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# *On the Application of Blockchain Technology in the Integration System of Lifelong Vocational Education in Guangdong-Hong Kong-Macao Greater Bay Area*

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***Keywords:*** Blockchain Technology, Guangdong-Hong Kong-Macao Greater Bay Area, Lifelong Vocational Education, Integration, Application

***Abstract:*** The Plan for Promoting the Cooperation and Development of Higher Education in Guangdong-Hong Kong-Macao Greater Bay Area clearly proposes to build the Guangdong-Hong Kong-Macao Greater Bay Area into a vivid model for the comprehensive cooperation and development of education between the mainland and Hong Kong and Macao, and promote the coordinated development of the education chain and the economy and society in Guangdong-Hong Kong-Macao Greater Bay Area. Building a lifelong vocational education integration system is an important area for the comprehensive cooperation and development of education between Guangdong, Hong Kong and Macao. In this paper, the application of blockchain technology is organically combined with the integration of lifelong vocational education in Guangdong, Hong Kong and Macao, and the application research of blockchain technology in the integration system of lifelong vocational education in the Greater Bay Area is carried out. Firstly, it introduces blockchain, core technology and its main advantages, and expounds the connotation and main characteristics of lifelong vocational education. Then it analyzes the coupling mechanism between the technological advantages of blockchain and the construction of the Greater Bay Area lifelong vocational education integration system. On this basis, it puts forward the ideas and measures for the application of blockchain technology in the construction of the Greater Bay Area lifelong vocational education integration system: construct the decentralized lifelong vocational education system in the Greater Bay Area at the structural level, construct the Greater Bay Area lifelong vocational education learning information database at the data level, construct the Greater Bay Area lifelong vocational education portfolio application system at the application level, and construct the Greater Bay Area intelligent learning resource trading platform at the transaction level. It is to provide reference for promoting the integration of lifelong vocational education in Guangdong-Hong Kong-Macao Greater Bay Area and the sustainable improvement of education quality.

## 1. Introduction

In 2020, the Ministry of Education and the People's Government of Guangdong Province jointly issued “The Plan for Promoting the Cooperation and Development of Higher Education in Guangdong-Hong Kong-Macao Greater Bay Area”, which clearly proposed to build Guangdong-Hong Kong-Macao Greater Bay Area (Hereinafter referred to as GHM Great Bay Area) into a vivid model for the comprehensive cooperative development of education between the mainland and Hong Kong and Macao, and promote the coordinated development of education chain and economy and society in GHM Great Bay Area. [1] The integration of lifelong vocational education is an important area for the comprehensive cooperation and development of education between Guangdong, Hong Kong and Macao. At the same time, building a lifelong vocational education system is an inevitable requirement to deal with the sustainable development of society and people. Emphasizing lifelong vocational education is not only the needs of society and the times, but also the needs of the development of vocational education itself. [2] In recent years, blockchain technology has been applied in the field of education with its outstanding advantages such as transparency, decentralization and immutability. [3] This study organically combines the application of blockchain technology with the integration of lifelong vocational education in GHM Great Bay Area, and constructs a lifelong vocational education integration system in GHM Great Bay Area based on blockchain application, which is of great significance to continuously improve the quality of Lifelong Vocational Education in the Greater Bay Area and promote the comprehensive cooperation of regional education.

