ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

The Logical Path and Operational Strategy of Empowering the Construction of the Young Pioneers with Blockchain Technology

Tiange Xia

Guangxi Normal University, Guilin, China
virginia0006@163.com

Abstract: *Based on the empowerment of blockchain technology to deepen the construction of Young Pioneers' work and promote the high-quality development of Young Pioneers' education, this article analyzes the difficulties that exist in the work of Young Pioneers in the digital age. By exploring the advantages of blockchain technology in the field of education and its coupling mechanism with the construction of Young Pioneers' work, a framework for the implementation of Young Pioneers' work and education based on blockchain technology is constructed, including the construction of a diverse and equal communication platform based on blockchain technology; It Utilize blockchain technology to build a socialized resource sharing ecosystem for Young Pioneers, achieving automated collaboration and badge authentication in their work, and assisting in the digital transformation of their work.*

Keywords: *blockchain technology; Young Pioneers work; Operation strategy*

1. Introduction

In 2022, China emphasized the need to promote "digitalization of education." Digitization of education is not only a direction for innovation in the field of education, but also an important issue for the work of the Young Pioneers in the new era. The Opinion on Strengthening the Work of the Young Pioneers in the New Era, released in February 2021, emphasizes the need to accelerate the networked transformation of the Young Pioneers in the era of full media and build a socialized work system; Integrate resources, mobilize teams, utilize positions, and strengthen student participation; Incorporate the performance of Young Pioneers into students' comprehensive quality evaluation, simplify practical approval, and mobilize family support. However, the current system lacks a multi-party collaborative digital mechanism, which makes it difficult to meet diverse needs and affects work efficiency. We need to accelerate the establishment of a digital collaborative mechanism for multi-party joint construction and education to enhance the work efficiency of the Young Pioneers.

Blockchain technology, with its unique decentralized architecture and tamper proof data, is gradually becoming a key force in promoting the deep development of educational informatization. Blockchain technology empowers the work of the Young Pioneers, revolutionizing activity organization and management through decentralized and tamper proof features, and building an open and transparent platform. This platform integrates sharing, authentication, and supervision, promoting the orderly, high-quality, and sustainable development of Young Pioneers education, and pushing Young Pioneers education to new heights.

2. Review of the Problems in the Construction of Young Pioneers Work in the Digital Age

2.1. The resources of the socialized positions of the Young Pioneers are scattered, and the problem of coordinated sharing remains to be solved

From the perspective of technological progress, the rapid development of network technology has greatly enriched the educational resource library of the Young Pioneers' activities, and the complexity and urgency of resource integration have also been highlighted in the process. Firstly, the lack of openness and interoperability of resources has become a significant obstacle. There is often a lack of unified standards and interfaces between different platforms, which makes it difficult to connect and

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

share resources. [1]This phenomenon of "resource isolation" limits the effective utilization of resources and increases the workload and cost of resource integration for Young Pioneers workers. Secondly, the widespread distribution of resources and the diversity of forms exacerbate the difficulty of integration. Young Pioneer workers need to screen out content that suits their own needs from a massive and heterogeneous resource, and effectively integrate and apply it. At the same time, existing information sharing platforms are mostly limited to traditional methods of information dissemination and transmission, such as offline meeting minutes, social media communication, multiple WeChat group communication, official website updates, etc. These methods have significant shortcomings in terms of information immediacy, interactivity, and deep integration.[2] More seriously, the lack of resource integration has had a negative impact on communication and interaction among Young Pioneers workers. Practical knowledge plays a crucial role in the work of the Young Pioneers. It originates from practice, guides practice, and continuously develops and improves in practice.

