diverse range of stakeholders. This crew must consist of 3-7 specialists with various ranges of skills who are composed of tutorial personnel, exterior experts,

and a adequate share of enterprise and organization personnel. This way, a more comprehensive and inclusive identification process can be developed [2].

3.3. The Identification System is Frequently Ambiguous due to Delayed Building of Legal Guidelines and Regulations, in Particular in the Absence of Applicable Countrywide Rules and Insurance Policies

To elaborate, the lack of country wide law provisions for credit score accumulation and conversion in each widely wide-spread and one-of-a-kind training are major contributors to the indistinct identification process. Additionally, the absence of clear necessities for certified builders and the lack of first-rate supervision and administration guidelines of identification consequences similarly exacerbate the situation. To make sure that learners' skills acquired from instructional establishments are diagnosed by means of society, it is fundamental to strictly audit the identification great of schooling education institutions. This can be accomplished thru curriculum and business enterprise audits. These measures are crucial for proper implementation of the identification process and for ensuring that learners' qualifications are appropriately recognized [3].

3.4. The Poor Flexibility of the Identification Method can be Attributed to the Lack of Experience among Organizational Personnel, Which is Primarily Evident in Two Aspects - the Inexperience of Identification Personnel and the Limited Value of the Identification Method

The inexperience of identification personnel is particularly mirrored in the lack of overseas trip and everyday training. It is essential that the certified personnel receive advanced foreign experience learning and regular training, which can help enhance their expertise. The restrained price of the consciousness technique is exceptionally due to the restrained consciousness substances submitted via newbies and the imperfect development of applicable facts platforms. It is necessary to ensure that learners provide comprehensive recognition materials, and the construction of relevant information platforms should be improved to enhance the value of the identification method [4].

3.5. The Susceptible Liquidity of Focus Effects can be Attributed to the Vulnerable Basis of Device Operation, Especially in the Subject of Organising a Cooperative Mechanism between Areas and Departments and the Venture of Deposit Administration for Establishments

To tackle this issue, our us of a is actively imposing the country wide qualification body machine and the countrywide deposit financial institution system. However, the implementation of these reforms is gradual and will require time.To aid the credit score administration machine reform, it is integral to introduce a credit score financial institution and leverage block-chain science to save learners' educational performance, coaching experience, and work trip in a countrywide credit score bank. By doing so, learners, instructional institutions, and employers can get entry to applicable records each time and anywhere. With a stronger credit management system in place, the liquidity of recognition results can be significantly improved [5].

4. The Development of an Online Learning Achievement Certification Model That Utilizes Block-Chain Technology Involves Constructing an Internal Mechanism

4.1. Design Principles

To tackle the problems existing in modern on-line studying fulfillment certification practices,

this paper proposes to assemble a block-chain primarily based mannequin illustrated in Table 1.

Table 1. Problems of the present on line studying fulfillment certification mannequin and options of this mannequin

Type	Existing Problem	Model Characteristics and Corresponding Schemes
Result certification	The authentication business process is complex	smart contract
	Open online courses vary in quality and standards	"Master-slave multi-link" data architecture
	Credit credibility and validity are not high	
	There are difficulties in learner identity authentication	Real name authentication based on block-chain
	Only the learning input is emphasized, while the learning output is ignored	The credit transfer method is evaluated according to the double standard of "learning quantity" and "learning outcome"
Privacy & Security	Security of user information	Crypto tree storage structure, imtamper of block-chain
	Learning data is susceptible to manipulation	
	Authenticity of learning outcomes	
	Diploma fraud	
Interoperability and accessibility	Lack of adjustment rules for unexpected situations	Editable block-chain based on chameleon hashing technology
	Database stress caused by access	Distributed and decentralized
	Learning outcomes are not traceable	Uniqueness and traceability of blocks

