

## PROCEEDINGS ARTICLE

# Innovation and Entrepreneurship Education Reform in the Context of the "Four New Economies"

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## ABSTRACT

In recent years, with the intensified wave of mass entrepreneurship, the education field has gradually paid more attention to the cultivation of innovative and entrepreneurial talents. The cultivation of innovative and entrepreneurial ability is a very important ability for contemporary college students. Therefore, identifying and analyzing the innovation and entrepreneurship ability of college students provides a solid theoretical basis and practical guidance for evaluating the effectiveness of innovation and entrepreneurship teaching and comprehensively promoting the reform of innovation and entrepreneurship education in colleges and universities to a certain extent. Against the background of four new economies, this article conducts an in-depth discussion on the reform of innovation and entrepreneurship education. Firstly, it expounds the research status of innovation and entrepreneurship education in the context of the four new economies; secondly, it analyzes the influencing factors of liberal arts students' innovation and entrepreneurial ability against the background of four new economies construction; finally, based on the promotion of the identification results, it puts forward suggestions for the reform of innovation and entrepreneurship education for liberal arts students, in order to promote the effective improvement of college students' innovation and entrepreneurship ability.

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## 1. INTRODUCTION

With the advent of the era of knowledge economy, the country and society are developing very rapidly and the demand for "innovative and entrepreneurial talents" has continued to increase. In addition, the employment situation in China is not optimistic in recent years. Many college students face the status of unemployment upon graduation, which has led to the formation of great employment pressure in the minds of students. In order to better promote the reform of innovation and entrepreneurship education in colleges and universities, the State Council formulated and issued the "Opinion on the Implementation of Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities". In the Opinion, the goals of innovation and entrepreneurship education reform in colleges and universities are clarified: "The quality of talent

training should be significantly improved and students' innovative spirit, entrepreneurial awareness, and innovation and entrepreneurship ability should be significantly enhanced". It can be seen that improving students' innovation and entrepreneurship ability is an urgent requirement of national development at this stage and it is also an inevitable requirement of implementing innovation-driven development, which has very important value and significance for the country and society.

## 2. RESEARCH STATUS OF INNOVATION AND ENTREPRENEURSHIP EDUCATION IN THE CONTEXT OF THE "FOUR NEW ECONOMIES"

The continuous and in-depth reform of innovation and entrepreneurship education has promoted

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experts and scholars to carry out different levels of research and discussion on innovation and entrepreneurship ability from different perspectives. First of all, some scholars analyzed the ways of cultivating innovation and entrepreneurship ability and put forward effective ways to cultivate college students' innovation and entrepreneurship ability from the perspectives such as lifelong education concept, OBE education reform mode, academy system mode, discipline competition, and so on [1]. Secondly, scholars have carried out in-depth and extensive research on the specific training mode, evaluation system, practical education platform and related influencing factors and obtained relatively ideal results. Finally, there are still many scholars who insist on analyzing the relationship between innovation and entrepreneurship ability and various influencing factors as a starting point. For example, some scholars take the economics sand table as an example to discuss the impact of simulation of operation on the innovation and entrepreneurship ability of college students; some take the school-enterprise cooperation model as an example to carry out a detailed analysis of the impact of the practice path of college students' innovation and entrepreneurship ability; some have analyzed the influence of college students' innovation and entrepreneurship ability from four aspects: information awareness, information technology, information knowledge and information ethics.

### 3. INSTANCE ANALYSIS OF FACTORS INFLUENCING THE INNOVATION AND ENTREPRENEURSHIP ABILITY OF LIBERAL ARTS STUDENTS IN THE CONTEXT OF THE "FOUR NEW ECONOMIES"

#### 3.1. Building a Framework of Influencing Factors

The construction of the influencing factor system of college students' innovation and entrepreneurship ability should start with the construction of the influencing factor framework [2]. Generally speaking, the influencing factor framework includes all the factors that can affect the innovation and entrepreneurship of college students. At the same time, accurate and complete disclosure and determination of relevant factors that may affect the innovation and entrepreneurship ability of college students is an important guarantee for the establishment of a scientific, fair and objective influencing factor system. Therefore, in order to

ensure the scientificity of the research to the greatest extent, this article builds a complete framework of influencing factors based on the perspective of improving the stakeholders of college students' innovation and entrepreneurship and divides the stakeholders into 7 categories on this basis: university administrators, experts from scientific research institutes, university teachers, enterprise experts, government experts, college students and experts from innovation and entrepreneurship associations.

