Research on the Application of Blockchain Technology in Intangible Cultural Heritage Creative Design and Teaching

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Abstract. Cultural and creative design is one of the powerful ways to innovate cultural development and cultural and economic prosperity. The progress of the times and the change of design trend also affect the innovation of cultural and creative design and teaching. However, at present, the Intangible cultural heritage and creative design and education in Anhui Province are also facing the old teaching mode and the disconnection of the times, the education centralism hindering the cultural and creative design to be popular, lifelong and design teaching management. The system can not meet the problems of cross regional learning and certification, so new technology is needed to change these disadvantages. Blockchain has the technical characteristics of information tamper ability, decentralization and distribution, privacy and supervision, smart contract, etc., which can effectively optimize and solve the problems in the design and teaching of Intangible cultural heritage cultural innovation in Anhui Province. This paper discusses the management of learning resources, tracking learning process, evaluation of learning results, shaping learning path, management and examination in the design and teaching of Intangible cultural heritage cultural innovation by blockchain technology In the application of nuclear teaching, we found that there are still some shortcomings after the application of technology, such as the complexity of operation technology and the easy disclosure of information, the problem of artificial filling and compatibility of information, and the optimization of related technology. I believe that with the continuous upgrading of technology, blockchain technology can be better applied in the field of cultural and creative design and teaching.

Keywords: Cultural and creative design · Blockchain · Education cultural and creative products

1 Introduction

“Cultural and creative industry is a kind of industry that endows culture with vitality through creativity under the background of economic globalization. At present, it has widely appeared in film and television media, animation, art design and other fields” [1].
Cultural and creative design products generally have the dual attributes of cultural communication and use value, and play an important role in helping local cultural prosperity and economic development. Anhui Province, as a major province of intangible cultural heritage, has been lukewarm in the application and innovation of intangible cultural heritage cultural development, mainly reflected in the low level of Intangible cultural heritage cultural innovation design, narrow application channels, lack of creativity and other aspects. In the final analysis, it is due to the lack of investment in personnel training and Intangible cultural heritage cultural innovation design education. In order to solve the current problems in the design and teaching of Intangible cultural heritage cultural creation, we need to actively use new technology to help the improvement of the design and teaching methods of Anhui intangible cultural heritage cultural creation.

2 The Current Situation of Intangible Cultural Heritage Creative Design and Teaching in Anhui Province

“Anhui Province is one of the birthplaces of Chinese civilization, and its intangible cultural heritage resources are very rich. How to inherit and protect Anhui intangible cultural heritage is very important for the economic and cultural development of Anhui Province” [2]. Since 2006, Anhui Province has made continuous efforts in the inheritance and development of intangible cultural heritage, and actively carried out model innovation in the design and teaching of intangible cultural heritage. For example, first, intangible cultural heritage education has been incorporated into the modern design education system and integrated into the whole process of school teaching; second, strengthen the construction of intangible cultural heritage and other characteristics and promote the education and inheritance of traditional handicrafts; third, in high school The school set up intangible cultural heritage and innovation demonstration professional points; fourth, encourage intangible cultural heritage artists, masters and inheritors to participate in design education. After more than ten years of development, the development of Anhui intangible cultural heritage creative design industry and teaching field has been greatly improved, but there are still many deficiencies to be solved. See Fig. 1 for the types of intangible cultural heritage in Anhui Province.

2.1 The Traditional Intangible Cultural Heritage Creative Design and Teaching Mode Are Out of Touch with the Times

At present, “the modernization of art design and art design education in China has entered a critical period” [3]. The development of information technology and the upgrading of teaching equipment have changed the structure of “centralized” traditional design education. For this reason, other disciplines such as economy, biology, computer, media and other education fields are actively changing the teaching mode, relying on Internet technology, social software self-Media, network new media and other active “decentralized” activities. “The traditional intangible cultural heritage creative design classroom based on fixed location and fixed time, which implies considerable time and transportation costs, has become a very expensive and relatively inefficient way of knowledge dissemination” [4]. This is not only the current situation in Anhui Province, but also in most
provinces in China. The focus of teaching is on textbooks and teaching sites in schools or classrooms, which makes the inspiration and concept of design with the spirit of the times and futurism lose its ground. The education of Intangible cultural heritage creative design is running counter to the future.

