



Research on Influencing Factors of College Students' Willingness of Continuous Participation in Innovation and Entrepreneurship Education Based on Interpretive Structure Model

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Abstract. The Innovation and Entrepreneurship Education of college students is an important way to cultivate high-quality personnel. In China's universities and colleges, it faces the problems of large input and wide coverage with the unideal output. This is directly related to whether the college students continuously invest their time and energy during the process of participating in Innovation and Entrepreneurship Education, which is the level of their willingness of continuous participation. This study systematically analyzes and combs the relationship among the influencing factors of College Students' willingness of continuous participation by selecting 14 main factors and establishing the explanatory structure model of these influencing factors. Some conclusions have been achieved as follows: Firstly, the most immediate factors are participation motivation, the team cohesion, the previous participation experience, the sense of satisfaction and the sense of achievement. Secondly, guaranteed conditions, curriculum resources, the management support, the incentive system and the quality of the instructors are the most fundamental factors. Lastly, the campus atmosphere, the teacher-student relationship, the self-conscious identification and the self-efficacy play a key role in promoting the students' willingness of continuous participation.

Keywords: college students · the Innovation and Entrepreneurship Education · the continuous participation · influencing factors · Interpretative Structure Model

1 Introduction

In 2015, the General Office of the State Council issued the "Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities", which clearly pointed out that colleges and universities should accelerate

the cultivation of innovative and entrepreneurial talent teams with large scale, innovative spirit and the courage to devote themselves to practice, and actively invest in the training of innovative and entrepreneurial talents, to explore new mechanisms for cultivating innovative and entrepreneurial talents. In 2018, the State Council issued the “Opinions on Promoting the High-quality Development of Innovation and Entrepreneurship to Create an Upgraded Version of “Double Entrepreneurship”, which once again pointed out that it is necessary to strengthen the education and training of college students’ entrepreneurship and innovation [1]. The country vigorously develops innovation and entrepreneurship education, implements innovation-driven, and promotes education reform, with the ultimate goal of adapting to social development and the country’s strategic planning [2]. According to the strategic development requirements of innovation and entrepreneurship education, colleges and universities should study all the links that have an impact on the whole process of the development of college students’ innovation and entrepreneurship education. In the top-level planning, innovation and entrepreneurship education should be integrated into the whole process of talent training, and innovation and entrepreneurship education related courses and construction should be vigorously established. Practice platform base, guide participation in innovation and entrepreneurship projects, hold innovation and entrepreneurship competitions, cultivate students’ innovative awareness, exercise students’ innovation and entrepreneurship ability, and focus on the combination of educational science and students’ innovative initiative, so as to better adapt to the drive of China’s innovative strategy the needs of social development.

2 College Students’ Willingness of Continuous Participation in Innovation and Entrepreneurship Education

2.1 Innovation and Entrepreneurship Education for College Students

From the perspective of the training process of innovative and entrepreneurial talents, innovation and entrepreneurship education should cover the whole process of creative mining, theoretical knowledge accumulation, scientific research ability inheritance and innovation, creative transformation and landing, and entering the market to form an enterprise. In this process, classroom teaching plays an indispensable role in acquiring theoretical knowledge of innovation and entrepreneurship, but what is more important is to generate new knowledge, new skills and new thinking in practice. The essence of innovation and entrepreneurship education is to achieve innovation and entrepreneurship talent training in a more practical, diversified and creative form.

American and European colleges and universities are actively involved in innovation and entrepreneurship education, and have gradually formed some typical models. It mainly includes “business platform model” [3], “independent college model” [4], “team project model” [5, 6] and “industry-university incubation model” [7, 8]. In April 2002, the Ministry of Education identified 9 universities including Renmin University of China as the first batch of pilot universities for innovation and entrepreneurship education reform. My country’s innovation and entrepreneurship education has experienced more than ten years of development. Under the encouragement of relevant national policies,

innovation and entrepreneurship in colleges and universities has Education continues to explore in the direction of specialization and depth, and gradually form unique innovation and entrepreneurship education models, such as platform-based entrepreneurship colleges integrating the implementation of the dual-entrepreneurship education model [9, 10], the dual-entrepreneurship education and technology industrial park incubation linkage model [11], and entrepreneurship training mode of industry-education collaboration [12]. And these models all highlight an important means, that is, innovation and entrepreneurship practice education.