4.2. Model System Architecture

The gadget structure of this mannequin entails various nodes, together with the consumer stop (learners), aid give up (universities, route aid providers, and different organizations), and inquiry end. In a block-chain community environment, all technique operations are performed on these three ports and are mechanically finished via clever contracts, as elaborated in Figure 2.
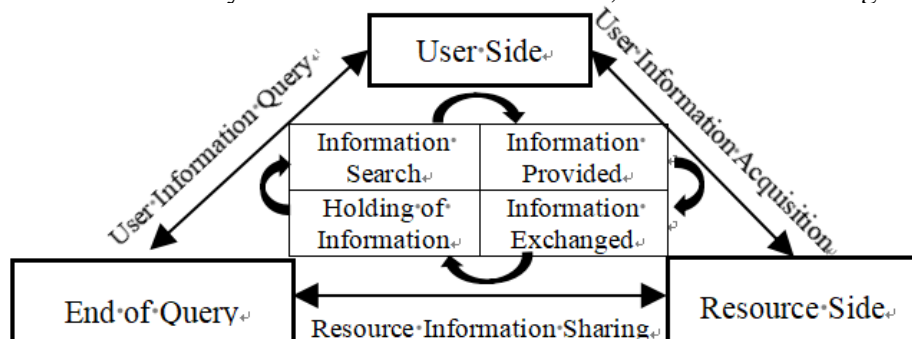
Figure 2. Design of online training learning outcomes certification model

User side. The consumer cease of this mannequin entails rookies registering to the platform through getting into their non-public data and sending it to a third-party regulator for verification.

Due to the encryption of all records records on the block-chain network, the storage and transmission of private facts is tremendously impenetrable and resistant to tampering or theft. Only after passing the verification process can learners join the block-chain network. Upon joining, the learner is assigned a special block-chain tackle and corresponding non-public and public keys. Learners can then autonomously pick guides to learn, every with its special ID, which is saved in the major block-chain alongside with getting to know conduct data, examination results, and different associated information.

Resource side. The useful resource aspect consists of instructional useful resource carriers (courses) and certificates issuers who act no longer solely as maintainers however additionally as supervisors of the system. Whenever a new useful resource node seeks to be part of the block-chain network, it is required to supply sure qualification information, which is then despatched to different regulators for review. Upon profitable verification, the gadget assigns the corresponding block-chain address, public and non-public keys.

End of Query. In situations the place an employer (such as an company or university) wishes to affirm a learner's gaining knowledge of achievement, the learner offers their personal key to the enquirer. By matching the public key with the received non-public key, the enquirer can get entry to the learner's private data and studying results. Moreover, by way of attractive in the identical system described above, the enquirer can affirm the authenticity of the certificates issued through comparing the contents of the signature message, block address, and different key factors on the success certificate.