2.2 Centralization Hinders the Popularization and Lifetime of Intangible Cultural Heritage Creative Design

“Lifelong education refers to the sum of all kinds of education that people receive in all stages of their lives, including all stages and modes of education system, including school education, social education, formal education and informal education” [5]. Market demand and designer’s self-requirements make life-long education more and more important. The wind direction in the field of cultural and creative design has been changing, which makes designers need to supplement knowledge all the time and make targeted feedback in the face of the changing market, including a series of changes in their own design system, such as design thinking, design inspiration, design style, etc. The emergence of this situation makes the field of intangible cultural heritage creative design education become more and more active. The former school centered design education behavior gradually transferred to education and training institutions, intangible cultural heritage inheritor studios, network design teaching, enterprises and other fields. The timeliness and foresight of these teaching methods are incomparable to that of school classroom education, because the materials come from the first-line design practice, people upload or share the educational resources to the network platform, and then they can listen to the class after identity registration, interact with teachers and inheritors of intangible cultural heritage in the network classroom, and make the teaching process simple and efficient. However, it is worth pondering that in Anhui Province and even in China, a large number of design education resources are placed in the closed
field such as the school. It is difficult for people who are separated from the identity of students to have the opportunity to understand and learn intangible cultural heritage knowledge again. The traditional education mode is difficult for most people to have the same right to education, which makes the field of design lifelong learning narrow. On the other hand, the network education resources vary from good to bad, which increases people’s learning time, cost and unforeseen learning burden. See Fig. 2 for centralized teaching mode.

![Fig. 2. Traditional centered design teaching mode](image)

### 2.3 Teaching Management System Fails to Meet the Requirements of Cross Regional Learning Certification

At present, design communication is becoming more and more common in the world, and its forms of communication are also diverse. There are four types of design communication in Chinese Universities: Visit form, expert lecture form, seminar form, cross regional teaching exchange form, “this cross regional teaching method can provide a good innovation platform for teachers and students. Through this platform, reasonable use of the differences between design colleges and universities can expand the breadth of students’ innovative thinking, promote the depth of thinking, and facilitate the verification and revision of their own design curriculum system” [6]. Especially in the process of the internationalization of teaching in Colleges and universities, the foreign exchange has expanded year by year, which has given birth to many cases of cooperation in running schools of cultural and creative design majors. Through the collision of eastern and Western cultures through design behavior, the design literacy and aesthetic appreciation have
been improved while the vision has been broadened. But back in China or in the province, this learning experience is difficult to prove students’ learning skills, knowledge literacy and teaching results. Because traditional educational institutions lack effective methods, resources and abilities to verify learners’ knowledge, skills and results, and it is also difficult to manage and verify learners’ learning activities, processes and results. This situation makes the learning experience and achievements of cross regional teaching personnel greatly discount in the interview of enterprises and government departments, and weakens their competitiveness in employment and work.

3 Concept and Characteristics of Blockchain

3.1 Blockchain Overview

On January 3, 2009, the first creation block with the serial number of 0 was born. Six days later, the block with the serial number of 1 appeared and connected with the creation block to form a chain, thus the block chain was born. Computer experts describe it as a decentralized distributed ledger database. Each block is like a hard disk, which saves all the information and encrypts it in the block through cryptography technology. Without mutual trust, blockchain technology can provide a decentralized and transparent data storage mode by using the mutual cooperation between blockchain network nodes based on consensus mechanism and distributed P2P network protocol for communication. The data stored in blockchain is packaged into blocks to form a chain structure and copied to each node, so it is called “sub” With the cooperation of cryptography, hash technology, consensus algorithm, smart contract and other related technologies, distributed public account books make the data in blockchain easy to verify and hard to be maliciously modified and completely destroyed (Fig. 3).

3.2 Characteristics of Blockchain

Information Shall not be Tampered with. Users jointly maintain the security of data in the Internet to ensure that it cannot be tampered with. Once the information is verified and added to the blockchain, it will be permanently stored. “Unless more than 51% of the nodes in the system can be controlled at the same time, the modification of the database on a single node is invalid, so the data stability and reliability of the blockchain are very high” [7].

Decentralization and Distribution. What we need to pay attention to here is that distributed is to go to the physical center, not to the management center. For example, when a large number of transactions are carried out at the same time, the decentralized processing method will save resources, make the transaction autonomous and simple, and avoid the risk of being controlled by the centralized agent.

Privacy and Regulation. From the perspective of the current practice or construction chain, the two seemingly contradictory points of privacy and supervision can be integrated. Because the exchange between nodes follows a fixed algorithm, the program rules in the blockchain will determine whether the activity is valid or not, so the data interaction does not need trust, so the two sides of the transaction can generate mutual trust without disclosing their identities.
Smart Contract. “It can realize the legal application based on the blockchain contract rules, and the top-level governance node can formulate the smart contract” [8]. A smart contract is a contract written by code and will automatically execute the contract signed by both parties in the contract when the conditions are met. Smart contracts are widely used in many fields. See Fig. 4 for the blockchain information data sharing architecture.
4 The Application of Blockchain Technology in Intangible Cultural Heritage Creative Design and Teaching