To achieve the purpose and effect of innovation and entrepreneurship education through practice has become a common way for colleges and universities both at home and abroad. The entrepreneurial practice platform is used as the carrier to implement practical and applied education and teaching activities to cultivate students' innovative and entrepreneurial ability and quality. In terms of the manifestations of innovation and entrepreneurship practice education in my country's colleges and universities, there are both overall planning models, such as the national unified planning of college students' innovation and entrepreneurship training programs, various national innovation and entrepreneurship competitions and other projects in which colleges and universities all over the world participate; there are also a hundred schools of thought contending, each with its own characteristics, such as open experimental projects, innovative space projects, industry-university-research incubation projects. Most of these innovation and entrepreneurship practice education are driven by student participation. Students' continuous participation in innovation and entrepreneurship education is not only a key factor in improving students' innovation and entrepreneurship ability, but also an important part of ensuring the quality of innovation and innovation education.

2.2 College Students' Willingness of Continuous Participation in Innovation and Entrepreneurship Education

The results of the "Blue Book on China's Innovation and Entrepreneurship Education" show that the current innovation and entrepreneurship education in domestic colleges and universities is valued, guided and promoted by the government, and colleges and universities themselves are constantly exploring and changing themselves. The survey results show that nearly 70% of colleges and universities invest more than one million yuan in innovation and entrepreneurship education. Almost all colleges and universities offer courses related to innovation and entrepreneurship, and credits related to innovation and entrepreneurship modules [13]. There are maker spaces, more than 70% of colleges and universities have established business incubators and laboratories, and 41.1% of colleges and universities have established research centers for innovation and entrepreneurship education on campus. At the same time, data from the "Chinese College Students Employment Report" shows that in recent years, the proportion of self-employment of fresh graduates in my country's colleges and universities has stabilized at about 3%, which has increased significantly compared with 1.2% ten years ago, but is still far lower than the proportion of developed countries. Although the proportion of entrepreneurs within three years of graduation can reach about 8%, there will still be more than half of entrepreneurs who leave the field within three years. The entrepreneurial fields chosen by entrepreneurs are mainly concentrated in the education and cultural industries that

they are most familiar with [14]. Homogeneous competition, low technical threshold and lack of market channels have become the main factors that make it difficult for enterprises to survive.

To sum up, the macro characteristics of innovation and entrepreneurship education in China's colleges and universities at this stage are: large investment, wide coverage, and unsatisfactory performance output, which is directly related to the time and energy that college students, as the main participants, continue to invest in innovation and entrepreneurship education.

At present, there are many research angles on innovation and entrepreneurship education, but most of them study the model and system from a macro perspective, but there are almost no studies on the degree of participation and investment of college students. This paper introduces the concept of "continuous participation willingness" [15] from the information system to describe and study the continuous investment of time and energy in the innovation and entrepreneurship education of college students. There are many influencing factors of college students' willingness to continue participating in innovation and entrepreneurship education, and the relationship between them is intricate. Based on this, this paper uses the interpretation structure technology to establish an overall framework model of the influencing factors of college students' willingness to continue participating in innovation and entrepreneurship education, and systematically analyzes the main influencing factors. The hierarchical structure relationship aims to help university innovation and entrepreneurship education managers to better clarify the interaction between various influencing factors, so as to reveal the mechanism of the influencing factors of continuous participation willingness, and further explore the key factors affecting continuous participation willingness. Strategies of college students' willingness to continue participating in innovation and entrepreneurship education.