4.3. Data Model Structure Design

The paper outlines a "master-slave multi-link" statistics hyperlink structure to signify the information mannequin of on-line getting to know effect certification. The getting to know consequence chain serves as the essential chain, whilst the scholar statistics chain and route statistics chain feature as subordinate chains. Through this system, various types of data are classified and stored, enabling the evaluation of both student performance and course quality, as demonstrated in Figure 3.
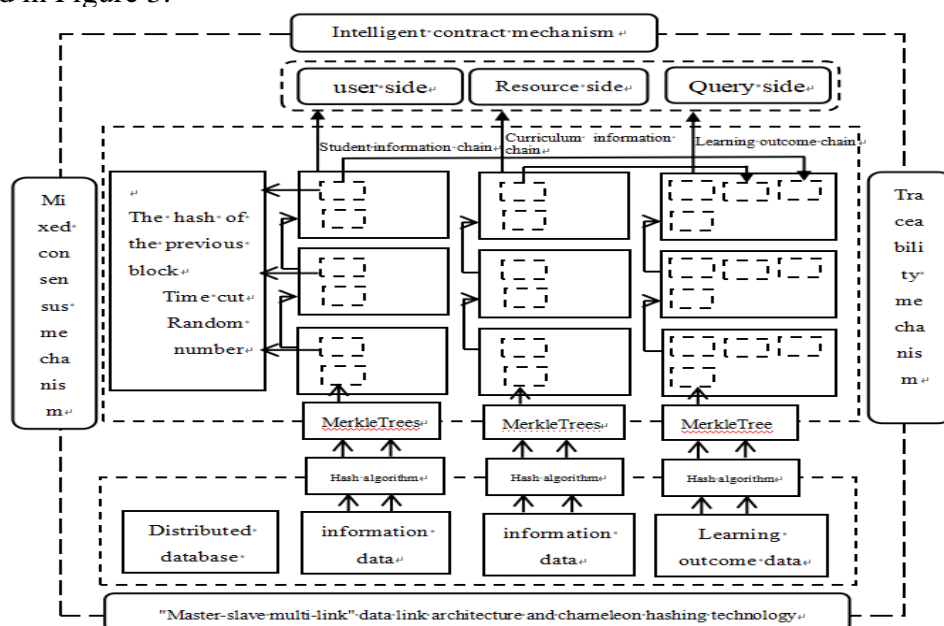
Figure 3. Design drawing of online training learning achievement certification model system

5. The Mechanism for Imposing on Line Mastering Success Authentication the Usage of Block-Chain Technological Know-how is As Follows

This paper makes use of a hybrid consensus mechanism that combines proof of fairness mechanisms and sensible Byzantine fault-tolerant algorithms to authenticate identification data and gaining knowledge of outcomes. The evaluation of course quality is achieved through the utilization of "master-slave multi-chain" data link architecture and smart contracts. Chameleon hash technological know-how is carried out to optimize block-chain community information, and more than one signatures are integrated to warranty the protection and authenticity of the authentication process, as illustrated in Figure 4.
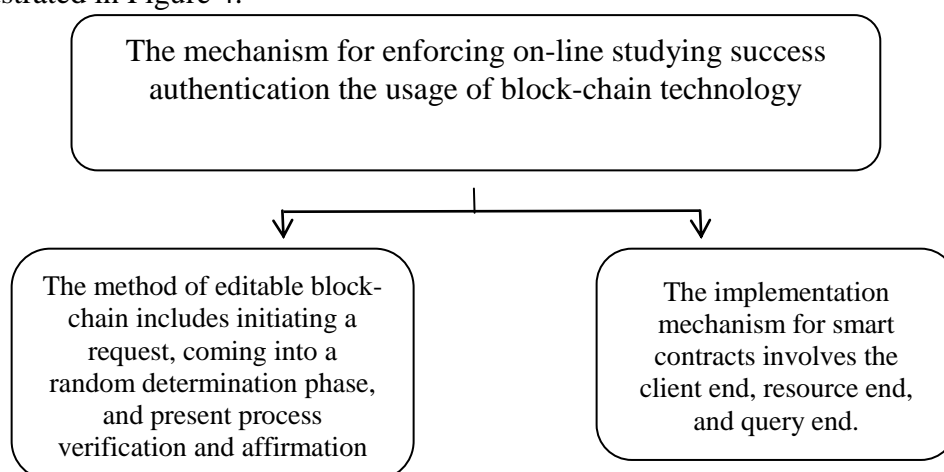
Figure 4. The diagram below illustrates the mechanism for achieving online learning achievement certification using block-chain technology.

5.1. Editable Block-chain

In sure scenarios, editing facts on the block-chain might also be quintessential for the steady operation of the system. Although in most cases, the statistics on the block-chain need to stay unmodified. To address this, the model incorporates chameleon hashing technology to modify problematic data on the block-chain. This process involves three stages [6].

The first stage involves initiating a request. Once a consumer submits a amendment request, the gadget acquires the user's block tackle and disseminates the request to the complete network. Other block-chain community customers acquire the request, and if the approval of over 50% of the customers is obtained, the gadget archives the user's request signature and proclaims it [7].