Mainly in the form of questionnaires, this article builds a framework of influencing factors of college students' innovation and entrepreneurship ability and conducts a preliminary descriptive statistical analysis of the questionnaire results. It also conducts an in-depth analysis of the relationship between all factors that can affect the innovation and entrepreneurship ability of college students and the relationship between each factor. Based on this, it builds a framework for the influencing factors of college students' innovation and entrepreneurship ability.

#### 3.2. Screening of Influencing Factors

In the process of screening influencing factors, first of all, it is necessary to focus on qualitative screening, because this can delete indicators that cannot obtain data from influencing factors based on the principles of observability and operability, and ensure that the indicators after qualitative screening can meet the observability and have practical application. Second, quantitative screening should be carried out. The main purpose of quantitative screening is to completely solve the problem of information duplication and the elimination of factor indicators can reflect the impact of duplicate information on the innovation and entrepreneurship ability of college students. Therefore, this article focuses on correlation analysis and simplifies the indicators of influencing factors. The specific steps are as follows.

First, the correlation coefficient between the influencing factor indicators is measured and calculated, the correlation coefficient of the  $j$ -th indicator of the  $i$ -th indicator is set as  $r_{ij}$ , the value of the  $j$ -th indicator of the  $P$ -th object after the standardization processing is  $y_{pj}$ , and  $\bar{p}_i$  is the average value of the  $i$ -th indicator, and the formula is:

$$r_{ij} = \frac{\sum_{p=2}^n (y_{pi} - \bar{p}_i)}{\sqrt{\sum_{p=2}^n (y_{pi} - \bar{p}_i)^2 (y_{pi} - \bar{p}_i)^2}}$$

Based on the above formula, the correlation coefficient of the influencing factor indicators can be obtained, and the larger the coefficient value, the higher the correlation between the indicators [3]. The

critical point of the correlation coefficient is taken as 0.9 using the method of Scholar Zhang Kun. If the absolute value of the correlation coefficient between the two influencing factor indicators is greater than 0.9, it indicates that there is duplication of information between the two and one of them can be deleted. This screening method can ensure that the information reflected by the influencing factor indicator system won't be repeated.

### 3.3. Building a System of Influencing Factors

#### 3.3.1. Innovation and Entrepreneurship R&D Ability — A-Level Main Factors

When students have a certain innovation and entrepreneurship ability, their innovation consciousness and innovative thinking will be significantly improved, so the research and development ability of innovation and entrepreneurship can directly affect the innovation and entrepreneurship ability of college students. Therefore, when colleges and universities carry out the reform of innovation and entrepreneurship education, they should reflect from the two aspects of R&D environment and R&D results, and further set the R&D environment as B1 and the R&D results as B2. The R&D environment reflects the basic indicators of university R&D, that is, the quantity and quality of software and hardware required by college students during the R&D period, generally including two sub-factors: innovation and entrepreneurship laboratory C1 and the number of classroom R&D projects C2. The R&D results can reflect the level of students' innovation and entrepreneurship ability, so the R&D results also include two sub-factors: the number of patents obtained C3 and the number of scientific articles published C4.