3 Construction of the ISM Model of the Influencing Factors of the Willingness to Continuously Participate in College Students' Innovation and Entrepreneurship Education

3.1 Research Methods

Interpretative Structural Modeling (ISM) is an effective method for modeling structural problems in complex systems. It mainly decomposes a complex system into several subsystems or elements through the identification of the interaction relationship between system elements, obtains the reachability matrix through some basic assumptions and related operations on graphs and matrices, then decomposes the reachability matrix, and finally constructs the A multi-level hierarchical structure model is developed, which makes the intricate relationship between many elements hierarchical and organized, thereby showing the internal structure of the system.

The ISM modeling process can be summarized into five steps: organize, establish and implement an ISM team; determine the system problems to be solved; analyze and determine the constituent elements of the system; establish an adjacency matrix according to the element relationship, and further construct a reachability matrix; decompose the reachability matrix Then build a structural model.

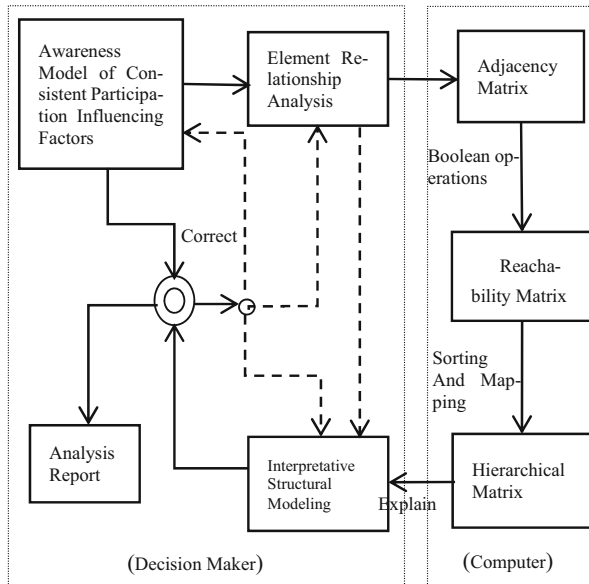


Fig. 1. The construction steps of influencing factors of college students' willingness to continue participating in innovation and entrepreneurship education based on the interpretation structure mode

There are many factors that affect the willingness of college students to continuously participate in innovation and entrepreneurship education, and there is a certain level of relationship between them (such as correlation, causation). Therefore, this paper analyzes the internal relationship and importance of each factor by introducing interpretative structural model. The construction steps of the ISM model are shown in Fig. 1.

3.2 Modeling

- Determination of influencing factors of continuing participation willingness

Based on the literature review, this paper finally screened out fourteen main factors that affect the willingness of college students to continue participating in innovation and entrepreneurship education, as shown in Table 1. From the analysis in Table 1, we can see that there are two main categories of factors that affect the willingness of college students to continuously participate in innovation and entrepreneurship education: environmental factors and cognitive factors. Among them, there are eight sub-factors of external environmental factors, and six internal personal cognitive factors. By consulting the opinions of six college teachers and eight college administrators and other experts, the key issue is determined as “College students’ intention to continuously invest energy and time in innovation and entrepreneurship practice (S_{15})”.

Table 1. Factors influencing the willingness of college students to continuously participate in innovation and entrepreneurship education

	S_i	Influencing Factors	Description
External environmental factors	1	Guaranteed conditions	Provide guarantee for scientific research support, finance, venue, etc. related to innovation and entrepreneurship practice.
	2	Curriculum resources	The quantity and content of course resources related to innovation and entrepreneurship, the level and gradient of course setting.
	3	Campus atmosphere	The extent to which an individual's perceived external environment supports creativity and innovation.
	4	Management support	The management efficiency and management level of college students' participation in innovation and entrepreneurship practice.
	5	Incentive system	Incentive system related to innovation and entrepreneurship practice, including organizers, instructors, college students and other participants.
	6	Quality of the instructors	Teacher's own professional ability, innovation and entrepreneurship ability.
	7	Teacher-student relationship	Academic exchanges between instructors and students, guidance and interaction for college students' practical activities.
	8	Team cohesion	Attract various influences that team members are willing to stay in the team, including the attractiveness of members, the attractiveness of the team's goals and tasks, the prestige gained after joining the team.

