Application of Blockchain Technology in the Construction of MOOC Digital Communication Platform

Jing Zhang[1,2(✉)] and Sulaima Haleem[1,2]

[1] School of Art and Design, Modern College of Northwest University, Xi'an 710130, Shaanxi, China
zhangjingbsjs@163.com
[2] South Eastern University of Sri Lanka (SEUSL), Oluvil, Sri Lanka

Abstract. The rapid development of blockchain technology and the construction of MOOC communication platform have a positive role in promoting higher education, the problems we have to think about and solve up to now are how to effectively build a MOOC communication platform in higher vocational education and how to use blockchain technology to build a MOOC curriculum system, and how to deal with the development of various MOOC platform contradictions, the preliminary proposed corresponding solutions. In accordance with the trend of education reform, this paper focuses on the sustainable development of MOOC education production, teaching, learning, research and use integrated block chain ecosystem, and the development and implementation of MOOC communication platform, so as to evaluate its development prospects.

Keywords: Blockchain · MOOC · Communication platform in the picture classification

1 Introduction

Due to the lack of verification of the practicality and scientific degree of MOOC, there is no MOOC platform developed directly from blockchain technology at home and abroad, but from the MOOC construction how to promote the Chinese education, the block chain Electronic Archives Trust Guarantee, the block chain security detection model and so on has had the certain research. puts forward the advantages and application ways of blockchain in the platform of E-commerce, which can be used for reference in the application of MOOC communication platform. there are corresponding suggestions for the application mode of blockchain technology in education but there is no effective link with MOOC. Reference based on dual factor module and blockchain technology, some research results have been made on the identity authentication of MOOC learners, but there is still a lack of analysis, research and practical test from the full-scale operation and diversified management of MOOC. The construction and use analysis of different dimensions of MOOC platform and the influencing factors of blockchain technology are the key points that universities should pay attention to in the future.

I. Ahmad et al. (Eds.): STSIoT 2021, LNDECT 122, pp. 564–573, 2023.
https://doi.org/10.1007/978-981-19-3632-6_67

In response to the national policy and strategy, the construction of MOOC communication platform in the context of blockchain needs to be combined with the sharing of big data, authentication and security system, optimization of energy saving, mutual communication and integration, and play an important role. This paper consists of the following parts. The first part introduces the relevant background and significance of this paper, the second part is the related work of this paper, and the third part is data analysis. The fourth part is example analysis. The fifth part is conclusion.

2 Related Work

To solve these problems Zhang et. al provide five summarized ways [1]. Le et. al provide evaluation of these courses, comparing a manual feature engineering approach to an automatic feature learning approach using neural networks [2]. Based on this, Shao discussed the influence of MOOC teaching on the reform of ideological and political teaching in colleges and universities [3]. The MOOC model tries hard to be "student-centered", mainly in the following two aspects [4]. Gamage et. al find overall collaboration opportunities in platforms are significantly less than the opportunities to interact [5]. Ali et. al reveal that highest number of courses available through SWAYAM platform is in the field of Engineering with 654 courses, followed by Arts and Recreation with 127 courses and Science with 93 courses [6]. The research reported here was conducted to further understand learners social engagement on a MOOC platform and the impact of engagement on course completion [7]. The purpose of Sharov et. al is to analyze the possibilities provided by the Ukrainian online platform of the Open University of Maidan (OUM), and to compare it with other Ukrainian platforms (Prometheus, EdEra) according to certain criteria [8]. Febrianti et. al examine to acknowledge the learning model development of MOOC-based BIPA for Business Communication [9]. In order to improve the effective management of MOOC platform resources based on traditional methods, Tian et. al. implement a deep neural network algorithm, and recommends related services [10]. MOOC communication platform is an important operational medium connecting academic institutions, institutions, experts and scholars, teaching teams, enterprises, students and so on, creative thinking mode of digital art is more needed. Blockchain technology can help colleges and universities to build interoperable, safe and stable platform blockchain, and reduce the workload of MOOC development, to provide innovative business and facilitation in massive open online course's vision, deployment, development, management, operation and application of technology.

2.1 Introduction to Blockchain Technology

It is a data storage computing system, which can calculate on it. At the same time, the distributed network based on Internet is composed of many nodes. In other words, blockchain is a data computing and storage system under Internet distribution. It can be understood as a public database.

(1) Principle of blockchain technology. In the blockchain, each block in the blockchain contains data, the hash value of the current block and the hash value of the previous

block. Different types of data are stored according to different blockchain types. Each block contains the hash value of the current block and the hash value of the previous block, which makes there a chain structure between blocks. In this chain structure, the latter block points to the previous block, while the first block does not point to it. We call it the creation block. In this level-by-level directional structure, if a block in the middle is changed, the blocks of all subsequent nodes will be changed. Therefore, when someone wants to add a new node or tamper with the data, the hash values of all blocks must be recalculated, which is also called work proof.