#### 3.3.2. Innovation and Entrepreneurship Knowledge Capability — A-Level Main Factors

The cultivation of innovation and entrepreneurship knowledge ability is the key to promoting the reform of innovation and entrepreneurship education of college students, so it should be reflected on the basis of the cultivation of innovation and entrepreneurship knowledge ability in colleges and universities combined with knowledge environment and knowledge application. Therefore, it is set to two B-level attributes: knowledge environment B3 and knowledge application B4. In addition, by carrying out diversified innovation and entrepreneurship courses, it can reflect the good or bad environment of

innovation and entrepreneurship courses and teachers in colleges and universities. On the basis of the knowledge environment, it further subdivides several sub-factors such as the number of innovation and entrepreneurship courses C5, the number of external entrepreneurial mentors C6, and the number of innovation lectures C7. The application of knowledge can give certain consideration to the standard of innovation and entrepreneurship ability of college students, so it is subdivided into: the number of innovative and entrepreneurial comprehensive projects above the provincial level C9, the excellent rate of innovation and entrepreneurship courses C10, and the number of awards in innovation and entrepreneurship discipline competitions C11 and other sub-factors.

#### 3.3.3. Innovation and Entrepreneurship Practice Ability — A-Level Main Factors

The essence of innovation and entrepreneurship ability is that college students can reasonably apply innovation and entrepreneurship thinking into practice and replace employment with entrepreneurship. Therefore, innovation and entrepreneurship ability are important content of college education at this stage and it is also the main attribute that affects college students' innovation and entrepreneurship ability. According to the relevant requirements in the "Opinion on the Implementation of Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities", the innovation and entrepreneurship ability of college students should be set up with practice environment B5 and practical results B6. Since students are the main expectation of innovation and entrepreneurship education, the practice environment of innovation and entrepreneurship education in colleges and universities is based on helping students improve their innovation and entrepreneurship ability and achieve the ultimate goal of improving students' level. Therefore, the practice environment B5 can be subdivided into: the number of innovation and entrepreneurship incubation base teams C12, the number of school-enterprise cooperation and entrepreneurship guidance institutions C13, and school-enterprise cooperation practice bases C14. Because practical results are the main manifestations of students' innovation and entrepreneurship ability, they are subdivided into sub-factors such as the annual average entrepreneurial success rate C15, the innovation and entrepreneurship achievement conversion rate C16, and the practical achievement investment rate C17.

### 3.4. Quantitative Analysis Results of Key Influencing Factors

#### 3.4.1. Identifying Key Influencing Factors Based on the DEMATEL Method

The DEMATEL method is an effective systematic analysis method for solving complex problems and factor analysis, which is a scientific method that can be modified by comprehensively considering various factors, is consistent with the problems to be solved in this research, and can ensure the accuracy and scientificity of the final research results. The specific steps are as follows:

The first is to identify the influencing factors. This research design uses C1, C2...C3 to represent the influencing factors of a subject. Second, it determines the relationship between various influencing factors and constructs the corresponding influence matrix. At the same time, it invites experts to rate the importance of the factors (3 = strong relationship; 2 = moderate relationship; 1 = weak relationship; 0 = no relationship). From this, the direct influence matrix C can be obtained. After the direct influence matrix is obtained, it is normalized. The specific normalization method is to add all the values in each row to obtain the maximum value and divide the direct influence matrix with the maximum value to realize the normalization of the direct matrix. The specific calculation process is:  $X=(x)_{n \times n}=C/s$ , where X represents the direct influence matrix after planning and S is the maximum value among factors. Then, the calculation of the comprehensive influence matrix T is carried out again and its formula is:  $T=(t)_{n \times n}=X(1-X)^{-1}$ . After the calculation of the comprehensive influence matrix T is completed, the influence degree  $D_i$ , the influenced degree  $R_i$ , the cause degree  $U_i$  and the centrality  $M_i$  of the influencing factors need to be further calculated. The influence degree represents the degree of influence caused by the influence factor  $c_i$  on other factors and its value is  $D_i = \sum_{j=1}^n T_{ij} (i = 1, 2, 1, n)$ . Since the influenced degree  $c_i$  will be affected by the comprehensive influence degree of other factors to a certain extent, its value is  $R_i = \sum_{j=1}^n T_{ij} (i = 1, 2, 1, n)$ . Centrality can reflect the position of the factor among all factors and its size can directly indicate the degree of influence of the factor. The larger the value, the more significant the influence, and its calculation formula is:  $M_i = D_i + R_i (i=1, 2, 1, n)$ . The cause degree is generally the value obtained by subtracting the influenced degree from the influence degree. Generally, the value can be a positive number or a negative number. However, when it appears as a negative result, it means that it is a result factor and is affected by many factors; when its value is positive, it means that the

factor is a cause factor and can have more influence on other factors. Its calculation formula is:  $U_i = D_i - R_i (i=1, 2, \dots, n)$ . The final step is to develop a causal graph based on the calculated results. The abscissa of the graph represents the centrality; the ordinate represents the cause degree, which can intuitively identify the position of a factor in the coordinate system to intuitively identify the potential key influencing factors.