(continued)

Table 1. (continued)

	S_i	Influencing Factors	Description
Internal personal cognitive factors	9	Participation motivation	Stimulate and maintain the internal and external driving force of college students' participation in innovation and entrepreneurship practice.
	10	Self-efficacy	College students' cognition of their own innovation and entrepreneurship ability.
	11	Previous participation experience	College students' previous experience of participating in college students' innovation and entrepreneurship practice.
	12	Self-conscious identification	Degree of recognition and acceptance of an individual's "identity" within the team.
	13	Sense of satisfaction	The degree of pleasure of college students participating in innovation and entrepreneurship practice.
	14	Sense of achievement	The benefits that college students get from participating in innovation and entrepreneurship practices, such as personal ability improvement, winning some awards.

- Build adjacency matrix and reachability matrix

Based on the analysis of the influencing factors of college students' willingness to participate in innovation and entrepreneurship education, the adjacency matrix is established by studying the relationship between various factors, which lays the foundation for the following model construction. The adjacency matrix is a square matrix that represents the basic binary relationship or direct connection between system elements. If $A = (a_{ij})_{n \times n}$ is defined as follows:

$$a_{ij} = \begin{cases} 1 & S_i \text{ has some kind of binary relationship to } S_j \\ 0 & S_i \text{ does not have some kind of binary relationship to } S_j \end{cases} \quad (1)$$

In the formula, S_i and S_j respectively represent the i and j factors ($1 \leq i, j \leq 15$ and take an integer). According to the definition of the adjacency matrix, the 15 factors of the willingness to continuously participate in the innovation and entrepreneurship

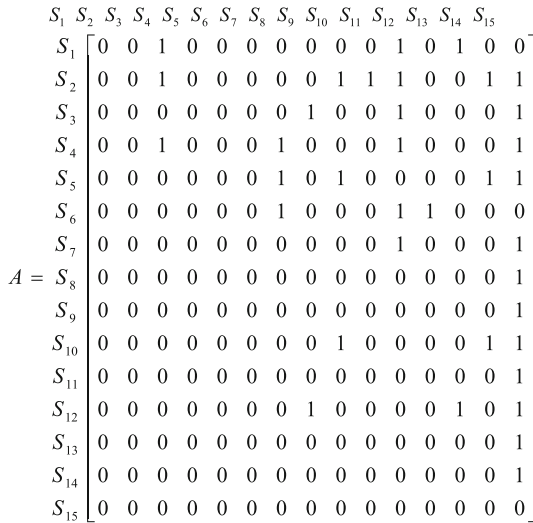


Fig. 2. Adjacency Matrix of Sustained Participation Willingness

education of college students are analyzed through the literature research method, and the adjacency matrix A is constructed, as shown in Fig. 2.

The reachability matrix M means that there is some kind of transitive binary relationship between elements S_i and S_j , or there is a directed path from node i to j on a directed graph. The reachable matrix M can be obtained by adding the unit matrix of the same order to the adjacency matrix, after operation and analysis, that is, adding A to I first to obtain a new matrix $A_1 = (A + I)$, where if the element a_{ij} in A_1 is 1, which means that from node i to node j can be reached directly, if A_1 is not a reachable matrix, continue to calculate. Square A_1 , which is $A_1^2 = (A + I)^2 = A^2 + A + I$, and use the Boolean algebra rule to calculate it, the rule is:

$$\begin{aligned}
 0 + 0 &= 00 + 1 = 11 + 1 = 1 \\
 0 \times 0 &= 01 \times 0 = 01 \times 1 = 1
 \end{aligned}
 \tag{2}$$