(2) Decentralization. The blockchain uses P2P peer-to-peer network, and its point-to-point transmission technology is the basis for the blockchain to break away from the control of centralized server and form a public ledger. There is no central server in this network. When someone joins the network, he will get a complete copy of the blockchain, which can be used to verify whether the blockchain is normal and orderly.

2.2 Characteristics of Blockchain

(1) Consensus mechanism with high cheating cost. Blockchain is a distributed ledger without a central structure, so a consensus mechanism is needed to replace the central structure to assume the role of the decision maker, that is, consensus algorithm. Common consensus algorithms include pow, POS, dpos, pbft, etc. different blockchains are based on different consensus mechanisms. For example: in a POW based blockchain, when a new block is added, the new block will be sent to all nodes in the network. Each node user can use the consensus algorithm to verify whether the current block is normal. If it is a normal block, the user node will add the block to its own blockchain copy. When more than 50% of the nodes in the network join the block, This block can exist effectively in the whole network. If you want to add an abnormal block, you must control more than 50% of the user nodes in the blockchain and obtain sufficient workload proof. This is almost impossible.

(2) It exists on the Internet and is open to all users. The blockchain is decentralized. Each node in the chain has complete data of the whole chain, and all information is fully disclosed to users. The general architecture of the blockchain is shown in Fig. 1.

(3) Very secure encryption technology. The blockchain uses the hash value as the password for block data and authentication. The hash value is a string of non repetitive and irregular strings generated by a specific calculation formula according to the block data. Once the data changes, the hash value changes, and the hash value cannot deduce the data. The blockchain generates a public key and a private key according to the hash algorithm for authentication. The public key is used as the user address, and the private key is privately held by the user. Authentication requires both public and private keys. However, the overall design of the client also has some general concepts, as shown in Fig. 2.

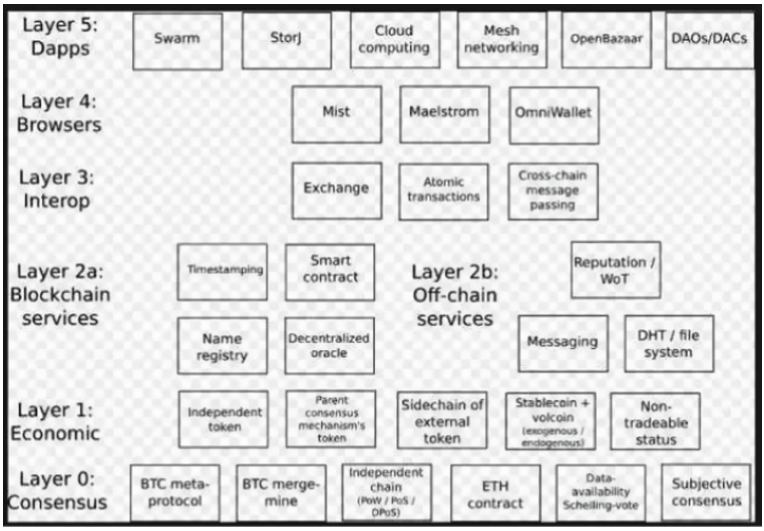

Fig. 1. Blockchain architecture

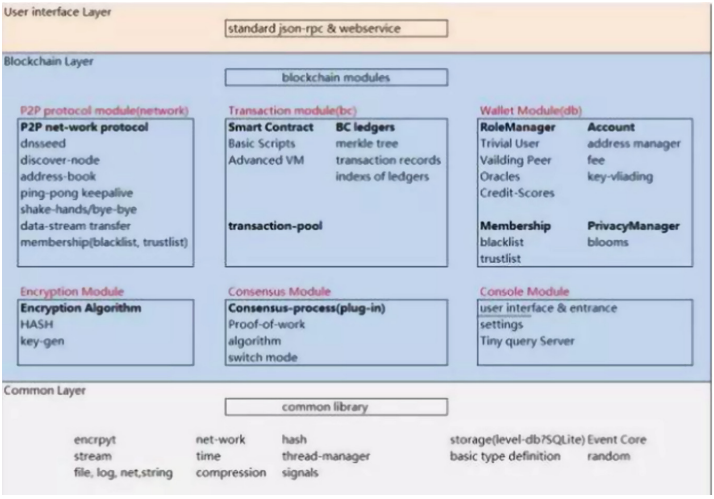

Fig. 2. Overall client architecture

2.3 Current Situation Analysis of MOOC Communication Platform

MOOC communication platform has the characteristics of big data, rich courses, sharing, large-scale, open, personalized and advanced technology. According to its teaching methods, it can break through the advantages of time and space constraints, the current popular non-contact network education. According to the current economic and technological development level, technologies such as big data, 5g, cloud computing, artificial intelligence and interactive experience are becoming more and more mature,