## 2. Research Status of Lifelong Vocational Education Integration in Guangdong-Hong Kong-Macao Greater Bay Area

Liu Wenqing (2018) believed that promoting universal learning and lifelong learning and building a lifelong education system in Guangdong-Hong Kong-Macao Greater Bay Area is of great significance to the national strategic planning for the sustainable economic development of Guangdong, Hong Kong and Macao. The author suggested building a large system, platform, hub and alliance framework for the lifelong learning needs of the people in the Greater Bay Area, so as to realize the co construction and sharing of high-quality lifelong education resources in the Greater Bay Area and form a cross city open lifelong learning environment, serve the construction and development of GHM Great Bay Area. [4] Xu Ling, Zhang Weiyuan and Li Xuechan (2019) analyzed the connection and innovative development of lifelong education qualification framework in Guangdong-Hong Kong-Macao Greater Bay Area from two aspects of theory and practice, including international comparison of qualification framework, theoretical basis of qualification framework, international standards of qualification framework, innovation mode of qualification framework, integration and challenge of Guangdong, Hong Kong and Macao qualification framework, innovation mode of China's qualification framework, etc. [5] Zhang Zhiqiang and Long Yun (2021) proposed to use “One plus X” certificates to promote the docking of the lifelong education qualification framework in Guangdong-Hong Kong-Macao Greater Bay Area, that is, by formulating the grade standards for mutual recognition of qualifications and credits based on learning achievements, building the credit exchange system in the Greater Bay Area, developing the certificate curriculum system, establishing the relevant quality assurance mechanism in the Greater Bay Area. And they also proposed to build a mixed "double qualified" team and improve the intelligent education information environment to break through the bottleneck of the integrated development of education in in the Greater Bay Area, so as to improve the construction of the lifelong education system. [6] Dong Ping (2021) put forward four suggestions and measures to improve the lifelong education system in n Guangdong-Hong Kong-Macao Greater Bay Area. The first is to break down institutional barriers and promoting the flow of lifelong education resources. Second, improve relevant systems and

encourage social capital investment to participate in lifelong education. Third, give full play to the complementary advantages of cities and expand the niche capacity. Finally, innovate the system and mechanism of lifelong education in the Greater Bay Area, optimize and standardize the environment, and promote the construction of lifelong education ecosystem in Guangdong-Hong Kong-Macao Greater Bay Area. [7] On this basis, Dong Ping (2022) proposed to reshape the lifelong education system in Guangdong-Hong Kong-Macao Greater Bay Area, improve the ability and level of lifelong education service area development in the Greater Bay Area, build a unified organization and improve the system and mechanism. [8]

To sum up, the existing research has made important progress and academic value, but most of them put forward suggestions and measures to build a lifelong education system in Guangdong-Hong Kong-Macao Greater Bay Area from the perspective of educational qualification framework, educational resource elements, mechanism and system, and there are few research results on the integration of lifelong vocational education in Guangdong-Hong Kong-Macao Greater Bay Area in the field of vocational education. And the research literature on the application of blockchain technology to build a lifelong vocational education integration system in Guangdong-Hong Kong-Macao Greater Bay Area is even rarer. This study organically combines the application of blockchain technology with the integration of lifelong vocational education in Guangdong-Hong Kong-Macao Greater Bay Area, and puts forward ideas and measures for the construction of the integration system of lifelong vocational education in the Greater Bay Area based on blockchain application, so as to provide reference for promoting the cooperation of lifelong vocational education in the Greater Bay Area.

## 3. Blockchain Core Technologies and Their Main Advantages

A scholar with a pseudonym of Satoshi Nakamoto published a groundbreaking paper “Bitcoin: A Peer-to-Peer Electronic Cash System” online in 2008. Therefore, the concept of blockchain is considered to originate from digital currency —— Bitcoin. It is a data structure that combines blocks in a chain. [9] At present, the generally accepted definition of blockchain has not been formed. In a narrow sense, blockchain refers to the decentralized shared general ledger that combines data blocks into a specific data structure in a chain manner and in chronological order, and prevents forgery and tampering with cryptography. In a broad sense, blockchain refers to a distributed computing paradigm and decentralized basic framework that uses distributed node consensus algorithm for data generation and update, adopts encrypted chain block structure for data verification and storage, and uses automated script code (smart contract) for data operation and programming. Blockchain is not only a cutting-edge technology, but also an advanced management concept, decision-making ideas and institutional framework in terms of decentralization, distributed storage, collective maintenance, information transparency, etc.