2.2. The communication barriers between the main bodies of the Young Pioneers are high, and it is difficult to achieve diversity and equality

In the digital age, due to the fragmentation of communication platforms, lack of unified digital communication standards, and uneven digital skills among participating parties, the communication and collaboration of the Young Pioneers face numerous barriers. Important participants in the Young Pioneers' work, such as schools, families, communities, and social institutions, often experience time differences and misunderstandings in information transmission and sharing, making it difficult to form effective synergy.[3] The phenomenon of poor communication has significantly constrained the innovation and effectiveness of the Young Pioneers' activities. Firstly, the fragmentation of communication platforms makes it difficult to synchronize information. Different entities may rely on their preferred communication tools, such as social media, instant messaging apps, email, etc. These platforms often lack direct interoperability, making information easily lost or misunderstood during transmission. In addition, each platform has its specific user group and usage habits, further exacerbating information segmentation and islanding effects. Secondly, the lack of unified communication standards is also an important reason for communication barriers. In the absence of clear standards, the format, encoding, and transmission methods of information may vary depending on the subject, leading to difficulties and even misunderstandings for the receiver when decoding the information. The lack of uniformity in these standards increases communication costs for Young Pioneers workers and reduces communication efficiency.

2.3. The collaboration mechanism between the Young Pioneers' on campus and off campus activities is complex, and efficient collaboration needs to be improved

The organization and management of the Young Pioneers' on campus and off campus activities involve multiple departments and institutions, requiring close collaboration among all parties. However, the current socialized organizational construction of the Young Pioneers is not yet sound, and there is a lack of effective collaborative management mechanisms.[4] Firstly, the collaboration of the Young Pioneers' internal and external activities involves multiple entities, including schools, communities, families, as well as various social organizations and institutions. Due to issues such as asymmetric channels for receiving information or conflicts of interest among these entities, the collaboration process often becomes complex and inefficient. Secondly, the organization and implementation of on campus and off campus activities require flexible allocation of various resources, including manpower, material resources, financial resources, and time. How to quickly respond to activity needs, accurately match resources, and ensure the smooth progress of activities is a major challenge faced by the Young Pioneers in their work. Thirdly, the work of the Young Pioneers lacks efficient information transmission and feedback mechanisms. In a digital environment, information spreads at an astonishing speed, and any delay or error can lead to collaboration failure. In practical operation, due to imperfect information systems, inconsistent information standards, or interference from human factors, there are often obstacles and lagging phenomena in information flow. Therefore, an information feedback mechanism is needed to ensure that all parties can obtain the necessary information in a timely manner and monitor and adjust the progress of activities in real time.

2.4. The traceability system for Young Pioneers' activity records is incomplete, and the authenticity of badge authentication is questionable

The recording and tracing of activities of the Young Pioneers is an important basis for evaluating

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

the quality and effectiveness of activities, as well as a key link in ensuring the authenticity of badge authentication. In the digital age, various methods of activity recording, large and scattered data, and other reasons have led to many shortcomings in the traceability system of activity records. On the one hand, badges cannot be preserved in the growth records of children for a long time. In reality, many badges of children and adolescents are often lost or damaged after a period of time due to poor management and improper preservation, and cannot leave a lasting mark on their growth records. This not only weakens the symbolic meaning of the badge, but also makes it difficult for children and teenagers to fully record their own growth process; On the other hand, due to issues such as data security and privacy protection, some activity records are difficult to disclose and trace. These issues not only affect the evaluation of activity quality and the establishment of feedback mechanisms, but also lead to doubts about the authenticity of badge authentication. Even more serious is the phenomenon of obtaining badges without qualified participation in activities, and even falsifying them for further education.[5]The existence of this phenomenon seriously undermines the authentication mechanism of the Young Pioneers emblem, greatly reducing its authority.