and technologies such as Internet of things, virtual reality, augmented reality and hybrid reality are more and more widely used. Blockchain technology is developing rapidly with the improvement of these technologies, combined with the advantages of big data, cloud computing and artificial intelligence, A new pattern has emerged. The construction space of MOOC communication platform under blockchain technology will be larger and larger, which will subvert the tradition and make it fair and transparent.

According to the environment, the cross regional, Cross School and cross professional application mode of MOOC course needs to be further studied and explored, including the management and operation of the market-oriented platform, especially the issue of intellectual property rights and sustainable development. Due to the different backgrounds of universities, cultures, disciplines and majors, the communication channels of MOOC are limited. There are some problems, such as unbalanced development of MOOC content, single form, chaotic content, low completion rate of MOOC courses, weak learner management and so on.

The bottleneck of MOOC communication platform construction also lies in the lack of time accumulation and trust. All universities have relevant management systems and pay much attention to the introduction of MOOC. MOOC advocates a free learning model across time and space. Compared with face-to-face teaching, MOOC teaching in Colleges and universities lacks time accumulation and trust. Strengthen the synchronous communication between online guidance and offline teaching to improve the safety, authenticity and reliability of MOOC.

3 Data Analysis

(1) Policy and management of platform construction

The construction of MOOC exchange platform needs the support of the national policy of keeping pace with the times and opening to the outside world, the national recognition of online learning, credits, degrees and other information, the standardization of procedures and systems to ensure the effectiveness of learning, and the use of advanced technologies such as big data, cloud computing and artificial intelligence to ensure the legitimacy and compliance of learning, The evaluation and verification process will bring new business opportunities to the market after the opening of relevant national policies. Therefore, it will promote the rapid development of MOOC communication platform technology and inter enterprise art. The learning law is as follows:

$$u_{k+1}(t) = u_k(t) + L(t)(\dot{e}_{k+1}(t) + e_{k+1}(t)) \tag{1}$$

For example, in the current struggle against COVID-19 epidemic, the State Education Department is particularly necessary to introduce some quality online courses on relevant platforms according to its own learning characteristics for unified management of universities and credit certification. Teachers from offline professional schools should help themselves with the individual differences between schools and students by means of self media and communication platform. At present, some colleges and universities try to avoid blind catalog micro courses and do not

directly organize, manage and choose online teaching. Due to immature technology, limited platform operation and unequal teaching level of teachers, it will cause negative effects such as poor teaching quality, chaotic management and unclear responsibility.

(2) Platform mode innovation

The ideal mode of MOOC communication platform construction needs to pay attention to different disciplines of different universities in the blockchain environment, pay attention to advanced technical functions, and create a MOOC communication platform with distinctive characteristics and innovative artistic forms.

1) MOOC communication platform technology innovation

The construction of MOOC communication platform should keep pace with the times and introduce more advanced technical functions, such as face recognition, virtual interaction, live communication, background big data synchronous analysis, etc. even student achievement and credit recognition should be linked to the blockchain. Timely and gradually improve the service consciousness of platform teaching. After MOOC enters the study, it should establish links such as teacher-student evaluation, teacher-student interaction and joint learning, so as to adapt to the new needs and differences of teaching in Colleges and universities, give full play to the advantages of first-class professional teaching resources, and then develop and improve the resources and management of MOOC platform, so that each individual and link can form a benign operation mechanism, It is necessary to treat the normal face-to-face teaching management of schools differently and resolve the operation conflict. For the platform system, its learning law is as follows:

$$u_{k+1}(t) = u_k(t) + \Gamma_{l1}\dot{e}_k(t) + \Gamma_{l2}\dot{e}_{k+1}(t) + \Gamma_{p1}\Delta\dot{e}_k(t) + \Gamma_{p2}\Delta\dot{e}_{k+1}(t) \quad (2)$$

2) The construction of MOOC communication platform should be carried out at different levels, paying attention to the differences of different disciplines in Colleges and universities

The education administrative department shall support, build, guide, operate and manage the MOOC communication platform at different levels, and formulate different standards and competition levels according to the school's hardware facilities, teachers, student level, management ability, systems and policies. If the unified standard can not play an important role in different institutions in different regions, or even form a teaching burden, the final MOOC communication is likely to become a formalism or image project, thus losing the significance of education and teaching.