The core technologies and advantages of blockchain mainly include the following: (1) Distributed ledger technology, with the main advantages of decentralization and reliable and stable system. (2) Consensus mechanism and algorithm to realize information transparency, data authenticity and security. (2) The main advantages of hash operation and timestamp technology are data tamper-proof, permanent storage of records, traceability and traceability. (3) Asymmetric encryption digital signature technology has the functional advantage of protecting privacy. (4) Smart contract technology has the advantage of automatically and efficiently completing transactions.

## 4. Connotation and Main Characteristics of Lifelong Vocational Education

The idea of lifelong vocational education is developed on the basis of lifelong education, which is a reinterpretation of vocational education under the background of lifelong education. The concept of

lifelong vocational education has broken through the limitations of the original narrow vocational education and training in time and space. In terms of time, it emphasizes that vocational and technical education runs through one's life and provides help for one's whole career. In space, it emphasizes the use of various places and the integration of various educational resources to carry out vocational and technical education and training. [10] The characteristics of lifelong vocational education mainly include persistence, entirety, flexibility, openness and dynamicity.

(1) Persistence: vocational education is not limited to a certain period of career development and a certain age, but runs through one's life and is a continuous process. (2) Entirety: various vocational education activities form a whole, including vocational education in schools, institutions, enterprises, communities, families and other places. In all stages and fields of life, all kinds of vocational education are inseparable and interrelated. (3) Flexibility: vocational education should break through the rigid rules and restrictions of traditional vocational education, establish a flexible and dynamic school running system, select flexible teaching methods and means, enrich various teaching contents and various organizational forms conducive to learning. (4) Openness: the door of vocational education is open to the whole society, emphasizing education for all. Everyone has the opportunity to receive education and training, and everyone can get an education suitable for their own development. (5) Dynamicity: vocational education should dynamically adapt to the needs of the labor market in different development periods, effectively communicate between vocational education and the industry, and ensure that vocational education actively adapts to the needs and changes of the labor market through the combination of industry, education and research.

## 5. Coupling Mechanism between Blockchain Technology Advantages and Requirements for the Construction of Lifelong Vocational Education System

In order to build a lifelong vocational education integration system based on blockchain, this study first analyzes the coupling mechanism between blockchain technology advantages and lifelong vocational education system, forming a theoretical basis for Technology Application Research Based on the coupling of the two. The coupling mechanism between blockchain technology advantages and lifelong vocational education features is shown in Figure 1.

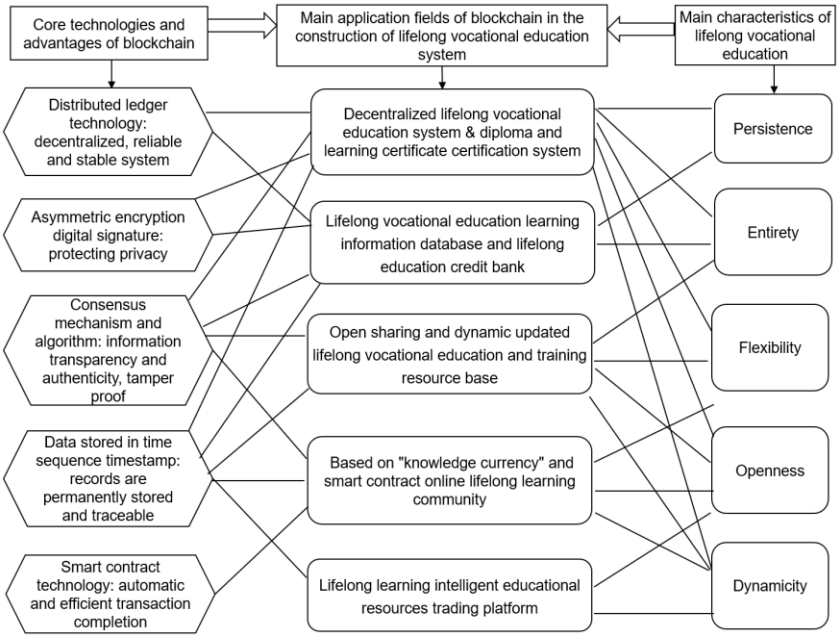


Figure 1: Coupling mechanism between blockchain technology advantages and lifelong vocational education characteristics