$(A + I) \neq (A + I)^2 \neq \dots \neq (A + I)^{r-1} = (A + I)^r = M$ can be obtained by sequential operations, where $(A + I)^{r-1} = A_{r-1}$, in the A_{r-1} matrix, if the element is 1, it means that there can be as many as $(r - 1)$ paths between nodes to reach the maximum value. When $A_{r-1} = A_r = M$, the reachable matrix is obtained, and through MATLAB, we obtain the reachable matrix M as shown in Fig. 3

- Divide the reachability matrix

Region division is to divide the element set S into different regions with binary relations, and decompose the elements of the reachability matrix into several regions according to the reachable set $R(S_i)$, the preceding set $A(S_i)$ and the common set $C(S_i)$, among which:

$$R(S_i) = (S_i | m_{ji} = 1, i = 1, 2, 3, \dots, n)$$

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}	
S_1	1	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1
S_2	0	1	1	0	0	0	0	0	1	1	1	1	0	0	1	1
S_3	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1
S_4	0	0	1	1	0	0	1	1	0	0	1	0	0	0	0	1
S_5	0	0	0	0	1	0	1	0	1	0	1	1	0	1	1	1
S_6	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1
S_7	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1
S_8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
S_9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
S_{10}	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
S_{11}	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
S_{12}	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	1
S_{13}	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
S_{14}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
S_{15}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Fig. 3. Sustained Participation Willingness Reachability Matrix

$$A(S_j) = (S_j | m_{ij} = 1, i = 1, 2, 3, \dots, n)$$

$$C(S_i) = (S_i | R(S_i) \cap A(S_j), i = 1, 2, 3, \dots, n)$$

The level division is used to determine the hierarchical status of each element in a certain area. If the element set of a divided area is P , the level of the element set from high to low is $L_1, L_2, L_3 \dots L_n$, where:

$$L_1 = (S_i | S_i \in P - L_0, C_0(S_i) = R_0(S_i), i \leq n)$$

$$L_2 = (S_i | S_i \in P - L_0 - L_1, C_1(S_i) = R_1(S_i), i \leq n)$$

$$L_k = \left(\begin{array}{l} S_i | S_i \in P - L_0 - L_1 - \dots - L_{k-1}, C_{k-1}(S_i) \\ = R_{k-1}(S_i), i \leq n \end{array} \right)$$

The final results of region and level division are shown in Table 2.

- Multilevel ladder directed graph

According to the above classification results, the structural model of the influencing factors of college students' willingness to continuously participate in innovation and entrepreneurship education is divided into four levels. Firstly, draw a sketch of each element, and then analyze the relationship between each element according to the reachability matrix M , which is represented by arrows, and draw a multi-level hierarchical directed graph. After sorting, the ISM structure model can be obtained as shown in Fig. 4.

Table 2. Class division

S_i	$R(S_i)$	$A(S_j)$	$C(S_i)$	$C(S_i) \cap R(S_j)$
1	1,3,8,11,13,15	1	1	L_4
2	2,3,8,9,10,11,14,15	2	2	L_4
3	3,8,11,15	1,2,3,4	3	L_3
4	3,4,7,8,11,15	4	4	L_4
5	5,7,9,11,14,15	5	5	L_4
6	6,7,11,15	6	6	L_4
7	7,11,15	4,5,6,7	7	L_3
8	8,15	1,2,3,4,8,12	8	L_2
9	9,15	2,5,9,10	9	L_2
10	9,10,14,15	2,10	10	L_3
11	11,15	1,2,3,4,5,6,7,11	11	L_2
12	8,12,13,15	5,12	12	L_3
13	13,15	1,12,13	13	L_2
14	14,15	2,5,10,14	14	L_2
15	15	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	15	L_1

