

Construction of Evaluation Model of College Students' Innovation Ability

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Abstract

Innovation is the voice of the times. College students are an important reserve force for national technological development and scientific and technological progress. Today, with the increasingly urgent demand for industrial upgrading, the cultivation of College Students' innovation ability should become the focus of national education strategy. Taking Sichuan University as an example, this study uses analytic hierarchy process to calculate the weight of indicators at all levels, and constructs the "evaluation model of College Students' innovation ability". According to the results of the model, this paper puts forward a series of countermeasures to improve college students' innovation and entrepreneurship ability.

Keywords

College Students; Innovation Ability; Evaluation System; Analytic Hierarchy Process.

1. Introduction

Innovation is the soul of knowledge economy, and the key to innovation is talents [1]. The original driving force of industrial upgrading comes from scientific progress and technological innovation [2]. Therefore, it is very important and urgent to cultivate college students' innovation ability. At present, the teaching content of colleges and universities is still based on imparting knowledge, and the teaching method is still based on classroom teaching [3]. The cultivation of students' innovative ability has been limited to a certain extent. What students need to master most is the "core" knowledge with wide coverage, strong mobility and high generalization, which can not be taught only in class [4]. These core skills must be obtained through students' active "construction" and "recreation", which requires college students' innovative consciousness and innovative ability to play an active role. For the evaluation of College Students' innovation ability, different groups have different definitions and indicators [5]. It is precisely the differentiation and diversification of the evaluation system that provides a scientific background and appreciation space for this study. The innovation ability of college students is the basic quality of college students. The prediction and cultivation of students' innovation ability is an important starting point for universities to establish morality and cultivate people. Therefore, this study also has important practical significance [6-8].

2. Construction of Evaluation Model of College Students' Innovation Ability

2.1. Basic Method

By consulting literature and consulting experts, this paper makes a theoretical analysis on College Students' innovation and entrepreneurship ability, finds a group of characteristic elements on the premise of ensuring compliance with the national quality training goal of innovation and entrepreneurship ability, and makes the indicators as specific and measurable as possible, and can reflect the actual situation of a certain aspect [9]. Through questionnaire

survey, the scores of various indicators are collected in the whole school, and the weight factors are obtained through data processing. Then the consistency of the weight factors is tested by statistical method, and the model equation which can be used as the evaluation basis is obtained after continuous adjustment.

2.2. Indicator Selection and Hierarchical Framework

The hierarchical framework of the model determined after the investigation (as shown in Figure 1) takes College Students' innovation ability as the decision-making goal, innovative learning ability, innovative knowledge base, innovative thinking ability, innovative practical skills and innovative spirit will Five indicators are primary indicators. In addition, there are 10 more detailed secondary indicators to facilitate the questionnaire respondents to understand the specific meaning of primary indicators and make more accurate evaluation.

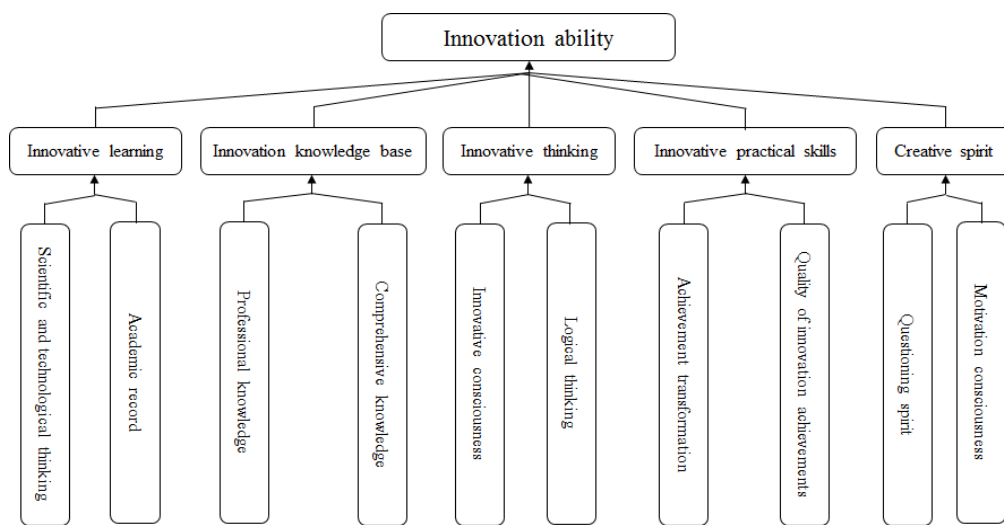


Figure 1. Hierarchical framework of College Students' innovation ability evaluation model

2.3. Judgment Matrix based on Statistical Results

The feedback results of questionnaire delivery are shown in Table 1.

