Educational Policy Formulation Based on Blockchain Technology

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Abstract. The inherent decentralization and security properties of blockchain make it well suited to address today's educational decision-making challenges. The educational policy evaluation index system is built on the basis of blockchain technology. The purpose of this paper is to study and implement educational policy formulation based on blockchain technology, and to systematically analyze the theoretical basis for educational policy formulation and evaluation using blockchain technology-related theories, combined with normative research, comparative research, and empirical research methods. This paper analyzes the process of educational policy formulation, designs an educational policy evaluation model, and provides a systematic and standardized management method for educational policy formulation and evaluation. The indicator weight calculation results show that the policy effect accounts for 43%, the policy effect accounts for 23%, and the policy effect accounts for 25%. In addition, taking the education policy of M province as an example, to verify the scientificity and operability of the education policy evaluation model established in this paper, the results show that the actual effective rate of the province's education policy is 63.56%, and the overall result is "average". It belongs to the middle and lower classes, which is in line with the actual situation.

Keywords: Education Policy · Blockchain Technology · Indicator System · Policy Evaluation

1 Introduction

With the continuous popularization of higher education in my country and the continuous reform and improvement of the educational system, the scale of running schools in major colleges and universities has increased year by year, and the number of college students has repeatedly hit new highs. The role of policy evaluation in higher education and policy management is reflected in its ability to timely locate policy issues, influence or determine the progress, review or termination of policies, and provide the best decision-making framework [10]. Distribution of higher education policy sources. my country's higher education policy review has achieved certain results in practice, but there are still some problems. The height of our country has not yet been established. This is an

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important issue that needs to be solved urgently in the process of strengthening scientific decision-making and promoting the standardization of policy evaluation in our country. The research and application of educational policy formulation based on blockchain technology in this paper is expected to solve this problem [5].

Different researchers have different views on the evaluation criteria of educational policy. Khan K M describes how to leverage the advantages of blockchain, such as cryptographic foundations and transparency, to enable effective electronic voting schemes. The proposed scheme meets the basic requirements of an electronic voting scheme and achieves end-to-end verifiability. Details of the proposed electronic voting scheme and its implementation using the Multichain platform are presented. An in-depth evaluation of the scheme has also been conducted, successfully demonstrating its effectiveness in implementing an end-to-end verifiable electronic voting scheme [9]. Hardison-Moody A assesses the impact and lessons learned from implementing policy, systems and environment (PSE) changes in 3 southern states through Faithful Families Thriving Communities (Faithful Families), a faith-based health promotion program. Implement the Faithful Family curriculum and PSE changes through a coordinated effort between the Expanded Food and Nutrition Education Program (EFNEP) and the Supplemental Nutrition Assistance Program-Ed (SNAP-Ed). Changes are measured using faith community assessments, field reports and annual reports [8]. Bastian K C used teacher appreciation and assessment rating data from North Carolina public schools to estimate the signaling and human capital effects of graduate degrees. These analyses take into account the overall impact of graduate degrees, as well as the impact of graduate degrees within and outside the field of faculty teaching. Signal analysis shows that teachers with graduate degrees in their teaching fields have comparable value-added estimates and receive higher ratings than teachers with only undergraduate degrees. Human capital analysis shows that postgraduate degrees within the region benefit faculty for added value in multiple comparisons and predict higher evaluation ratings on leadership criteria [2]. Through the analysis of the existing research, most of the research on education policy evaluation at home and abroad absorbs and reflects the research results of public policy evaluation.

This paper takes higher education policy evaluation as the theme, discusses and solves the problems existing in the structure of higher education policy evaluation system in our country, which has important practical significance to speed up the construction of higher education policy evaluation system. Under the background that evaluation-related research is not yet rich and mature, it can improve people's awareness of the importance of higher education policy evaluation, thereby accelerating the development of education-related research on higher education policy evaluation in my country; on the other hand, it can provide policy evaluation activities. Standardization constraints can effectively promote the standardization of my country's higher education policy evaluation activities, further improve the level and quality of my country's higher education policies, and are also conducive to the reform and development of higher education.