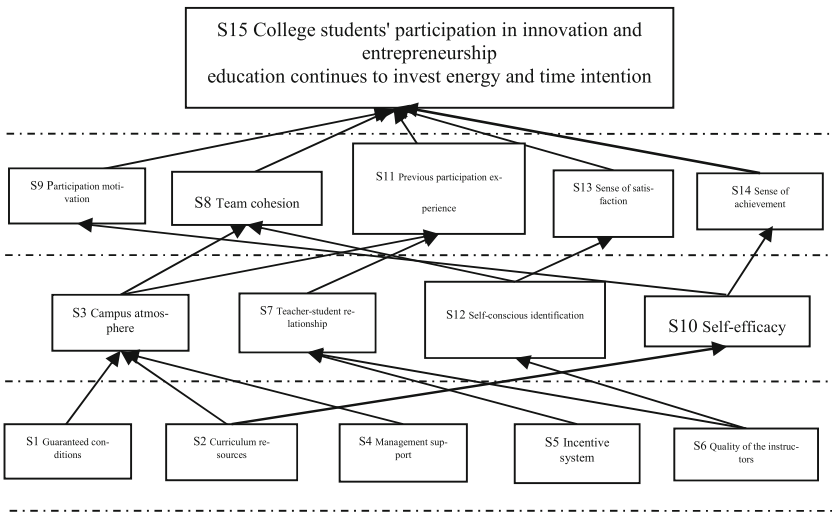


Fig. 4. ISM model of influencing factors of continuous participation willingness

4 Result Analysis

According to the explanatory structure model in Fig. 4, it can be seen that the influencing factor system of college students' willingness to continuously participate in innovation and entrepreneurship education is a complex system with a four-step structure, the logical relationship is more complicated. The influencing factors include surface direct factors, intermediate indirect factors and deep root causes.

4.1 Surface Direct Factors

Surface direct factors refer to the improvement of these factors, which can directly affect the research object. The direct factors that affect the willingness of college students to participate in innovation and entrepreneurship practice and continue to participate are participation motivation, the team cohesion, the previous participation experience, the sense of satisfaction and the sense of achievement. These are all The factors at the level of personal cognition indicate that the change of the environment on people's behavior can only work through the change of personal cognition. Motivation is the forerunner of behavior. Merrill believes that students are learners who have sufficient motivation to learn and can persuade themselves to adapt to well-prepared teaching situations and acquire specific knowledge and skills from them [16]. Motivation becomes the internal driving force for students to keep learning. In addition, it can be seen from Fig. 4 that the previous participation experience, the team cohesion, the sense of satisfaction and the sense of achievement will be affected by next-level factors. It is difficult to operate directly on these factors, so it needs to be considered comprehensively.

4.2 Intermediate Indirect Factor

The campus atmosphere, the teacher-student relationship, the self-conscious identification and the self-efficacy in the third layer of the explanation structure model are indirect factors. Because they interact and interact with the second-order and fourth-order factors, they are the focus of the relationships in the model. The relationship between these factors is relatively close, and it is difficult to solve a problem alone. Among them, the campus atmosphere and teacher-student relationship are external environmental factors, which are related to the five factors of the fourth level, and are more affected by the fourth level, and also have an impact on the team cohesion and the previous participation experience of the second level. The self-conscious identification and the self-efficacy are indirect factors at the level of personal cognition, and are personal factors that can be directly influenced by the fourth-level rooted external environmental factors, with a mediating effect.

4.3 Deep Root Causes

The root factors that affect the willingness of college students to continuously participate in innovation and entrepreneurship education are factors that affect or indirectly affect other factors, but are not affected by any factors. Guaranteed conditions, curriculum

resources, the management support, the incentive system and the quality of the instructors at the bottom level of the model are all root factors. Because these factors are not affected by other factors, but they affect other factors. Therefore, managing these factors is the easiest to operate and the easiest to receive.

5 Strategies for Improving College Students' Willingness to Continuously Participate in Innovation and Entrepreneurship Education

According to the analysis results, we can put forward strategies to improve the willingness of college students to continuously participate in innovation and entrepreneurship education from the following aspects, for the decision-making level of colleges and universities to choose.