Table 1. Statistical results of questionnaire delivery

Type	Average value
Innovative learning ability	7.72
Innovation knowledge base	6.97
Innovative thinking ability	7.51
Innovative practical skills	6.73
Willingness to innovate	7.53

By comparing the properties of the elements, a series of judgment matrices are established, and the comparison judgment matrix of the first level index layer relative to the decision-making goal is constructed:

$$P = (P_{ij})_{n \times n} \tag{1}$$

It should be noted that $P_{ij} > 0$, and meet $P_{ji} = 1/P_{ij}$, $P_{ij} (i, j = 1, 2 \dots n)$.

Representing the relative importance of element I to j, we use 1-9 as the scale to assign the importance. The meaning of scale is shown in Table 2

Table 2. Definition of scale significance

Importance scale	Definition description
1	Indicates that two elements are of equal importance compared
3	Indicates that the former is slightly more important than the latter
5	Indicates that the former is obviously more important than the latter
7	Indicates that the former is more important than the latter
9	Indicates that compared with two elements, the former is extremely important than the latter
2, 4, 6, 8	Represents the intermediate value of the above adjacent judgment

Thus, the judgment matrix is obtained:

$$P = \begin{pmatrix} 1 & 3 & 2 & 5 & 2 \\ \frac{1}{3} & 1 & \frac{1}{3} & 2 & \frac{1}{3} \\ \frac{1}{2} & 3 & 1 & 5 & \frac{1}{2} \\ \frac{1}{5} & \frac{1}{2} & \frac{1}{5} & 1 & \frac{1}{2} \\ \frac{1}{2} & 3 & 2 & 3 & 1 \end{pmatrix} \# \tag{2}$$

2.4. Calculate Weight Set ω

There are a series of eigenvalues in the judgment matrix. Where the maximum eigenvalue is λ_{max} . The eigenvector is ω . Solve the eigenvalue of the judgment matrix P , After normalization, the weight vector set of the relative importance of the corresponding elements of the primary index layer to the factors of the decision-making target layer is obtained:

$$\omega = (\omega_1, \omega_2, \dots \omega_n) \tag{3}$$

After calculation, the matrix is obtained and normalized to obtain:

$$\omega = (0.363, 0.098, 0.218, 0.068, 0.253) \tag{4}$$

2.5. Consistency Test

In order to avoid too much deviation due to subjective factors when selecting the scale of the judgment matrix, the consistency test is used to test the selected judgment matrix. Calculate the maximum characteristic value:

$$\lambda_{max} = \sum_{i=1}^n \frac{(P\omega)_i}{n\omega_i} \tag{5}$$

Where n is the order of the judgment matrix.

When the following relation is satisfied, the judgment matrix passes the test, otherwise it needs to be adjusted until it is satisfied.

$$C.I. = \frac{\lambda_{max} - n}{n - 1} \tag{6}$$

$$C.R. = \frac{C.I.}{R.I.} \tag{7}$$

$$C.R. < 0.10 \tag{8}$$

$R.I$ is called random consistency index, and its value is shown in Table 3:

Table 3. Values of average random consistency index $R.I$

n	1	2	3	4	5	6	7	8	9
$R.I$	0	0	0.58	0.9	1.12	1.24	1.32	1.44	1.45

After inspection, the weight set obtained meets the requirements, so it passes the inspection.

2.6. Evaluation Weight Set Results

$\omega = (0.363, 0.098, 0.218, 0.068, 0.253)$ As the final calculation result, a judgment equation can be obtained:

College Students' innovative ability = $0.363 \times$ innovative learning ability + $0.098 \times$ innovative basic knowledge + $0.218 \times$ innovative thinking ability + $0.068 \times$ innovative practical skills + $0.253 \times$ innovative spirit will.

It can be seen that innovative learning ability is considered to be the most important index to evaluate innovative ability. On the contrary, innovative practical skills are considered to have little impact. The reason is that the good training mechanism of Sichuan University, including the three-dimensional joint mechanism of "school, college and students" mentioned above, provides students with many opportunities to learn these skills quickly and generally, so innovative practical skills are not so important.

On the other hand, because students have many opportunities for innovative practice and exercise, and are fair and balanced, personal development largely depends on personal learning ability. If you can learn faster than others, you can master more at the same time, accompanied by the improvement of innovation ability. This logic is also applicable to explain the higher weight of innovative thinking ability and innovative spirit will.