As shown in the above figure, the paper first analyzes the main characteristics of the core technologies of blockchain, give play to the advantages of various technologies of blockchain, and then combine the main characteristics of lifelong vocational education to develop the main application fields of blockchain technology in the construction of lifelong vocational education system with the goal of meeting the construction requirements of lifelong vocational education system. Taking the application fields of "lifelong vocational education learning information database" and "lifelong vocational education credit bank" in Figure 1 as an example, the blockchain's distributed ledger, consensus mechanism, timestamp, digital signature, smart contract and other technologies are applied to give play to their technical advantages such as decentralization, data transparency and authenticity, permanent record storage, tamper-proof, traceability, and automatic transaction completion, in combination with the "persistence" and "integrity" characteristics of lifelong vocational education and its system construction requirements, the technical application fields of "lifelong vocational education learning information big database and lifelong vocational education credit bank" are put forward (see the following for details).

## 6. The Application of Blockchain Technology in the Integration System of Lifelong Vocational Education in GHM Greater Bay Area

Based on the analysis of the coupling mechanism between the technical advantages of the blockchain and the requirements for the construction of the lifelong vocational education system, this study puts forward the construction idea of the lifelong vocational education integration system in GHM Greater Bay Area based on the blockchain technology: build a decentralized lifelong vocational education system in the Greater Bay Area at the structural level, build a learning information database of lifelong vocational education in the Greater Bay Area at the data level, and build a combined application system of lifelong vocational education in the Greater Bay Area at the application level, build the Greater Bay Area intelligent learning resources trading platform at the trading level. The lifelong vocational education system in GHM Greater Bay Area based on blockchain technology is shown in Figure 2.

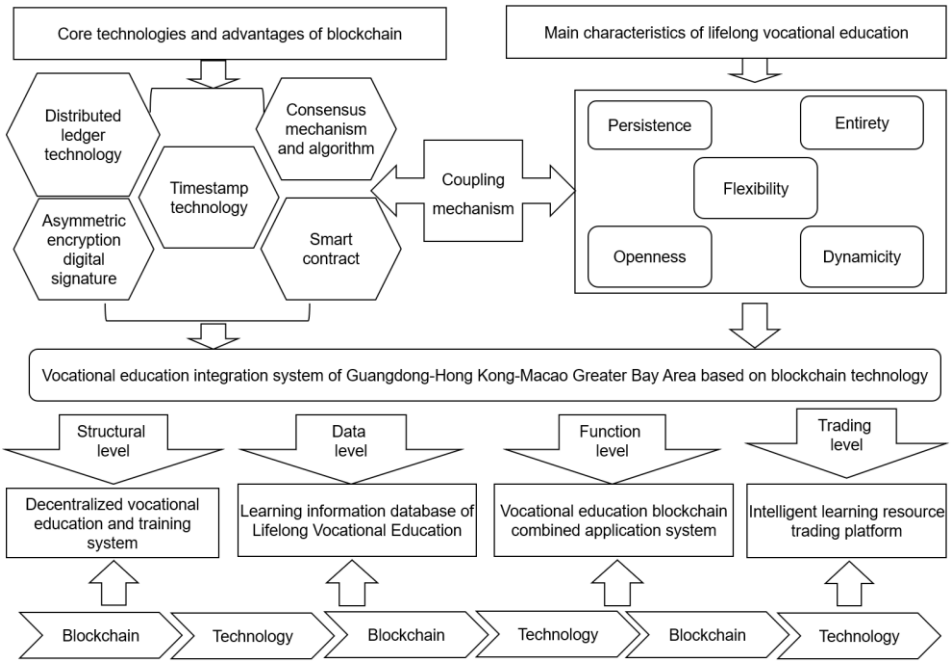


Figure 2: The lifelong vocational education system in GHM Greater Bay Area based on blockchain technology

### 6.1. Structural Level —— Build A Decentralized Lifelong Vocational Education System in GHM Greater Bay Area

The construction of decentralized lifelong vocational education system aims to break through the original time and space constraints of traditional vocational education, break the monopoly pattern of central institutions, face the participation of the whole people and educational equity, and promote open and distributed vocational education activities. Realize vocational education throughout one's life in terms of time, support the planning and development of the whole career, make effective use of various places and forms in terms of space, organically integrate various vocational education resources, diversify and personalize at the same time, and meet the needs of lifelong learning.