2 Research on Educational Policy Formulation Based on Blockchain Technology

2.1 Blockchain Technology

In blockchain technology, a blockchain is a chained structure in which encrypted transaction information is stored in blocks and the blocks are timestamped in chronological order. A block consists of a block header and a block body. The block header records the metadata information of the block, such as the version number of the current block, the hash value of the block, the hash value of the root node of the Merkle tree generated from the transaction list, and the timestamp generated by the blockchain. A block consists of a transaction processing counter and transaction processing, which records the hash values of all transactions from the previous block to the current block, which are linked together by a data structure called a Merkle tree. Key technologies such as Hash algorithm, Merkle tree, timestamp and asymmetric signature are involved in the blockchain. When the blockchain technology stores data, it uses cryptography-related technologies such as hash algorithm, asymmetric encryption, etc. to encrypt the data. This data processing method enables the data to receive more protection during the storage process [7, 12].

2.2 Design Principles of the Evaluation Index System

2.2.1 The Principle of System Integrity

The construction of educational policy evaluation index system is a complex systematic project, which must truly reflect the basic characteristics of each aspect, such as the actual effect, efficiency and impact on other industries of the educational policy. The indicators are independent of each other, but also related to each other, and together they form an organic whole [1, 3].

2.2.2 Principle of Scientific Rigor

According to the content and purpose of educational policy evaluation, the name and meaning of the indicators should be determined in the process of index creation, that is, the index system should be strict and accurate, and should not be inconsistent. The concept and scope of application of indicators must be based on theoretical scientific basis [11, 13].

2.2.3 The Principle of Operability

Education policy evaluation is still in the exploratory stage. At the same time, due to the different conditions such as the implementation of policies and the difficulty of obtaining actual data such as policy outputs, policy evaluation will encounter various problems, the indicators should be unified, and the comprehensive indicators with commonality should be selected as much as possible to strive for the operability of the data [4].

2.3 Policy Evaluation

The application of policy evaluation in educational policy forms the category of educational policy evaluation. In terms of classification, education policy is a kind of public policy, and the study of education policy cannot be separated from the reference of the public policy research of its superordinate concept. Evaluation is the activity of making value judgments based on quantitative (or qualitative) descriptions. Fact judgment is "quantitative (or qualitative) description of things", that is, the description of the development state, nature and law of things. The analysis of post-policy outcomes is mostly true judgment, and the key feature of true judgment is objectivity. Objectivity is based on the objective description of the state of the object; value judgment is the judgment made by the evaluator on the objective things according to his own needs and wishes under the condition of describing the objective facts. Value judgment is an activity that unifies objectivity and subjectivity, including the needs and desires of the evaluator's subject. Subjectivity refers to the conclusion of the evaluation and the evaluator's own understanding of how things "should be" [6].

3 Index Establishment of Education Policy Evaluation Based on Blockchain Technology

3.1 Construction of Evaluation Index System

While considering traditional educational policy factors, in order to emphasize the factors of blockchain technology, this paper divides the technical level into two parts: blockchain architecture and system risk, so that we can more clearly see the impact of blockchain technology on the entire education policy. Based on the above viewpoints, on the basis of preliminary screening of factors through questionnaire survey, literature research and expert consultation were carried out, and the index system shown in Fig. 1 was finally sorted out using the calibration method.

Policy effect: The policy effect in the education policy evaluation index system is mainly reflected by the educational development status. Educational policies formulated to promote the development of educational policies are comprehensive, so policy indicators also involve all aspects of education. For this reason, we have selected three indicators to measure educational policies: education investment, achievement transformation, educational talents, and aspects. These three indicators are all quantitative indicators. By comparing the actual indicator values to achieve the expected goals, the effectiveness of educational policies can be directly mapped. These index values can be obtained directly through relevant statistical data or obtained through data processing. Policy effect evaluation is an important content of education policy evaluation.

Policy efficiency: Economic efficiency mainly measures the relationship between educational policy input and policy output, and administrative efficiency mainly measures the social approval status of education policy. The index values of economic efficiency and administrative efficiency are represented by the level with gray characteristics, which can reflect the impact on the evaluation of the entire education policy through specific processing methods.