3. The coupling logic between blockchain technology and the work of the Young Pioneers

3.1. The meaning of blockchain

Blockchain is a new application model that combines distributed data storage, peer-to-peer transmission, consensus mechanisms, encryption algorithms, and other computer technologies. It is essentially a decentralized database, where each node has a copy of the entire database and ensures data integrity and security through consensus mechanisms. Each data block in blockchain contains a certain amount of transaction information and is connected to the previous data block through cryptographic methods, forming an immutable and unforgeable chain data structure with multiple significant characteristics, including decentralization, openness, autonomy, information immutability, and anonymity.[6]

3.2. The advantages of blockchain technology in education

Blockchain technology, with its unique advantages, has shown great potential in the field of education. By deeply integrating five core features: peer-to-peer transmission, distributed ledger, consensus algorithm, chain timestamp, and smart contract, it can bring unprecedented changes to the education ecosystem. Firstly, point-to-point transmission ensures the direct and efficient flow of educational resources, reduces intermediate links, and enables the rapid and safe sharing of learning materials, achievements, etc. between teachers and students, schools, and even globally, promoting the barrier free dissemination of knowledge. Secondly, the construction of a decentralized education information recording system using distributed ledger technology can solve trust and security issues in cyberspace by leveraging its technological advantages such as data transparency, tamper resistance, and traceability. Each learning record, certificate authentication, etc. is jointly maintained by multiple nodes in the network, enhancing data security and transparency, effectively preventing tampering and forgery, and providing solid technical support for degree authentication, credit mutual recognition, etc. Furthermore, consensus algorithms ensure consistency in data updates and validation among all parties involved in the education system, such as schools, students, and educational bases, promoting standardization and interoperability of educational data and laying the foundation for building an open and collaborative educational environment. Chain timestamps provide tamper proof time stamps for every operation in the educational process, ensuring the authenticity and traceability of learning trajectories, and facilitating the evaluation of learning effectiveness and the management of activity integrity. Finally, the introduction of smart contracts enables the automation of educational rules and processes, such as automatic reward distribution, course registration and payment management, greatly improving the efficiency and transparency of educational management, while also providing students with more personalized and flexible learning path choices. Blockchain technology, with its unique advantages, is gradually reshaping the future of the education industry, promoting education towards a more fair, efficient, and transparent direction.

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

3.3. Analysis of the appropriateness of blockchain technology and the construction of the Young Pioneers' work

3.3.1. Point to point transmission empowers the diverse and equal work subjects of the Young Pioneers

In the teaching work of the Young Pioneers, the peer-to-peer transmission characteristics of blockchain technology provide solid support for the diversity and equality of the work subjects. The point-to-point transmission mechanism allows various participants in the Young Pioneers' work (including schools, families, communities, social institutions, etc.) to directly exchange information and share resources without going through intermediate links. This decentralized communication method not only greatly improves the efficiency of information transmission, but also ensures the authenticity and integrity of information, allowing every work subject to participate in the construction and development of the Young Pioneers on an equal footing. Point to point transmission can promote direct dialogue and collaboration among work subjects, help form a more democratic and open working atmosphere, and enable the voices and opinions of various subjects in the Young Pioneers' work to be heard and adopted more widely, thereby further enhancing the pertinence and effectiveness of the Young Pioneers' work.

3.3.2. The problem of resource coordination and sharing in the socialized battlefield of the Young Pioneers empowered by distributed ledgers

Distributed ledger forms a decentralized and tamper proof database by synchronously replicating and storing data on multiple nodes in the network. This feature enables the Young Pioneers to more effectively integrate and manage socialized battlefield resources from different channels, such as educational bases, practical activity venues, volunteer service projects, etc. Through the blockchain platform, the information of these resources can be updated, shared, and queried in real time, avoiding the problems of resource information asymmetry and idle waste in traditional models. At the same time, distributed ledgers ensure the authenticity and traceability of resource data, providing reliable data support for decision-making in the work of the Young Pioneers.