MOOC communication platforms need not be too many, as shown in Fig. 3. The execution platform provides operation rules, resource sharing and service guarantee. The specific initiative and teaching work will be left to the institutions, managers or teachers operating on the platform. The school will operate specific MOOC courses according to the direction of each discipline, the advantages of professional resources and the characteristics of talent training. The

fees charged also need to be combined with the University's tuition management policy. The education administrative department can choose incentive policies and certification standards to better play the role of the curriculum.

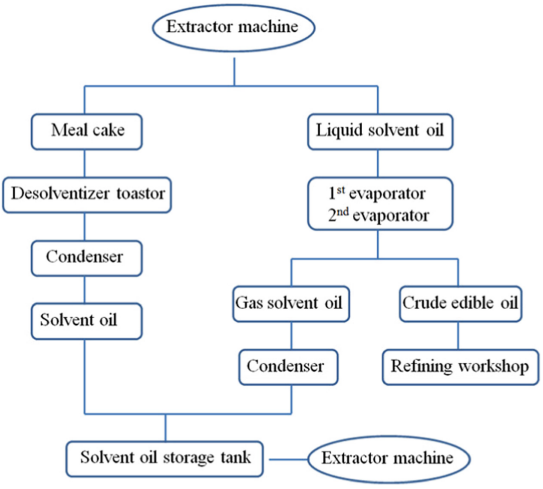

Fig. 3. MOOC digital communication platform process

3) Promote the integration of blockchain teaching and MOOC

Introducing blockchain technology into MOOC communication platform will bring high data and information security. College users will have strong collective trust in MOOC teaching resources, student information, teaching results and interactive information data, embed blockchain information content into various professional fields for classified teaching, and accelerate new technologies and education such as virtual experience, artificial intelligence and synchronous analysis of big data The in-depth integration of information and art will promote artistic innovation and information sharing and integration of industry and education. The key to promoting the integration of blockchain technology teaching and MOOC platform construction is to cultivate the innovative thinking of teachers and students in blockchain teaching, which is a comprehensive innovative thinking mode of technology, mathematics, industry and artistic logic. The innovative achievements should be tested in practice.

4 Example Analysis

(1) Strengthening the construction and management team of moocs

MOOC construction is an extremely complex systems engineering of computing, design, development, construction, technology, statistics, management, application, evaluation, feedback, and so on. In view of the current form of MOOC presentation, topics that need to be technically optimized for presentation, tend to block

chain technology expansion material analysis, dynamic demonstration, case analysis, exercise evaluation, graphic animation, virtual experience, forum exchange, note sharing, data evaluation, results analysis, group interaction and other forms. Based on the background of the Internet of things, the introduction of advanced technology, the characteristics of multimedia, multi-dimensional perspective, the characteristics of subject direction, the changes of course contents, the diversified arts, and the personality of students, teachers decide the form of knowledge construction.

MOOC construction needs a strong, responsible, technical hard, strong sense of responsibility, dare to be the first, constantly enterprising, brave to try the production and management team. In order to ensure the smooth progress of each link, it is necessary to have appropriate and professional work management personnel when the MOOC course is completed. The Management Team should adhere to the principle of integration of MOOC construction and application, insist on the combination of its own construction platform and foreign introduction to expand the advantages of MOOC, and base on the ability and management level of teachers and students of the school, give full play to the universities' advantages of multi-media, multi-disciplinary, multi-disciplinary, multi-modal, multi-lingual and multi-cultural resources, and encourage them to independently develop MOOC courses, to promote MOOC construction, operation, management, evaluation and other processes more humane, systematic, safe, digital, standardized.

(2) Setting up the MOOC mixed model and implementing the resource sharing

According to the students' strong curiosity, they are very adaptable when they accept new things, new models, new media, new environment and new structure. Using the advantages of online MOOC resources to achieve resource sharing, through the block chain technology can better serve offline teaching, not only safe and effective, but also to improve students' autonomous initiative.The introduction of rollover classroom teaching features under blockchain technology, the autonomy of teachers, according to the characteristics of colleges and students, the selection and self-made learning resources, and then link to the resources of MOOC platform, in this way, it is convenient for online and offline moocs to integrate various teaching methods. Based on the establishment of this mixed model, the teaching resources are more diversified, rich and interesting. Teachers and students can work together to develop their strengths and avoid their weaknesses, and give full play to their respective advantages, in order to improve the teaching and learning efficiency of college teachers and students, and further improve the level and quality of education and teaching.