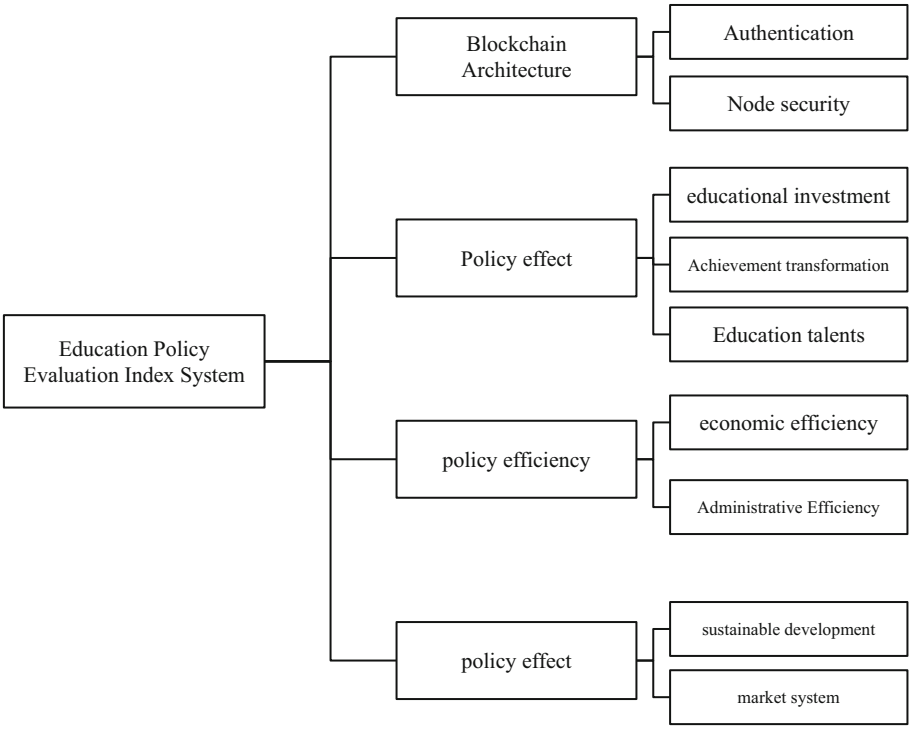

Fig. 1. Education Policy Evaluation Index System

Policy effect: The policy effect index mainly measures the incidental effect on the market competition system and industry due to the implementation of education policy. We select the impact of education policy on sustainable development and the impact of education policy on the market system to reflect the effect of education policy. The effect indicators of educational policy are all qualitative indicators, because these effects are not measurable with simple data, but a complex comprehensive effect with fuzzy characteristics. Impact evaluation is also an important aspect of educational policy evaluation. Through the measurement of these indicators, the effect, efficiency and effect of educational policies can be comprehensively reflected, and by using specific methods to process the indicator values, a comprehensive and comprehensive understanding of the output and effectiveness of educational policies can be obtained.

3.2 Calculation of Index Weights Based on AHP

Analytic Hierarchy Process is a decision-making system of power and scale that can help to solve problems involving a large number of subjects and objective factors, especially when the ultimate expectations are not clear. Analyzing with Analytic Hierarchy Process is a decision-making process. It is very effective. It "transforms a complex problem into a process, a graph can show the consistency of the various subdivisions in the internal factors of the system, and then grouped step by step". In the process of using the AHP, the

research question is first explained, and then the elements related to the decision-making problem are divided into the structural level, the criterion level and the ideological level according to their interaction. Or membership, then by forming a comparative score for the importance of each element, the weights can be calculated and tested. Finally, according to the homework results, analyze the problem solving and draw conclusions. The main calculation steps are as follows:

Calculate the maximum eigenroot of the corresponding judgment matrix A is λ_{max}:

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n}\frac{(Aw)_i}{w_i} \tag{1}$$

Calculate the random consistency ratio C.R. of the total ordering of the hierarchy:

$$C.R. = C.I./R.I = \frac{\lambda_{max} - n}{n-1}/R.I. \tag{2}$$

If C.R. > 0.1, the judgment matrix A does not satisfy the consistency, and the judgment matrix A needs to be corrected for basic consistency. The correction process can be realized by the matrix correction method. If C.R. < 0.1, pass the basic consistency test.

4 Empirical Analysis of Educational Policy Formulation Based on Blockchain Technology

4.1 Calculation Results of Indicator Weights

The fuzzy comparative evaluation matrix is given by experts, and then the data is processed by the Analytic Hierarchy Process (AHP), and finally the weights of the indicators at all levels of the evaluation system shown in Table 1 can be obtained.

