



# EduChain: Blockchain-Based Informative Platform for Vocational Education and Training

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**Abstract.** Blockchain is conducive to enhancing the digitalization and informatization levels of vocational education and technical training, as well as achieving the strategic goals of high-quality development of vocational education reform and educational modernization. Blockchain has become a hot point of research and application due to its excellent characteristics, including distributed data storage, encryption algorithm, tamper-proof technology, and consensus mechanism. A vocational education and technical training platform built on blockchain technology can be used to construct a database of vocational knowledge and technical training, improve the scientific quality of the teaching process and evaluation of teaching results, and provide a highly reliable digital qualification certification system and other application fields. This platform has the application advantages of integrating vocational education resources, accurately connecting the supply and demand of vocational education, and protecting intellectual property rights.

**Keywords:** Vocational education · Technical training · Blockchain

## 1 Introduction

As the cutting-edge technology of cryptography, blockchain technology is triggering disruptive changes in global finance, the Internet of Things, e-commerce, health care, government governance, and other industries. It will also play a novel and crucial role in the technical innovation and industrial transformation of vocational education and training. As an innovative technology in cryptography, blockchain is considered a distributed ledger and the center of data storage and management. It records additional information such as the source, path, and value of each transaction information in the form of a key, thus ensuring the security and accuracy of the transaction information, thus reducing the transaction costs of both parties, and solving the trust problem of both parties. Blockchain technology features distributed data storage, encryption algorithms, non-tamper capabilities, and consensus mechanisms.

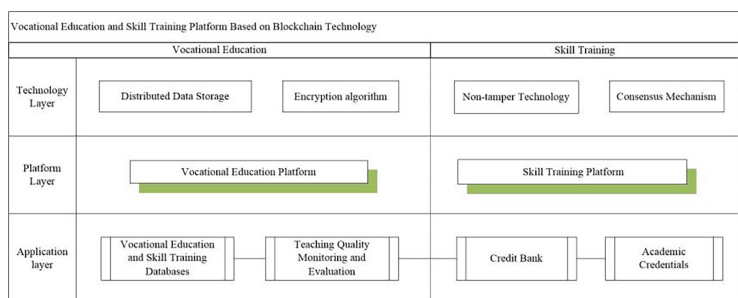
Blockchain technology has been combined with finance, the Internet of Things, e-commerce, health care and governance industries globally, causing disruptive changes in these industries. For example, blockchain technology can be used to safely and reliably manage massive data in the medical field (Mo Mingsen et al., 2023) [1]. Scholars

have only recently begun to explore the integration of blockchain technology into the field of intelligent education. At present, the relevant application research of education blockchain is mainly concentrated in three domains: education resource management, student information management and education infrastructure platform construction (Zhao Gang et al., 2022) [2]. With regard to student information management, blockchain technology can be used to securely record and verify student transcripts, academic certificates and other qualification documents (Kataev Mikhail and Bulysheva Larisa, 2022) [3]. In the construction of education platform, Japan has established a learning analysis platform based on blockchain technology in higher education, accumulated a large amount of educational data, and conducted research. The learning analytical tools and research results can be shared among different educational institutions (Flanagan Brendan and Ogata Hiroaki, 2018) [4]. Among these, the application research of blockchain technology in student information management is more extensive, while the research in the other two fields is relatively limited. Moreover, research in vocational education and skill training, lifelong education platform construction and other aspects are still lacking (Ocheja Patrick et al., 2022) [5].

This paper introduces the connotation and characteristics of blockchain technology, probes into the construction strategy and operation mechanism of vocational education and skill training based on blockchain technology, so as to improve the digital informatization level of vocational education and training, enhance the competitiveness of technical talents, promote the trust and information sharing between schools and enterprises, and realize the goal of educational modernization and high-quality vocational education.

## 2 Construction Strategy of Vocational Education and Skill Training Based on Blockchain Technology

The vocational education and skill training platforms based on blockchain technology, as shown in Fig. 1, can facilitate the construction of a professional knowledge and skills resource database, teaching quality monitoring and evaluation, credit bank, qualification certification, and other application fields.



**Fig. 1.** Construction strategy of vocational education and skill training Platform [owner draw]

## **2.1 Build a Professional Knowledge and Skills Resource Database**

Educators and trainers can continuously publish professional knowledge and skills resources with keywords on the platform, build teaching resources together, share them among different platforms, and continuously enrich the professional knowledge and skills resource library. Since the published data information is tamper-proof and traceable, no one can deny, modify or delete it except the publisher who holds the key. This protects the intellectual property rights of publishers and improves the enthusiasm of educators and trainers to build high-quality teaching resources library.

## **2.2 Improve the Scientific Evaluation of Teaching Process and Results**

On this platform, educators and trainers can constantly record students' learning data at different stages during the teaching process, and form a database of vocational education and skills training results, which lays a data foundation for teaching quality control and teaching evaluation. Employers can not only use the performance database to recruit professional and skilled talents that enterprises need, but also participate in the teaching process. Employers can cooperate with educators and trainers to develop teaching resources that meet the needs of industry development and enterprises, dynamically monitor teaching quality, and guide teaching objectives to meet the needs of talent reserves of industrial and enterprise.

## **2.3 Establish a Credit Bank Certification Mechanism**

The credit bank is the operating mechanism of the school's simulated bank, which opens an independent credit account for each student and constantly converts the learning results into credits during the learning process. Students can demonstrate the achievement of vocational education and technical training to vocational colleges, training institutions or employers by accumulating credits. The student-centered credit bank system has improved the convenience of students. Employers, vocational colleges and training institutions make joint efforts to constantly revise the dynamic standard of converting learning results into credits, so as to make it more credible in society. The credit bank system based on blockchain technology helps vocational colleges, training institutions and employers to form a unified standard credit alliance and form a scientific consensus on the evaluation of skilled talents.