#### 6.1.1. Open Lifelong Vocational Education in GHM Greater Bay Area

At this stage, traditional education still occupies the leading position in the vocational education system. The central institution——government agency or school organizes educational activities and uniformly provides educational resources. Only after obtaining the academic certificate in the specified length of schooling and the specified educational place can the individual's vocational knowledge, technology and skills in a certain field be proved. While building a decentralized and open vocational education system by using blockchain technology, breaking the monopoly of education by central institutions, further opening the right to run schools, open educational resources, open online courses and open diploma issuance under the premise of strict access conditions and standardized approval procedures, breaking through the specified length of schooling and the constraints of specified educational places, so as to make vocational education fully open, flexible in time and changeable in space The participation of the whole people is more conducive to learners' continuous and effective access to lifelong vocational education.

#### 6.1.2. Distributed Lifelong Vocational Education in GHM Greater Bay Area

On the above basis of opening the right to run schools, encourage the diversification of school in GHM Greater Bay Area running subjects and form a distributed school running pattern. In addition to the educational qualifications of schools, training units and other institutions approved by the education department, more institutions, trade associations, professional organizations, enterprises, communities and even individuals that meet the access conditions and approval procedures are allowed to provide vocational education services. In order to effectively cope with the increasing difficulty of education management and process monitoring that may arise from the diversification of school running entities, blockchain related technologies can be combined to give full play to the technical advantages of decentralization, permanent data storage, information transparency, authenticity, security, tamper proof, traceability and verifiability, so as to fully ensure the transparency of the education process, the credibility of the education results, and the authenticity and permanence of the learning records, In addition, it is connected with the blockchain based learning information big database and the education and learning certificate authentication system, so that the certificates obtained from various school running subjects at any stage of a person's career can be checked, traced and authenticated as the certificates issued by traditional schools, effectively proving the knowledge, skills and technologies they own. Under the distributed lifelong vocational education pattern, formal and informal vocational education are organically integrated, formal and informal vocational education complement each other, and the inter school boundary is becoming increasingly blurred. Learners can make their own learning plans and choose their own learning content in any learning institution, obtain equivalent course certificates and credit accumulation, and apply to the education department or relevant authority for academic degree certificates.

### 6.1.3. Diversified Lifelong Vocational Education in GHM Greater Bay Area

There are still rigid teaching regulations and restrictions in the traditional vocational education system. The use of blockchain technology is conducive to the establishment of a flexible learning system. Various teaching organization forms are adopted, and flexible and diverse teaching contents and methods are selected. Learners can make their own learning plans and courses, and the learning methods, contents, places, time, progress and other aspects can vary from person to person, Reduce artificial learning obstacles to the greatest extent, improve learning vitality, and significantly enhance learning initiative and enthusiasm.

### 6.1.4. Personalized Lifelong Vocational Education in GHM Greater Bay Area

Lifelong vocational education runs through a person's life and carries out his whole career. Therefore, lifelong vocational education should be people-oriented and dynamically adapt to the personalized needs of learners at different stages. The use of blockchain technology is conducive to learners' safe creation, maintenance and sharing of a personal learning resource library composed of learning content, learning process, learning achievement and effect, so as to realize personalized learning and personalized resource management, improve learning process and learning effect. The blockchain technology is used to build a vocational education resource library that can be used efficiently and shared safely, break the boundaries between learning and work in time, break the barriers between formal and informal, formal and informal vocational education in space, and provide a series of learning resources that individuals can freely choose and learning methods that individuals can freely combine to meet the personalized needs of educatees Realize the individualized learning objectives of the educated.