3.3.3. The consensus algorithm empowers the Young Pioneers with a difficult collaborative management mechanism for on campus and off campus activities

The collaborative management mechanism of the Young Pioneers' on campus and off campus activities often faces challenges such as a large number of participants and complex interests, resulting in great difficulty in collaboration. The consensus algorithm of blockchain technology provides an effective solution to this problem. Consensus algorithm is the process in which nodes in a blockchain network reach consensus on data updates, ensuring the recognition and synchronization of data by all nodes in the network through specific algorithms and rules. In the collaborative management of internal and external activities of the Young Pioneers, consensus algorithms can promote consensus among all parties involved in activity planning, task allocation, progress tracking, and other aspects, reducing disagreements and conflicts. Meanwhile, consensus algorithms can also ensure the authenticity and consistency of activity data, avoiding the risk of data tampering or forgery. Through the blockchain platform, all participants can view the progress and results of the event in real time, promoting transparency and sharing of information, and providing strong guarantees for the smooth progress of the event.

3.3.4. Chain timestamps pose challenges for recording and tracing activities of the Young Pioneers

The recording and tracing of the activities of the Young Pioneers is an important part of ensuring the quality and effectiveness of the activities. However, under traditional methods, the integrity and credibility of activity records are often difficult to guarantee, which poses challenges for subsequent evaluation and reflection. The chain timestamp feature of blockchain technology provides an innovative solution to this problem. Chain timestamps combine data with timestamps and arrange them in chronological order on the blockchain, forming an immutable and traceable data chain. In the Young Pioneers' activities, each activity record is assigned a unique timestamp and associated with other relevant data to form a complete activity archive. This feature makes activity records highly credible and traceable, allowing for clear restoration of activity scenes and details even after many years. At the same time, the chain timestamp also promotes the fairness and objectivity of activity evaluation, providing strong support for the continuous improvement of the Young Pioneers' work construction.

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

3.3.5. Smart contracts empower Young Pioneers with automated collaboration in their work

Smart contracts can automatically execute preset terms and rules when specific conditions are met. Through smart contracts, the Young Pioneers can set up a series of automated workflows and rules, such as activity registration, fee payment, task allocation, and achievement acceptance. When specific conditions are met (such as the required number of applicants, successful payment, etc.), the smart contract will automatically trigger the corresponding operation without manual intervention. This automated collaboration approach not only reduces human errors and delays, but also lowers management and time costs. Meanwhile, smart contracts ensure transparency and credibility in the collaboration process, allowing all parties involved to have a clear understanding of the progress and results of the collaboration. Through the application of smart contracts, the work of the Young Pioneers will be more efficient, orderly, and fair.

4. The operational strategy of empowering the construction of the Young Pioneers with blockchain technology

4.1. Space joint education: from "dispersion" to "integration", improve the overall management system of battlefield resources

During the 18th collective learning session of the Central Political Bureau held on October 24, 2019, it was emphasized that "blockchain should be taken as an important breakthrough point for independent innovation of core technology" and "the application of blockchain technology in education and other fields should be actively promoted, and the use of blockchain data sharing models should be explored". As a cutting-edge application technology in educational informatization construction, blockchain technology has gradually become an important driving force for the integration of educational resources, [7]and has also become a key element in the integration of ubiquitous educational resources. Firstly, through the distributed storage technology of blockchain, various educational resources of the Young Pioneers, such as courseware, practical activity cases, educational base resources, volunteer service information, red cultural and creative products, red study routes, etc., can be digitally stored on the blockchain. These resources will no longer be limited to a single institution or region, but can be shared and exchanged across the country. Children and counselors can access these resources at any time according to their own needs, thereby improving the efficiency of resource utilization. Secondly, the smart contract technology of blockchain can set access permissions and fee allocation mechanisms for resources. By automating the execution of smart contracts, it is possible to ensure fair allocation of resources and reasonable returns. At the same time, the transparency of blockchain makes the usage of resources and the process of cost allocation clear and visible, enhancing trust among all parties involved. This blockchain based resource sharing model will break the traditional monopoly of resources, promote optimized allocation and efficient utilization of resources. Finally, introducing blockchain traceability and tracing mechanisms to enhance the quality of shared services. By using blockchain technology to record the full lifecycle information of resource production, storage, circulation, and usage, the authenticity and reliability of resources can be ensured. Young Pioneer workers can have a clear understanding of the sources and quality information of resources, thus making more informed choices. This traceability and tracing mechanism will improve the overall quality and level of education services provided by the Young Pioneers.