#### 3.4.2. Analysis of Identification Results

First, it is the analysis of the centrality of the sub-factors. In this study, a centrality analysis is carried out on the basis of a decision-making trial and an evaluation of the principles of the laboratory method. Centrality can directly reflect the position and role of factors in the system. Through analysis, it can be seen that the key influencing factors of college students' innovation and entrepreneurship ability ranked by strength are 6 sub-factors of C16, C14, C12, C17, C13 and C3, and their centrality is basically above 8.148, showing that it has a very important influence on the cultivation of college students' innovation and entrepreneurship ability, so it is necessary to pay attention to these sub-factors. Second, it is the cause degree analysis of the sub-factors. If the cause degree of the sub-factor shows a positive value, it is a cause factor; if it is a negative value, it is a result factor. According to the strength of influence of the sub-factors, they are ranked as: C12, C7, C1, C17, C3, C9, C5 and C16. These eight sub-factors have a more positive role in promoting the improvement of college students' innovation and entrepreneurship ability. At the same time, the values of C12 and C7 both exceed 1.1, indicating that they are the key sub-factors among the cause factors. Therefore, in the process of cultivating college students' innovation and entrepreneurship ability, colleges and universities should pay attention to the cultivation of theoretical basis, innovative thinking and innovation consciousness. Third, it is the analysis of the sub-factor causal graph. Among the many sub-factors, the cause degree of the number of innovation and entrepreneurship incubation base teams C12 is the strongest, which means that the influence degree it brings is the largest, and its centrality value is 9.65, ranking third. It can be seen that the role of C12 in the overall factor system is the most important. The innovation and entrepreneurship achievement conversion rate C16 has the largest centrality and is the most critical factor in the influencing factor system, so it has a very high influenced degree. Fourth, it is the analysis of the centrality and cause degree of the main factor. From the arrangement order of the result factors of the B-level factors, it can be seen that the three factors of knowledge

application B4, practice environment B5, and R&D environment B1 are greatly affected by other factors. From the analysis of the three A-level main factors, it can be seen that practice ability is the key factor affecting the overall system, followed by knowledge ability, which are the focus of improving college students' innovation and entrepreneurship ability.

#### **4. SUGGESTIONS FOR PROMOTING THE REFORM OF INNOVATION AND ENTREPRENEURSHIP EDUCATION FOR LIBERAL ARTS STUDENTS BASED ON IDENTIFICATION RESULTS**

##### **4.1. Strengthening the Creation of a Practice Environment for Innovation and Entrepreneurship Education**

In the process of strengthening the practice environment of innovation and entrepreneurship education, colleges and universities should start from two aspects: the first is to promote the synchronization of hardware facilities and service management support. Because at this stage, many colleges and universities pay attention to hardware investment and ignore the service management support. Although colleges and universities have established a "maker space" according to the requirements in the "Opinion on the Implementation of Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities", the matching rules and regulations and management methods have not followed up in time. Therefore, in the construction of innovation and entrepreneurship incubation bases, it is not practical to emphasize "hardware investment" over "soft service", but to implement both of them. The second is to improve the construction of teaching staff in the innovation and entrepreneurship incubation base for college students. Since most of the innovation mentors are schoolteachers, they can't give effective guidance from a substantive point of view. Therefore, colleges and universities should introduce a professional team of teachers to be responsible for the guidance of market analysis, market evaluation, financial system, enterprise management and team building during the period of students' entrepreneurship [4].