## 6.2. Data Layer - Build the Learning Information Database of Lifelong Vocational Education in GHM Greater Bay Area

### 6.2.1. Permanent Record of Schoolwork Data

Blockchain technology can be used to permanently record and store schoolwork data in a distributed way, allowing any qualified educational institution or training organization to record learners' educational activities, learning behaviors and learning results at any stage across platforms and systems, and to permanently store them in cloud servers to form individual learning big data. [11] The learning information database of lifelong vocational education based on blockchain technology can permanently record and store the process experience and schoolwork data of learners receiving vocational education in various stages, fields and forms.

### 6.2.2. Effective Certificate of School Transfer in GHM Greater Bay Area

Through the blockchain learning information big database, we can understand the information about the courses, subject attributes, main contents, assessment methods, grades, credits, learning achievements and other information that learners have completed, and understand the competition, practice, scientific research and other project activities that students have presided over or participated in. When students enter school, the enrolled institutions or institutions can comprehensively master the candidate information through the big database, it is also helpful for candidates to transfer between different schools without going through various transfer procedures such as application for learning certificates and issuance of transcripts from the original school.

### 6.2.3. Supporting Materials for Job Application in GHM Greater Bay Area

Recruitment enterprises and employers can obtain the applicant's school information and details from the learning information database of lifelong vocational education through legal and compliance channels to accurately evaluate the matching degree between the applicant's qualifications and job requirements. Learning information big database allows students to transfer their personal data, and students can also transfer academic data to the applicant enterprises as convincing supporting materials for job application.

### 6.2.4. Evaluation Basis for Talent Training in GHM Greater Bay Area

The learning information big data of lifelong vocational education based on blockchain technology can also serve as an important basis for the school to carry out the teaching quality of on campus courses, the effectiveness of off campus practical teaching, the evaluation of the results of school enterprise cooperation, and the comprehensive evaluation of talent training quality, which is conducive to the effective connection and high matching between the supply and demand of vocational talents, the promotion of the precise cooperation between schools and enterprises, and the deep integration of industry and education.

## 6.3. Application Level——Build a Combined Application System for Lifelong Vocational Education in GHM Greater Bay Area

### 6.3.1. Education and Learning Certificate Authentication System of GHM Greater Bay Area

The persistence, flexibility, openness and other characteristics of lifelong vocational education determine the diversity of individual lifelong learning achievement certificates or academic diplomas. However, with the intensification of competition in the employment market, the emergence of false academic diplomas has seriously impacted the fairness of vocational competition. It is increasingly important to build an effective anti-counterfeiting, fair and reliable certificate authentication system. The blockchain technology is used to build a permanently stored data, secure tamper proof, authentic anti-counterfeiting, traceable and verifiable identification and certification system. The academic degrees and various learning certificates are stored in the blockchain database to completely and permanently record everyone's continuous learning experience. On the one hand, the authenticity of the certificates can be guaranteed, making the academic degree identification more reliable and the certification more efficient, On the other hand, it can significantly reduce the time, labor and various costs of manually completing the acceptance, review, inspection, certification and other operations in the process of traditional certification of academic qualifications.

### 6.3.2. Lifelong Vocational Education Credit Bank of GHM Greater Bay Area

Credit bank is a learning achievement certification management center and learning achievement conversion service platform that simulates and draws lessons from the characteristics of banks such as deposit, loan and redemption, and takes lifelong education credit recognition, accumulation and conversion as its main function. [12] The credit bank for lifelong vocational education has built an overpass for effective connection and mutual recognition of learning achievements between academic vocational education and non-academic vocational education, pre service education and post service education, vocational education and general education. The decentralized feature of blockchain distributed ledger technology makes it unnecessary to build a credit transaction central system when building a credit bank conversion platform. It gives full play to the technical advantages of asymmetric encryption algorithm, consensus mechanism, time series data, etc., so that the records of

credit recognition, accumulation, deposit and loan redemption can be permanently stored, securely tamper proof, truly anti-counterfeit, and the credit conversion mutual recognition information can be traced and verified, effectively solve the technical means and social trust problems of credit bank.