The Second stage entails the random decision phase. Once the amendment request is accepted, the device implements a allotted random quantity era protocol. With this protocol, a couple of events can mutually generate a random wide variety to decide which person is granted permission to regulate the block. This stage contains a random wide variety technology protocol in the system to make certain every person has an equal risk of receiving permission to alter the block, thereby stopping assaults focused in the direction of customers with preexisting block change permissions.

The third and final stage is the verification and confirmation phase. With the permission to adjust the content, the distinct consumer modifications the block information, and different nodes confirm the content material changer as the chosen node whilst verifying the up to date block information. Upon profitable verification, the cutting-edge block statistics is saved. However, if the verification fails, the disbursed random variety era protocol is re-initiated to adjust the customers granted permission, and the aforementioned procedure is repeated.

5.2. Implementation Mechanism of Smart Contract

The clever contract's implementation notably facilities on the verification and matching of pupil statistics and gaining knowledge of outcomes, as properly as the automated recording and monitoring of the gaining knowledge of process's facts and outcomes. From a contract party perspective, the model implements three categories of smart contracts, as demonstrated in Figure 5.
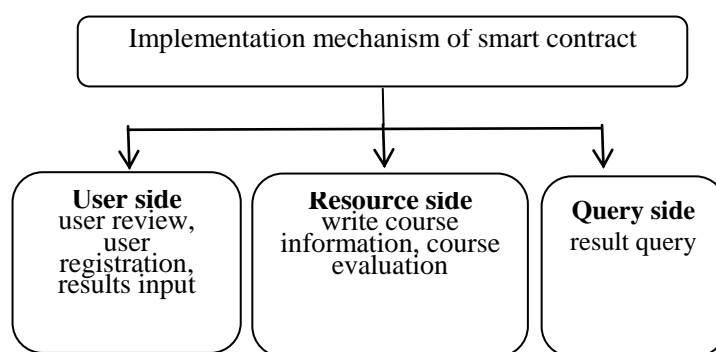

Figure 5. Smart contract of on-line studying result certification mannequin

6. Conclusion

To curb and address the outbreak of novel coronavirus pneumonia, the Ministry of Education has implemented a guideline of "suspending classes without stopping school." This initiative specifically encourages the use of online teaching platforms to facilitate remote learning [8].

This find out about delves into the implementation mechanism of block-chain science to validate and authenticate on line getting to know outcomes. The goal is to beautify the credibility and liquidity of mastering effect data. The certification technique has lengthy been plagued by means of countless issues, consisting of confined adaptability of focus concepts, a single composition of awareness subject, ambiguous cognizance processes, bad flexibility of attention methods, and susceptible liquidity of awareness results. As such, this mannequin proposes a mastering result certification mannequin that accommodates block-chain technology [9].

The gadget structure of the mannequin includes three predominant nodes: the person give up (learners), the useful resource quit (universities, route useful resource providers, and different organizations), and the inquiry end. With block-chain community implementation, all manner operations take place inside these three nodes and are robotically performed thru clever contracts.

This paper makes use of a hybrid consensus mechanism, which combines proof of fairness mechanism and realistic Byzantine fault-tolerant algorithm, to authenticate identification data and getting to know outcomes. Course first-class assessment is facilitated by using using a "master-slave multi-chain" statistics hyperlink structure and clever contract. The chameleon hash technology is utilized to optimize certain information within the block-chain network. Additionally, a couple of signatures are used to warranty the protection and authenticity of the authentication process [10].

To tackle the problem of equity and credibility concerning certification consequences that stem from the lack of direction excellent evaluations, the mannequin employs the "master-slave multi-chain" architecture. This structure permits categorized facts storage to limit block data redundancy, as nicely as promote the two-way contrast of on line getting to know effects and direction quality.

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Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

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

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