Results Table 1 shows that the two aspects of blockchain architecture and policy effects account for the largest proportion, accounting for 61% of the total evaluation weight. Among them, the blockchain accounts for 18% of the total proportion and about a quarter of the technical level. First, it can be seen that blockchain technology has an important position in the entire technical analysis. In other respects, policy efficiency accounted for 23%, and policy effect accounted for 25%.

4.2 Case Study

The empirical analysis is to verify the scientificity and operability of the educational policy evaluation model established by the paper.

Evaluation period: 2018 and 2020.

Evaluation object: M province education policy.

The results of the evaluation of higher education policy in M province are as follows:

As shown in Fig. 2, compared with the evaluation grade scores and the vector V = (1, 2, 3, 4, 5) = (good, better, fair, poor, poor), it can be seen that the province's education policy The actual degree of effectiveness is 63.56%, and the comprehensive

Table 1. Weights of indicators at all levels of education policy

main indicators	Main Indicator Weight	Secondary indicator	Secondary indicator weights
Blockchain Architecture	0.18	Authentication	0.08
		Node security	0.1
Policy effect	0.43	educational investment	0.21
		Achievement transformation	0.12
		Education talents	0.10
policy efficiency	0.23	economic efficiency	0.13
		Administrative Efficiency	0.10
policy effect	0.16	sustainable development	0.09
		market system	0.07

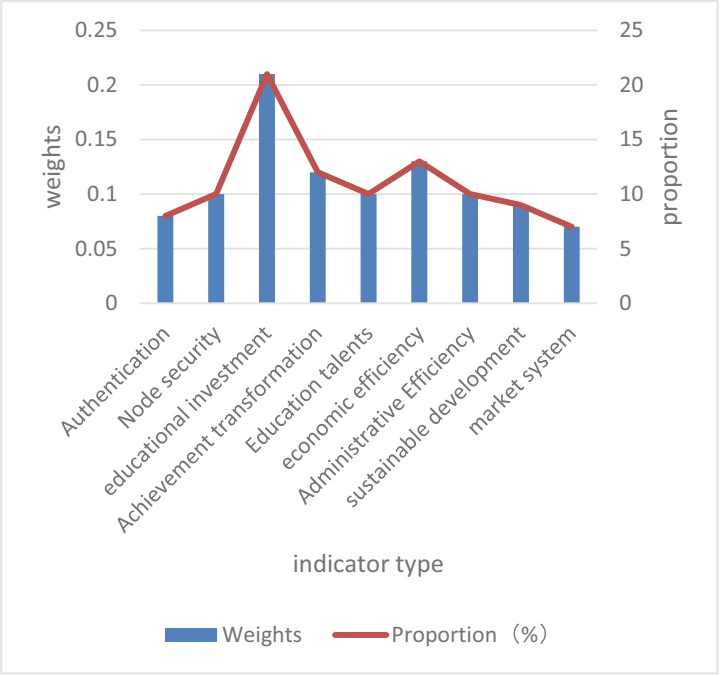

Fig. 2. Results of the Higher Education Policy Evaluation in Province M

result is between "average" and "good", which belongs to the middle and lower level, which is in line with the reality that the province belongs to the low level of education development and the supporting policies are not perfect. Through the case analysis of this province, it can be verified that the educational policy evaluation index system established in this paper and the establishment of the educational policy index system based on AHP are operability and feasibility. The results of educational policy evaluation are the basis for the improvement and adjustment of educational policy, according to which the educational policy system can be revised and perfected.

5 Conclusions

This paper builds an evaluation index system for educational policies based on blockchain technology, which is conducive to assisting the formulation of related policies, and has important theoretical value for strengthening the management of educational policy formulation and evaluation, and effectively stimulating the guiding and supporting role of educational policies on education and realistic meaning. Due to the limited personal ability and the relative lack of materials, this paper has certain limitations. For example, in the analysis of the development and characteristics of the construction of foreign education policy evaluation systems, it focuses on the general problems of the construction of education policy evaluation systems, and lacks relatively complete analysis of higher education policy evaluation cases, which may affect the sufficiency of the arguments.

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