### 6.3.3. Open Shared and Dynamically Updated Vocational Education Resource Pool of GHM Greater Bay Area

On the one hand, the openness of lifelong vocational education requires that educational resources be highly open and efficiently shared. The distributed ledger technology of blockchain is adopted to store various vocational education resources in different blocks in the library in a distributed manner. All nodes directly share resources in the library, such as teaching courseware, instruction manual and learning tools, through point-to-point open communication and consensus software agreement, which can not only improve the efficiency of resource sharing, but also solve the problem of resource isolation, at the same time, the technical advantage of decentralization can significantly reduce the intermediary cost of the construction of the educational resource library, exempt the R & D investment and management and maintenance costs of the intermediary platform, and further promote the open sharing of educational resources. On the other hand, the dynamic characteristics of lifelong vocational education require that educational resources be regularly and continuously updated. The network authentication mechanism based on the blockchain consensus mechanism and smart contract is conducive to dynamically updating the educational resource base and continuously ensuring the resource quality. First, upload educational resources to the cloud platform, use the blockchain asymmetric encryption algorithm, public key and private key to encrypt the resources respectively, and form an educational resource block after storage, then the block is broadcast and authenticated throughout the network. When a consensus is reached and the number of authenticated nodes exceeds 51%, the block is stamped with a time stamp, and then the P2P flow is started in the network. The smart contract in the underlying architecture of the blockchain automatically completes the authentication, flow, sharing and other processes. The whole process is traceable, verifiable, open, transparent and tamper proof. Each node user jointly authenticates the application value of the newly uploaded resources. When a block resource is obsolete, the above process is restarted, and all nodes jointly and dynamically complete the update, upgrade or iteration of the resources. Therefore, the consensus mechanism based on blockchain and the network authentication mechanism based on smart contract can prevent the generation of obsolete, low-quality, invalid and duplicate resources, effectively promote the renewal of resources and continuously ensure the quality of resources.

### 6.3.4. Online Learning Community Based on "Knowledge Currency" and Smart Contract of GHM Greater Bay Area

Blockchain technology helps reshape and optimize the online learning community. Some studies believe that in addition to recording personal education records and academic achievements, blocks can also be used as a basis for measuring personal knowledge wealth. [13] Similar to the blockchain "Bitcoin", the blockchain technology can be applied to issue the virtual currency - "Knowledge Currency" of the learning community and establish a circulation mechanism. In learning, online community students can pay knowledge currency to obtain learning resources or educational services. After the completion of the study, the educational institution will issue Knowledge Currency to the students as a reward. Students can publish all kinds of works, learning achievements and even creative schemes in the community for communication, sharing or evaluation in the community, and they can be permanently recorded. Other students can recognize the value of the works by means of purchase, gift and so on, and the author will receive knowledge currency. Students can also obtain knowledge coins by posting, asking questions, answering and other learning behaviors. Therefore, under the

incentive of blockchain knowledge currency and its mechanism, students' learning enthusiasm and sharing participation can be effectively stimulated and maintained. At the same time, the smart contract technology of the blockchain can ensure the automatic operation of the online learning community. The students' posts, questions, answers and other contents will be automatically pushed to the community platform. The pre-defined rules and procedures of the blockchain automatically control the forum, and automatically delete or screen rumors, misleading remarks or unhealthy information to keep the learning community clean. In addition, students' qualifications shall be regularly certified based on the quality and quantity of posts. Students can enjoy different community rights according to different qualification levels, such as free access to educational resources, downloading learning materials or speaking unlimited times, and dynamically adjust the size of their rights according to the changes of students' qualification levels, so as to create a positive and progressive atmosphere for the online learning community.