4.2. Subject Collaboration: Improving the Collaborative Mechanism of Practical Education Activities from "Multi directional" to "Chain"

Blockchain technology, with its decentralized, transparent, and tamper proof characteristics, can provide a new communication platform for the work of the Young Pioneers and deepen the democratization process of their work. Firstly, the platform establishes a centralized organization, forming an open mechanism of multi-party collaboration and diverse aggregation, breaking the limitations of traditional hierarchical structures, and ensuring that all stakeholders such as children, counselors, and parents can participate in discussions and decision-making on an equal footing. By using smart contract technology to set platform rules, we ensure fairness and transparency in the communication process, so that the voices of all parties can be heard and respected. Secondly, the platform will adopt distributed ledger technology to record all communication content, which can ensure the authenticity and integrity of information, and can also trace historical records to enhance the trust foundation. Children and adolescents can freely express their opinions and share experiences without worrying about information being tampered with or deleted. This open and transparent

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

communication environment will stimulate children's enthusiasm for participation, promote the cultivation of innovative thinking and democratic consciousness. Finally, introducing the incentive mechanism of blockchain to further enhance the platform's interactivity and participation. For example, issuing digital badges or points as honors and rewards to users who actively participate in discussions, provide constructive feedback, or share high-quality resources. This positive incentive mechanism will encourage more children to participate in platform construction and jointly promote the democratization process of the Young Pioneers' work.

4.3. Badge authentication: from "neglect" to "traceability" to improve the transparency and authenticity of the Red Scarf Medal

In October 2020, the "Overall Plan for Deepening the Reform of Education Evaluation in the New Era" clearly stated that information technology should be fully utilized to improve the scientific, professional, and objective nature of education evaluation. Blockchain technology can create a professional collaborative authentication mechanism in the automation collaboration and badge authentication of Young Pioneers' work. Firstly, the automation of Young Pioneers' work can be achieved through the smart contract technology of blockchain. For example, the processes of team application, activity registration, and performance evaluation can be written into smart contracts and deployed in each block. When specific conditions are met (such as submitting complete information, meeting selection criteria, etc.), smart contracts will automatically perform corresponding operations and generate results. This automated processing method will greatly reduce manual intervention and error rates, and improve work efficiency. Secondly, the distributed ledger technology of blockchain can record various data and information of children's participation in activities in real time. These data include various aspects such as activity participation, resource utilization, and member performance, ensuring that the entire process of children's participation is traceable. Through data analysis and mining techniques, we can gain a deeper understanding of the operation and existing problems of the Young Pioneers' work. Based on these data, predictive models and warning mechanisms can be established to detect potential risks and opportunities in advance and provide accurate support for decision-making. This data-driven decision-making approach will improve the accuracy and scientificity of decisions.