3. Ways to Improve College Students' Innovation Ability

3.1. Strengthen and Improve the Teaching of Basic Courses, Cultivate Learning Ability and Broaden Basic Knowledge

Innovation needs conditions. First, we need to have solid basic knowledge. Ability is acquired through training and Practice on the basis of mastering a large amount of knowledge. Rich

knowledge can promote the enhancement of ability, and outstanding ability can promote the acquisition of knowledge [10]. Ability mainly includes the ability to acquire knowledge, the ability to use knowledge and the ability to innovate, among which the cultivation of innovation ability is the weak link of colleges and universities. The cultivation of innovation ability can not rely on the study of book knowledge. Mastering solid basic knowledge is the basis of cultivating innovation ability. We should strengthen the teaching of basic courses and leave more space for students to develop in the future; Broadening the scope of knowledge and expanding students' vision and knowledge are conducive to the formation of growth points for germination of new knowledge.

3.2. Improve Students' Professional Identity and Promote Them to Participate in Professional Learning

Universities should include the cultivation of students' professional identity in their teaching work. In the entrance education of freshmen, the school can take professional cognitive learning as a course and include it in the training plan to help students fully understand their chosen major and produce certain emotional cognition. Secondly, it can play the exemplary and leading role of an example. Excellent former students in this major can give speeches and interact with new students, so that students can have emotional identification with their chosen major [11]. Thirdly, establish a long-term mechanism of professional cognitive education. Professional cognition is a long-term process, which can prolong the cycle of professional cognition and choose experienced teachers to give guidance in different periods and themes. Finally, we must strengthen psychological counseling. College Students' academic and professional psychology need to be given enough guidance and dredged. Strengthening psychological counseling can reduce academic difficulties and improve professional identity.

Teachers should widely participate in the promotion of College Students' professional identity and play a positive role at the teacher level. Objectively summarize and compare the professional characteristics, scientifically analyze the professional prospects, and convey the actual situation of the major and the future development direction and employment prospects of students to students, so as to make students full of confidence in the future. Secondly, teachers can improve teaching methods. Teachers' teaching has changed from teacher centered to student-centered, paying attention to the classroom interaction between students and teachers, encouraging students to ask and solve problems, and enhancing students' sense of academic achievement, so as to internalize into professional identity.

Students should have the awareness and action of active innovation and entrepreneurship, and actively cultivate professional interests, including reading and studying books and documents related to their majors, expanding their horizons and actively participating in professional social practice [12]. At the same time, combine various resources and adopt multi-dimensional solutions to improve their professional identity and actively participate in professional learning.

3.3. Carry out "Scientific and Technological Innovation" Activities for College Students to Enhance Their Willingness and Enthusiasm for Innovation

Strong desire for innovation is the internal driving force to cultivate innovation consciousness and innovation ability. At present, many college students lack the desire for innovation. In order to overcome the formed thinking mode of college students, scientific and technological innovation activities can be used as the carrier to stimulate college students' desire for innovation through rich content and various forms of activities. Cultivate students' innovative thinking, innovative spirit and innovative ability; Cultivate students' ability to analyze and solve problems; Cultivate students' practical ability.

3.4. Build a Reasonable Evaluation and Incentive Mechanism to Accurately Grasp the Situation of Students' Innovative Ability

Reasonable evaluation and incentive mechanism is the institutional guarantee for cultivating students' innovative ability. In education evaluation, teachers should change the past to take the examination results as the only standard to evaluate students, establish a set of comprehensive evaluation system, and bring the students' examination results, students' practical ability and students' performance in daily learning and life into the evaluation system for comprehensive assessment and evaluation. On the incentive mechanism, on the one hand, we should give substantive rewards to the teaching staff and backbone, so that their innovative achievements can be recognized and rewarded by the society. At the same time, a special reward fund shall be established to give special rewards to teachers who have made outstanding achievements in cultivating students' innovative ability, and provide financial facilities for teachers' innovative activities guided by students. On the other hand, through scholarships, innovation funds, incentive credits, innovation credits and other measures to encourage students to carry out innovation activities, and provide financial support and professional guidance for students' innovation activities.