5.1 From the Perspective of Root Causes

- Implement both “soft and hard”, hardware investment and management support services are implemented simultaneously. Firstly, make full use of internal and external resources to increase the construction of innovation and entrepreneurship infrastructure. Secondly, scientific and efficient management support services should be provided.
- Optimize the structure and build an innovative and entrepreneurial curriculum system that is interlocking, in-depth, and specialized. First of all, we should open innovative thinking and entrepreneurship basic enlightenment courses as compulsory basic courses for freshmen according to the major categories; secondly, we should open elective courses or lectures related to literature reading, thesis writing, project declaration; thirdly, teachers should be encouraged to transform scientific research projects into project courses.
- “Accounting and rewarding”, formulating an incentive system for multi-element participation, multi-level integration and continuous development. Multi-element participation means that there should be a corresponding reward and punishment system for managers, teachers, and mentors who participate in the innovation and entrepreneurship education process. Multi-level combination means that the reward methods and contents should be diverse and rich, and material and spiritual rewards coexist. Sustained development means that incentives must be timely and run through the whole process. According to psychological theory, timely incentive behavior can produce twice the effect of delayed incentive behavior. Therefore, it is necessary to conduct sufficient research and quantification on the process of innovation and entrepreneurship, so that the results can be rewarded in time.

5.2 From the Perspective of Direct and Indirect Factors

- Create a strong and positive campus atmosphere for innovation and entrepreneurship. First of all, do a good job in policy publicity and provide timely and effective guidance services. The next highest is to cultivate a culture of innovation and entrepreneurship,

educating people with culture, and cultivating people. Hold campus innovation and entrepreneurship culture festivals and classified project exhibitions, vigorously promote innovation and entrepreneurship culture, instill the inclusive ideas of “everyone can innovate”, “encourage entrepreneurship and allow failure” to college students, and form implicit incentives.

- Improve college students' innovative and entrepreneurial personality traits. Self-efficacy refers to an individual's judgment of whether he or she is capable of accomplishing a task. Representing college students' firm beliefs and attitudes to overcome various difficulties to achieve innovation and entrepreneurial goals, students with high self-efficacy tend to positively and positively evaluate opportunities and potential benefits [17]. Achievement needs help to guide college students to choose learning goals in their study and life, pay attention to the development of goals, and actively strive towards their chosen goals. Humanistic psychology theory points out that self-actualization first emphasizes the need for achievement, rather than simply talking about how to achieve achievement. Achievement is a side phenomenon radiated from the need for achievement, and the sense of achievement can effectively stimulate the willingness of college students to continue participating in innovation and entrepreneurship education [18]. Therefore, colleges and universities should start from the level of consciousness, through the development of enlightenment education, innovative thinking training, psychological counseling, and ideological guidance, to enhance their self-confidence and entrepreneurial awareness of innovation and entrepreneurship, and stimulate the multi-level achievement needs of college students in the process of innovation and entrepreneurship, and generate a sense of achievement.
- Create a good engagement experience and increase satisfaction. The previous participation experience and the degree of pleasure felt in the process of participation will have a direct impact on subsequent choices and behaviors. By regularly holding tea parties or questionnaires, opening opinion mailboxes, and organizing interviews with instructors, we can keep abreast of the problems encountered by college students in the process of participating in innovation and entrepreneurship education, so that college students have a good participation experience and a sense of satisfaction.

6 Conclusions

This paper uses interpretative structural model to analyze and explore the influencing factors and relationships of college students' willingness to continue participating in innovation and entrepreneurship education. First, the binary relationship between the factors is judged, then an adjacency matrix is constructed on the basis of the binary relationship, and the reachability matrix is obtained according to the adjacency matrix. A corresponding interpretative structural model is derived. Although this paper uses the explanatory structure model to integrate many complex influencing factors, it is beneficial to systematically analyze the influence mechanism of each factor on the willingness of college students to continue participating in innovation and entrepreneurship education, but the established model is a qualitative analysis model after all. It needs to be further validated by quantitative methods. Therefore, the use of quantitative analysis

techniques such as structural equations to test the model established in this paper will be the direction of the author's future research.

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