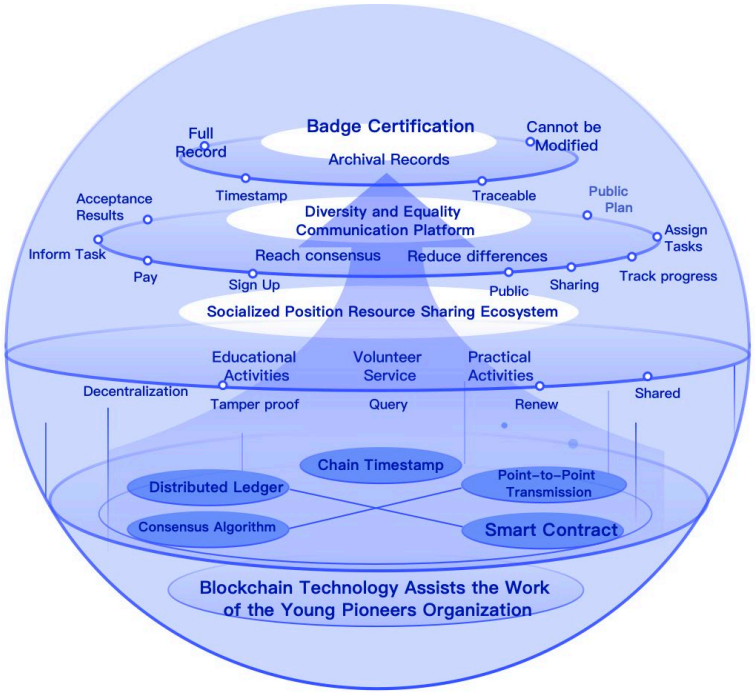

Figure 1: The operational strategy of empowering the construction of the Young Pioneers with blockchain technology.

In addition, certification of learning outcomes plays an important role in building a lifelong learning system and constructing a learning society.[8] Badge authentication based on blockchain technology can ensure the uniqueness and authenticity of the badge, recording the growth process and achievements of children and adolescents. During the badge authentication process, children and teenagers obtain

ISSN 2616-7433 Vol. 6, Issue 11: 27-33, DOI: 10.25236/FSST.2024.061105

excellent performance data information through participating in activities and completing tasks, and connect through P2P networks to form a decentralized distributed timestamp system. The authenticated badge will be permanently recorded in the block and will become a powerful proof of honor and ability for children and adolescents. At the same time, the badge authentication system also provides accurate data support for the decision-making of the Young Pioneers' work. By analyzing the distribution of badges, the difficulty of obtaining them, and the participation of children, it is possible to more accurately evaluate the effectiveness and existing problems of the Young Pioneers' work, providing a more scientific basis for decision-making. As shown in Figure 1.

5. Conclusions

Building a blockchain based working mechanism for the Young Pioneers is the key to their modernization. Through this technology, we can break down information barriers, promote collaboration between families, schools, and communities, and enhance work transparency and credibility. This move creates a fair and safe environment for the growth of children and lays the foundation for the work of the Digital Young Pioneers. The goal is to build a new ecology closely linked by home, school, and society, efficiently respond to the needs of the times, ensure the comprehensive development of children, establish a model of educational innovation and cooperation, and lead the education of the Young Pioneers to new heights.

Acknowledgements

This paper presents the research results of Innovation Project of Guangxi Graduate Education"Research on the Patriotic Education of the Young Pioneers Empowered by Red Culture and Creativity", Project number: XYCSR2024035.

References

[1] Sun Lekang, An Jianqiang. Research on the Supply Model of Digital Education Resources Based on Blockchain Technology [J]. Teaching and Management, 2024 (12): 33-37.
[2] Wang Kaikai. Research on Practical Knowledge of Young Pioneers Counselors [D]. Shandong Normal University, 2020.
[3] Zhu Qiang. Research on the Current Situation and Optimization Strategies of Practical Education for Primary School Young Pioneers [D]. Qinghai Normal University, 2022.
[4] Hu Meiru, Chen Jing. The construction of a socialized work system for the Young Pioneers in the new era empowered by digital technology [J]. China External Education, 2023 (05): 23-34.
[5] Information source: Guangxi News Network - Contemporary Life Daily https://v.gxnews.com. cn/a/ 9895779.
[6] Sun Yi, Fan Lingjun, Hong Xuehai. Development and Application of Blockchain Technology: Current Status and Challenges [J]. Chinese Engineering Science, 2018,20 (02): 27-32.
[7] Yang Peng. Exploration of the Application of Blockchain Technology in the Integration of Educational Resources [J]. Educational Theory and Practice, 2022, 42 (18): 18-22.
[8] Huang Guiyi. Research on Learning Achievement Authentication Management System Based on Blockchain Technology [J]. Modern Educational Technology, 2021, 31 (01): 69-75.