3.5. Functional Departments Shall Provide Necessary Financial and Policy Support

Under the background of "mass entrepreneurship and innovation", in order to effectively improve the innovation and entrepreneurship ability of college students, relevant functional departments should provide favorable financial and policy support. First of all, guide colleges and universities to integrate innovation and entrepreneurship education into the talent training program, strengthen the construction of "entrepreneurship and innovation" teachers, and actively carry out college students' innovation and entrepreneurship activities within the school. Secondly, local government departments at all levels should cooperate with colleges and universities to jointly set up college students' innovation and entrepreneurship fund, develop more innovation and entrepreneurship projects, and then transfer better information and resources to the cultivation of College Students' innovation and entrepreneurship ability. Finally, for the innovation and entrepreneurship practice of college students, we should give reasonable tax policies and provide more office space to improve the probability of success of College Students' innovation and entrepreneurship.

3.6. Create Diversified Innovation and Entrepreneurship Teaching Forms and Create a Strong Innovation Atmosphere

Universities can make full use of academic and engineering departments and student organizations, such as student unions, associations and other departments and associations, and students can organize students to carry out innovation and entrepreneurship competitions and activities: such as mathematical modeling competition, entrepreneurship plan competition, software design and other activities. Secondly, schools should attach great importance to the challenge cup, and create more national competitions such as "Youth" and "Internet plus", so that more students can participate in it. In addition, the school can contact local well-known enterprises to allow students to participate in more field visits and production practice, so as to stimulate students' awareness of innovation. You can also often invite industry elites to give lectures on innovation topics, so as to better teach students innovation and entrepreneurship experience and skills and make up for the shortcomings in the classroom.

4. Conclusion

Based on a large number of literature analysis, questionnaire survey and expert opinions, combined with the actual situation of Sichuan University, this study establishes an evaluation

model of College Students' innovation ability by using analytic hierarchy process, which can better guide the comprehensive evaluation of students' innovation ability and make the evaluation system scientific, standardized and institutionalized. This paper uses rigorous statistical processing methods, but due to the limited sample of evaluation opinions, it can not completely avoid its subjectivity. In the actual use process, it should be adjusted according to the situation. Based on the research and calculation results, this paper puts forward a series of countermeasures to improve college students' innovation and entrepreneurship ability..

References

- [1] Pierer H V. Knowledge and Innovation Is the Key Factor to Business Success and Economy Development[J]. Management review, 2002, 000(007): 46-47.
- [2] Gao Laixin, fan Fuyou, Research on the combination evaluation model of College Students' innovation and entrepreneurship ability [J] Journal of Chongqing Industrial and Commercial University (NATURAL SCIENCE EDITION), 2018, 35 (06): 95-100.
- [3] Wang Lifeng Research on evaluation index system of College Students' scientific and technological innovation ability based on AHP model -- Taking rail transit specialty as an example [J] Continuing education, 2016, 30 (07): 59-61.
- [4] Men Ruixue. Research on constructing the evaluation and evaluation model of College Students' innovation and entrepreneurship ability [J] Journal of Jilin Institute of Education (MID), 2015, 31 (10): 25-26.
- [5] Zhao Lei. Research on the evaluation index system of College Students' innovation ability in the new era [J] Journal of Henan University of science and technology, 2018, 38 (08): 17-20.
- [6] Feng Minmin Aesthetic evaluation of garden plant landscape based on AHP fuzzy comprehensive evaluation model [J] Journal of Hangzhou Normal University (NATURAL SCIENCE EDITION), 2007 (05): 373-378.
- [7] Nie ya. Research on the Cultivation Countermeasures of College Students' innovation and entrepreneurship ability under the background of "mass entrepreneurship and innovation" [J] Marketing, 2019 (39): 113-114.
- [8] Liu Qin, Liu Donglan. Research on the current situation and improvement of College Students' innovation and entrepreneurship ability -- a case study of G University [J] University education, 2020 (02): 33-35.
- [9] Qiao Haishu, Li Yuanhang. A summary of research on the cultivation of College Students' innovative ability [J] University Education Science, 2008, 1 (1).
- [10] Qin Zuze, Huang Junwei, Tang Shouyin. Resistance factors and Countermeasures of Cultivating College Students' innovative ability [J] Journal of Social Sciences of Xiangtan University, 2003 (02): 141-144.
- [11] Fu Guangwan. Analysis of policy environment in the process of Cultivating College Students' innovative ability [J] Theory monthly, 2003 (08): 137-138.
- [12] Liu Siyang, Liang Muyun. Research on the current situation and Countermeasures of innovation and entrepreneurship education in Colleges and universities in Sichuan -- Taking Colleges and universities in Southwest China as an example [J] Modern commerce and industry, 2017 (13): 164-165.