(3) The establishment of production, teaching, learning, research, and use of integrated regional blockchain ecosystem

MOOC construction under blockchain technology can enable teachers and students to absorb the latest, most professional, the most cutting-edge knowledge at home and abroad, so that students can improve their professional, technical, entrepreneurial capabilities, and thus enhance their competitiveness in the workplace. Combining with their own professional background and disciplinary advantages, colleges and universities have set up their own distinctive mooc communication platform to create an integrated block chain ecosystem of production, teaching,

learning, research and use, it mainly includes building an innovative MOOC team platform, upgrading the content and management model of MOOC, implementing an innovative mooc drive system, gathering talents from various fields in the professional field, and cultivating research and development teams with strong technology, to guide the strength of all sectors to support moocs certification credits, stimulate the enthusiasm of teachers and students to create and so on, as shown in Table 1.

Table 1. MOOC team builds framework

Production, teaching, learning, research, and use of integrated block chain ecosystem			
Building a MOOC team			
Management Team	R & D team	Operation team	Teaching team
Improve the management system	Technology, art	Operation and maintenance	Senior experts, professionals, art optimization

(4) Supporting moocs and strengthening the policy of credit conversion

The need for national education authorities to encourage the promotion of online moocs and to establish real-time standards for teaching quality and credit recognition, taking into account the individual talent development goals and needs of each school, as well as different teachers, technical support, subject characteristics and management system, in order to ensure the quality of professional teaching, according to the blockchain technology, to develop a safe, reliable, rigorous, decentralized and transparent teaching method that integrates mooc online learning with offline classroom teaching, multiple methods are used to carry out credit verification, achievement assessment, credit conversion, question-answering test and learning process verification. Optimize the content and form of MOOC, turn to the specialized, systematic course, let students develop good habits, a sense of responsibility, put more time and energy into learning.

5 Conclusion

In the educational exploration of MOOC exchange platform construction, blockchain innovation technology is not suitable to tamper with in massive open online course management, learning record, course content, knowledge base, exchange record, academic information, authentication information, etc., the Factor of safety is high and has a wide range of applications. Blockchain makes it possible for universities all over the country to start from a starting line, which can be in advance of the layout of colleges and universities, do a good job in the construction of MOOC, will be able to preempt.It is hoped that the current research results of this topic can provide some research ideas and practical value for the application of blockchain technology in MOOC. Although the idea of building a MOOC communication platform based on blockchain technology

has been put forward, as well as the related course production, due to the constraints of time, technology, production environment, cognitive level, and the strength of teachers, there are some deficiencies in curriculum design, resource sharing management, credit recognition and so on. In the future work will focus on technology, knowledge, platform construction and other aspects.

References

1. Zhang, J., Lu, L.: Practical dilemma and elaboration of MOOC out of the existence of internet. J. Inf. Teach. **218**(7), 3539–3552 (2018)
2. Le, C.V., Pardos, Z.A., Meyer, S.D., Thorp, R.: Communication at scale in a MOOC using predictive engagement analytics. J. Teach. Reform. **64**, 78–88 (2018)
3. Shao, M.: Research on the influence of MOOC teaching on the reform of ideological and political education in colleges and universities. Teach. Forum **37**(7), 4867–4880 (2018)
4. Zheng, J.: Discussion on the reform of mixed teaching mode of ideological and political courses in colleges and universities from the perspective of MOOC. J. Educ. Teach. **31**(5), 460–470 (2020)
5. Gamage, D., Perera, I., Fernando, S.: MOOCs lack interactivity and collaborativeness: evaluating MOOC platforms. Int. J. Eng. Pedagog. **63**, 226–235 (2020)
6. Ali, A., Bhat, M.A., Ganaie, S.A.: India on the cyber learning platform: an insight about SWAYAM MOOC platform. INT. J. Inf. Platf. **31**(5), 460–470 (2020)
7. Sunar, A.S., Abbasi, R.A., Davis, H.C., White, S., Aljohani, N.R.: Modelling MOOC learners' social behaviours. Comput. Hum. Behav. **96**(8), 925–932 (2020)
8. Sharov, S., Kolmakova, V., Sharova, T., Kamyshova, T.: Possibilities of the Ukrainian online platform OUM. Int. J. Inf. Educ. Technol. **28**(1), 131–138 (2021)
9. Febrianti, L.Y., Devina, Ningsih, R.Y.: BIPA for business communication learning model development through MOOC. J. Earth Environ. Sci. **35**(4), 309–316 (2021)
10. Tian, Y., Sun, Y., Zhang, L., Qi, W.: Research on MOOC teaching mode in higher education based on deep learning. Comput. Intell. Neurosci. **36**(2), 165–171 (2022)