4.1 Manage Learning Resources

“Art design and education is the earliest reform and opening up involving information technology. Today’s derived MOOC, flipped classroom and other teaching methods are inseparable from the foundation of art design and education” [9]. Facing the new teaching reform in the field of design education, the main body of curriculum design, such as MOOC and flipped classroom, is still based on the traditional textbook content and teaching form of design education. This also leads to the intangible cultural heritage creative design teaching unable to attract the students’ learning attention and stimulate the students’ design creativity. The main reason is that the traditional design teaching work is too one-sided, the corresponding teaching content is too focused on the textbook knowledge, the lack of contact with the cultural and creative product design practice, and the lack of awareness of the intangible cultural heritage cultural background and history involved. Therefore, in this link, we can develop the corresponding intangible cultural heritage creative teaching resources and construction structure system through blockchain technology, connect the intangible cultural heritage masters and intangible cultural heritage protection platform, and update the corresponding teaching information and content online in real time. Teachers and students, enterprises and institutions can download the resources as learning reference and design materials, as well as upload their own works, design inspiration and learning information, so as to improve the learning resource management structure, enrich the classroom content and teaching form, and also stimulate students’ Learning Creativity and attention (Fig. 5).

Fig. 5. Intellectual property rights confirmation process of blockchain cultural and creative products
4.2 Follow up Learning Process

The intervention of blockchain technology enables students to track and read the learning situation in school. The school combines the personal information and learning situation of students with blockchain technology to record students’ learning subjects, examination results, design works, competition situation, etc. These data blocks become the voucher for students’ design and study in school. Each education block chain can directly see the students’ learning achievements at different stages. Due to the traceability of blocks, these data will not be easily deleted and modified, and students’ design works and learning assignments will also be protected by copyright. In the stage of learning completion, school administrators can evaluate it reasonably and scientifically. When entering the enterprise, the company can also verify students’ learning data in time. In this way, it solves the problem that the learning process of students from enrollment to employment is difficult to track, which helps students, schools and enterprises to read information and judge students’ ability.

4.3 Assessing Learning Outcomes

It is the most effective way to evaluate students’ learning situation by practice and competition in intangible cultural heritage creative design education. However, the existing problem is that the evaluation may be opaque and not objective, and the evaluation results of students’ design learning may be changed consciously due to the influence of external factors. Because of the different evaluators, schools, regions and even categories of intangible cultural heritage, it is difficult for traditional educational institutions to effectively evaluate and certify students’ learning process and results objectively, fairly, automatically and accurately. The teaching evaluation based on blockchain technology can be transformed into the certification of students’ learning achievements, and the corresponding feedback of students’ learning effect can help the curriculum system to find shortcomings and further improve. From the perspective of security, the use of blockchain technology can ensure anonymity and provide multiple signature technology for each group to ensure information traceability. In the data layer architecture of the double-layer chain, the main chain information is generated into the information in the sub chain block. As long as the integrity of the main chain’s full function nodes is guaranteed, the malicious attack of the chain block can be protected. The data stored in the block mainly includes course name, design practice project, course weight and other subjects. Besides, it also includes the qualification conditions for graduation requirements as one of the evaluation basis, and design course learning as the output value of the result learning. It is determined by the comprehensive evaluation of students’ learning achievement, learning process and learning evidence through quantitative and qualitative methods. In this way, the traditional evaluation based on achievement and credit can become the evaluation based on the ability and index required for graduation. At the same time, the consensus mechanism ensures the persuasiveness of the assessment results, because the assessment is no longer limited to the subjective will of teachers. At present, “some colleges and universities have published the teaching materials of entrepreneurship and innovation education which are popular with students, and produced more practical and mature teaching methods and evaluation standards” [10].
It can be said that the application of blockchain technology in learning evaluation can effectively make up for the loopholes of learning evaluation in the field of Intangible cultural heritage design education.

### 4.4 Shaping the Learning Path

At present, “in the process of personalized recommendation of design education, when the characteristics of learning resources are insufficient, it is necessary to collect, analyze accurately and allocate education resources reasonably” [11]. “This makes the design education in Colleges and universities should change the learning environment of students according to the relevant problems of the course, and make students have creative ability and passion” [12]. In the learning process of Chinese colleges and universities, the students in the third stage need to further strengthen the research on a certain field of cultural and creative design. Some students are interested in traditional ceramics, and some students are interested in Chinese traditional furniture. This requires reasonable learning evaluation to help students guide their own learning path. Due to the establishment of learning block, students’ choice of learning direction in cultural and creative design specialty is more clear. Teachers can effectively evaluate students’ learning achievements through learning achievements and design practice in the block, and help students improve their design ability. Students can adjust and choose their own hobbies according to the information of the education block, and help to shape their own design learning path through different types of smart contracts, so as to avoid blindly choosing the direction of learning and research.