## 6.4. Transaction Level - Build an Intelligent Learning Resource Transaction Platform in GHM Greater Bay Area

### 6.4.1. Automated All-day Efficient Transactions

By embedding smart contracts, blockchain technology can complete education contracts and certificates, and build a virtual economy education intelligent trading platform. The purchase, use and payment of various services in the system are automatically completed by the system without manual operation. At the same time, the purchase records cannot be tampered with and are true and effective. All transaction and contract data will be permanently saved. After the learners send the purchase information on the platform, the system will automatically send the purchased learning materials to the learners according to the pre-defined rules and procedures of the smart contract, and automatically track the logistics distribution information of the materials. Once the learners confirm that they have signed in the learning materials, the platform will automatically and accurately complete the payment without manual operation. The whole process will realize the all-weather automatic transaction. The platform can provide online learning tutoring services such as one-to-one tutoring, intensive lectures on key and difficult points, and problem solving. It can also provide relevant learning software and tool resources. Learners can choose appropriate services and resources according to their learning plan, learning difficulty and progress, and learning and examination forms to meet their own personalized needs and achieve independent consumption.

### 6.4.2. No Intermediary Point-to-Point Low-Cost Transaction

The intelligent learning materials and services trading platform can give play to the decentralized advantages of blockchain, eliminate transaction intermediaries, and do not need a third-party payment platform such as Alipay. The demand side can directly connect with the supplier point-to-point, that is, point-to-point connection between learners and educational institutions, students and teachers, institutions and institutions, which eliminates the operation and maintenance costs of the intermediary platform, simplifies the operation process, and enables the platform to achieve high efficiency and low-cost operation.

### 6.4.3. Permanently Recorded and Traceable Transaction Process

The transaction information of the platform is recorded on the blockchain through the smart contract program, which is open, transparent, true and effective, and can not be tampered with. It can effectively prevent fraud, and can be traced and verified at any time to fully protect the rights and interests of both the supplier and the demander. In addition, the blockchain automatically executes

the smart contract procedures and rules, and cannot tamper with or interfere with the transaction process manually. While improving the transaction efficiency, it ensures the stability and reliability of the transaction platform and effectively prevents the platform system from crashing.

### 6.4.4. "Knowledge Currency" Payment and Incentive

The above-mentioned "knowledge currency" is a virtual currency issued by using blockchain technology, which can also be used to pay for transactions of intelligent learning materials and services. Learners can use the knowledge currency on the platform to purchase various learning materials and online learning guidance services. The platform can also provide learning effect testing services, and return different amounts of knowledge currency as encouragement according to different grades, so as to enhance the enthusiasm of learners. The personnel department of the unit and the human resources department of the enterprise can also issue knowledge currency as the start-up funds for subsidizing and encouraging employees' on-the-job training and continuing vocational education, and the amount of knowledge currency reward obtained by employees when they complete their studies can be used as an important basis for measuring their learning achievements and evaluating their continuing education effectiveness.

## 7. Conclusions

Lifelong vocational education is an education that serves people's lifelong development and supports the realization of lifelong vocational value. How to promote the reform and improvement of lifelong vocational education system is of great significance. As an emerging cutting-edge technology, the application value of blockchain in improving the efficiency and quality of education supply will increasingly appear. Under the guidance of “The Plan for Promoting the Cooperation and Development of Higher Education in Guangdong-Hong Kong-Macao Greater Bay Area”, this paper organically combines the application of blockchain technology with the integration of lifelong vocational education in GHM Greater Bay Area, explores the construction of the integration system of lifelong vocational education in the Greater Bay Area, and analyzes the coupling mechanism between the advantages of blockchain technology and the requirements for the construction of the lifelong vocational education system. On this basis, this paper puts forward the idea and a series of measures of applying blockchain technology to build GHM Greater Bay Area lifelong vocational education system, aiming to provide reference for promoting the integration of GHM Greater Bay Area lifelong vocational education and its sustainable development.

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