## **2.4 Provide a Highly Reliable Digital Qualification Certificate System**

At present, qualification certificates are generally stored in records or accounts by some government departments, schools and other institutions. This single-point storage method may also cause problems such as improper storage, loss, cumbersome certificates, and circular certificates. Taking advantage of the tamper-proof nature of blockchain, students' various qualification certificates of students can be produced and stored in the blockchain account book for verification by education stakeholders and third-party organizations. This becomes an important reference for continuing education schools, applicants and other relevant stakeholders.

The digital certificate based on blockchain has the characteristics of being anti-counterfeit, traceable, verifiable, recoverable, and higher security and recognition. The e-cert certificate automatically generated by the platform is easy to verify and can be kept permanently.

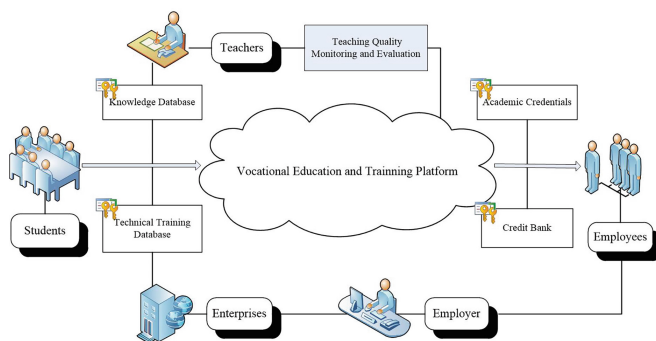
### 3 Operation Mechanism of Vocational Education and Technical Training Based on Blockchain Technology

How can students find the vocational education and technical training services that suit them on the massive information Internet? How can they register and pay for these services? How do they get the certification of what they have learned? And does their training just meet the needs of the enterprise and get a job? Many existing online education platforms are difficult to complete due to technical limitations. Usually, there are various problems, such as content homogenization, intellectual property disputes, low credibility of courses and corporate identity, and lack of interconnection between platforms.

As shown in Fig. 2, the vocational education and technical training platform based on blockchain is student-centered, which will provide new solutions for online education. By controlling students' learning processes and monitoring educators' teaching quality, the platform will improve the transparency, trust and effectiveness of transactions between students, educators, trainers, employers and other stakeholders.

#### 3.1 Integrate Vocational Education Resources

By establishing a knowledge and technical training resource database, combined with online high-quality education resources and offline teachers, vocational education resource integration is achieved. It can guarantee the benchmark level of vocational education and provide educational equity for remote areas. It can also reduce the repetitive work of teachers and return to the guiding function of teachers. Additionally, it can promote urban technology and talents to the countryside, and effectively solve education problems such as lack of funds and teachers.



**Fig. 2.** Operation mechanism of vocational education and technical training Platform [owner draw]

### 3.2 Accurately Connect the Supply and Demand of Vocational Education

The encrypted information of blockchain can ensure the traceability and tracing of information. The platform based on blockchain can solve the problem of property rights and accountability of information, enhance the trust of both sides of information transactions, and significantly reduce information transaction costs. By leveraging blockchain we can precisely connect the supply of vocational education talents and the demand for industry revitalization. The in-depth integration of industry and education can solve the structural unemployment problem and address the mismatch of educational resources, thus improving the use efficiency of educational financial funds.

### 3.3 Protection of Intellectual Property Rights

Blockchain is traceable and accountable, which is conducive to the establishment of property rights in the material library. Blockchain can solve the problem of a lack of knowledge traceability and trust in online open courses and other information technology media, and provide validity, trust and accountability for information exchange. For example, in the field of medical and health education, the traceability and accountability mechanism of knowledge is very important and students can select appropriate resources according to property rights and traceability.

## 4 Conclusion

The application of blockchain in the field of vocational education can solve the problem of information asymmetry between vocational colleges and employers in school-enterprise cooperation projects. It can promote the technological innovation of industry and education, and break through the technical barriers of in-depth integration of industry and education. The construction of vocational education and technical training system based on blockchain not only takes students as the center, but also runs through the whole process of students' learning from vocational education to employment. This system realizes the information symmetry of students' skill information and knowledge information. As the vocational colleges and employers on the vocational education and technical training platform based on blockchain can realize sharing information, the trainees can better adapt to the recruitment needs of employers. Then, the supply and demand of vocational education and technical training will be connected with the industrial system, and the structural unemployment problem will be fundamentally solved.

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## References

1. Mo Mingsen, Ji Shan, Wang Xiaowan, Mohiuddin Ghulam, Ren Yongjun. Privacy Data Management Mechanism Based on Blockchain and Federated Learning. *Computers, Materials and Continua*, vol. 74, no. 1, pp. 37–53, 2023.
2. Zhao Gang, Di Bingbing, He Hui. A novel decentralized cross-domain identity authentication protocol based on blockchain. *Transactions on Emerging Telecommunications Technologies*, vol. 33, no. 1, 2022.
3. Kataev Mikhail, Bulysheva Larisa. Blockchain system in the higher education: Storing academic students' records and achievements accumulated in the educational process. *Systems Research and Behavioral Science*, vol. 39, no. 3, pp. 589–596, 2022.
4. Flanagan Brendan, Ogata Hiroaki. Learning analytics platform in higher education in Japan. *Knowledge Management & E-Learning-An International Journal*, vol. 10, no 3, pp. 469–484, 2018.
5. P. Ocheja, F. J. Agbo, S. S. Oyelere, B. Flanagan and H. Ogata. Blockchain in Education: A Systematic Review and Practical Case Studies. in *IEEE Access*, vol. 10, pp. 99525-99540, 2022.

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