##### **4.2. Promoting the Transformation of High-Quality Innovation and Entrepreneurship Achievements**

First of all, colleges and universities need to set up a special institution to be responsible for the transformation of innovation and entrepreneurship achievements. Taking Nanjing University as an example, in 2016, it was selected as the National Innovation and Entrepreneurship Demonstration Base, and in 2017, the Office of Innovation, Entrepreneurship and Achievement Transformation was established. Based on the advantages and characteristics of Nanjing University, it has formed an industry-university integration platform with support, focus and advantages — the "Campus Crowd Innovation Training Platform", in order to emphasize national policy and educational innovation and provide services for national innovation-driven strategies and local economic development. Secondly, colleges and universities need to actively build a platform for the transformation of innovation and entrepreneurship achievements, because the construction of this platform can greatly promote the accurate transformation of achievements. For example, Tianjin Sino-German University of Applied Sciences established the Innovation and Entrepreneurship Achievement Transformation Center for College Students in 2017. Its functions include: transformation of scientific and technological achievements, incubation of entrepreneurial projects and other important functions. The establishment of this platform promotes the realization of a series of innovation and entrepreneurship achievements of college students, such as cultural creativity, industrial design, information technology, intelligent manufacturing and e-commerce.

##### **4.3. Establishing and Improving the Innovation and Entrepreneurship Education Environment**

Improving the innovation and entrepreneurship education environment and improving students' innovation and entrepreneurship ability are the primary tasks of colleges and universities at this stage. First, it is necessary to continuously improve the construction of entrepreneurship education teaching staff. Colleges and universities need to improve teachers' innovative and entrepreneurial practice ability through effective means, and hiring professional entrepreneurial mentors can be used to invite well-known entrepreneurs, successful people in

innovation and entrepreneurship, and venture capitalists to provide students with professional, practical and oriented guidance. Colleges and universities can choose to build a sound innovation and entrepreneurship education environment through innovation and entrepreneurship practice projects, discipline competition project guidance, and one-to-one mentoring. Second, it is needed to complete the optimization of the curriculum system to better cultivate students' innovation and entrepreneurship ability. On the one hand, efforts should be made to increase the proportion of innovation and entrepreneurship courses in the curriculum system of college students [5]. Although colleges and universities have designed courses related to innovation and entrepreneurship platforms, it is difficult to attract students' attention due to the relatively low proportion of courses and elective courses mainly offered. In addition, the practical teaching content of the school's innovation and entrepreneurship courses is extremely limited, which limits the goal of simultaneous development of theory and practice. Therefore, colleges and universities need to add practical teaching content based on the existing innovation and entrepreneurship subject system and form a curriculum system that emphasizes both theory and practice.

#### 4.4. Optimizing the Basic Environment for Innovation and Entrepreneurship Research and Development

When adjusting and optimizing the basic environment of innovation industry research and development, colleges and universities can start from two aspects [6]. Firstly, they must pay attention to and increase the investment in the construction of innovation and entrepreneurship infrastructure in colleges and universities, because from the perspective of the development of colleges and universities at this stage, the common aging of equipment in scientific research practice rooms has largely hindered the orderly progress of research and development activities such as student innovation and entrepreneurship. Therefore, colleges and universities need to build a scientific management mechanism based on their own actual needs and increase their investment in infrastructure construction. The second is to encourage and support students to actively participate in innovation and entrepreneurship projects, arouse students' interest in research projects, and help them master certain research methods, in order to form a good research and development atmosphere and improve students' innovation and entrepreneurship ability.

## 5. CONCLUSION

All in all, the reform of innovation and entrepreneurship education in the context of the four new economies needs to be based on the actual teaching environment, teaching characteristics and teaching status of colleges and universities and take teachers and students as the foundation, to continuously strengthen the practice environment of innovation and entrepreneurship education, promote the transformation of high-quality innovation and entrepreneurship achievements, establish and improve the education environment for innovation and entrepreneurship, and optimize the basic environment for innovation and entrepreneurship research and development, in order to provide students with more opportunities for innovation and entrepreneurship, and at the same time, promote the quality and level of school teaching reform.

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