### 4.5 Management and Assessment Teaching

In Due to the popularity of Internet in school education, the teaching process of teachers and students can not be uploaded to the school education information terminal in time. The teaching information recorded in paper documents can not provide sufficient proof for students’ learning, because the timeliness and contingency of design activities make these records difficult. All these bring great difficulties to the management and assessment of the school. Blockchain technology can make up for these shortcomings of teaching management, and fully integrate the data information of students’ personal electronic status with blockchain management technology through technical means, so as to create an efficient and easy to manage education management platform.

On this platform, the government education management department creates the alliance chain, grants trust and authorization to the joined nodes and grants the required permissions to operate and maintain the data of teachers’ teaching and students’ learning on the blockchain. The education supervision department is responsible for supervising the behavior of all the subjects in the chain, avoiding the problems in time, and participating in the maintenance of the blockchain. The management teacher is responsible for the uploading and recording of all the files of students in school. The student management department of colleges and universities must confirm and endorse all the contents filled in by the management teachers, so as to ensure the authenticity and effectiveness of the student data files. Colleges and universities are responsible for recording the design and teaching activities that students participate in on the chain, including the content, time,
achievements and other information. The school of design is the user of blockchain information, and jointly maintains and records student file information. It can view the trusted student file information recorded on the blockchain through permission application, so as to realize the accurate assessment of students.

5 The Practical Challenge of Applying Blockchain Technology to Intangible Cultural Heritage Creative Design and Teaching

5.1 Complex Operation Technology and Easy Information Disclosure

Although blockchain technology has many advantages in intangible cultural heritage creative design and education, its specific operation method is not easy to learn. Many design majors may not be able to easily understand and learn the corresponding file download and upload methods, which creates many obstacles for students’ autonomous learning. For colleges and universities, many teachers in charge of student information management need training and ability certification before they can take up their posts. Secondly, due to the need for openness and transparency of user information, many teachers and students will be worried about whether personal identity information will be disclosed. For example, many harassed phones, SMS and emails steal personal information through network technology, which leads to the need to optimize the security management of blockchain technology.

5.2 Human Filling and Compatibility of Information

There may be some phenomena such as content falsification, score cheating and input error when the information is filled manually. Once the data is filled, it cannot be modified, which increases the use risk of blockchain, and the change of one data may change the corresponding block. At the same time, different operating systems are not compatible with the software platform, which makes it difficult to upload and download data, makes it more difficult for different entities in the blockchain to work together, and affects the overall application relationship.

5.3 Relevant Technologies Need to Be Optimized

Education is not to focus on improving the economic interests of the school, but to pay more attention to how to train students to meet the needs of social development of high-quality cultural and creative design talents. “This is determined by the cultivation of talents with innovative thinking, the cultivation of students’ practical ability, and the cultivation of students’ team spirit of design education” [13]. Therefore, it is required that relevant staff should innovate and optimize the block chain technology operation methods to better meet the needs of design education for technology, aiming at some unreasonable setting problems and technologies Technical structure should be reformed and innovated.
6 Expectation

“The major of art design education pays more and more attention to the cultivation of students’ creative thinking and practical creative ability, so as to improve the employment rate of students and bring more students to the school” [14]. With the further optimization and algorithm innovation of blockchain technology, it can better help improve students’ creative thinking and practical ability. In online teaching and cross regional teaching, it can ensure students’ relevant interests to provide accurate learning proof materials, and it can further help students to connect with employers in terms of employment promotion. For example, in terms of investigating students’ learning achievements and design level, employers can easily use blockchain technology to identify the true and the false, and use the results of data analysis to assist the recruiter whether to recruit or arrange the positions of the candidates, so as to achieve the purpose of talents. Of course, such a way can also be applied to the enrollment of master’s and doctor’s degree in Colleges and universities, because the data in the block is unalterable and correct.

“Although there is no clear understanding on how to apply blockchain to the field of distributed storage of educational resources, we can still learn from its idea of distributed governance: the world wide web (WWW) is a natural distributed governance platform of educational resources, which can achieve effective distributed governance combined with the use of users” [15]. In this era of interconnection of all things, blockchain technology can effectively use the materials of design education to provide more and better design teaching services for students, reduce the energy and time of users in identifying good and bad learning resources, and further improve the quality and efficiency of education. Because the complex information on the network can reduce the bad and useless data information under the optimization of blockchain technology, which is convenient for students and users to find the learning materials they want.

Online teaching payment, design copyright maintenance, teaching courseware sovereignty determination, etc. are all in urgent need of blockchain technology for protection. Due to the characteristics of its technology, it can well maintain and serve to fight against piracy, design infringement, etc. In the future, there will be more design works and online courseware based on blockchain technology, which will further promote the application of blockchain technology in the field of design education. This alone can curb the rampant piracy in China and protect the legitimate rights and interests of designers. Henceforth, there will be more design works and online courseware based on blockchain technology, which will further promote the application of blockchain technology in the field of design education.

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