

Research on the cultivation of innovative thinking and innovation ability based on IEC interdisciplinary talents

Duquan Zuo^{1,2,a,*}, Jie Liu², Jinjie Luo¹, Qiang Luo¹, Guoling Ma²

¹College of Mechanical Engineering, Chongqing Three Gorges University, Chongqing, 404100, People's Republic of China

²College of Aviation Engineering, Civil Aviation Flight University of China, Guanghan, 618307, People's Republic of China

^ataiyanghefeng@cafuc.edu.cn

*Corresponding author

Keywords: Double creation, Innovative thinking, Innovation ability, Innovative quality, Talent training

Abstract: Contemporary college students are the first source of social progress and development. They must adapt to the development of economic times and have strong innovative thinking and innovation ability. Based on the current situation of college students' innovation and entrepreneurship in China, this paper puts forward the methods to improve the innovative thinking ability and enhance the innovative quality of college students in China, strengthens the practical teaching link, integrates the entrepreneurial practice education activities into the whole teaching process of IEC talent training in colleges and universities, establishes the cultivation goal and scale, adopts the diversified talent training mode, constructs the complete education theory system suitable for the professional quality training of IEC compound talents, and creates an atmosphere more suitable for cultivating the innovative thinking ability and innovation ability of IEC talents.

1. Introduction

With the substantial expansion of the enrollment scale of colleges and universities in China, the existence of these students seem to become unsurprising. Correspondingly, the number of college graduates has increased every year, but the proportion of jobs provided by the society does not increase, which will lead to the trend that the social labor market exceeds the standard, and a large number of college students are facing the problem of being no jobs. This situation will directly affect the development of the country's real economy, thereby thus making the already contradictory employment situation more severe. In recent years, the preferential policies of the state to encourage college students to innovate and start their own businesses (referred to as double creation) can not only ease the tense employment situation, create more and better job opportunities, but also bring new innovation points to the society [1].

2. Current situation analysis of college students' double creation

2.1 Analysis of cultural environment

The first is the cultural environment factor. Innovation and Enterprise Capabilities (IEC) is a historical, produced under certain social and cultural conditions, and has a far-reaching influence on the spirit of double creation. The cultural environment factor plays a very important role in double creation education. However, China's national conditions are different from those of other countries. Before the reform and opening up, China was in a closed development state. At the same time, western countries have cultivated a large number of IEC-type compound talents who are brave to explore, risk and challenge. In addition, the double creation education system in most colleges and universities is not complete, and there is no sound double creation system, good cultural atmosphere, correct evaluation guidance, etc., which leads to the lack of a good environment for college students. Even so, we have always cherished the traditional idea of valuing agriculture over commerce, and this idea has slowly taken root in the minds of college students. In short, college students in China lack not only the thinking of double creation, but also the atmosphere of double creation [2]. Therefore, college students should establish their correct outlook on life and employment, and the most important thing is to accurately establish the concept of entrepreneurship, so as to improve their entrepreneurial quality and ability.

The second factor is the policy environment. In order to encourage college students' enthusiasm for IEC education, our government has launched a number of double creation policies [3]. At the same time, universities are also actively responding to this development, not only offering courses related to double creation, but also encouraging students to start their own businesses on campus to break through the bottleneck of double creation. However, due to the increasing trend of college graduates, this phenomenon has caused great pressure on social employment. In addition, the situation of double creation is relatively difficult. Most fresh college graduates not only lack funds and ideas, but also lack strong support policies from the state [4]. As a result, they ran into difficulties everywhere during their entrepreneurship, which gradually lost the initial spiritual motivation of these entrepreneurial newborns, and finally became more than enough.

2.2 School-level analysis

First of all, in terms of school cognition, most colleges and universities have insufficient understanding of Double creation, no solid theory, and no senior practice. The university's understanding of entrepreneurship education only stays in the graduation rate and employment rate, completing the indicators and improving the reputation of the university, rather than establishing entrepreneurship education on the basis of guiding students to find themselves and achieve themselves. They attach great importance to utilitarianism, so helping students to accept mass entrepreneurship education is not promoted by universities. Double creation education is a part of the learning of college students, especially entrepreneurship students. Only by correctly understanding the importance of the goals and value orientation of entrepreneurship education, can we understand its internal real development significance.

Secondly, the teacher team: because the teacher team will directly affect the students' absorption of the Double creation education, and the double creation education knowledge that college students need to learn covers a wide range, not only the comprehensiveness needs to be improved, in addition to the knowledge learned in class, but also pay attention to practice, so the curriculum of the double creation students mainly focuses on practice. The hands-on experience generated by the guidance of practical experience can bring more effectiveness to students intuitively for the traditional teaching knowledge, and teachers have more experience and awareness than students, which plays a very

important role in guiding students on the path of double creation. However, at this stage, most teachers in China still have a lot of deficiencies in their understanding of double creation [5]. Many teachers may have no entrepreneurial experience, lack of theory, imperfect practice, and too single teaching method.

Finally, the curriculum system: Although the Ministry of Education has issued many policies on double creation education for college students all the year round and many colleges and universities throughout the country also attach great importance to it, at present, most colleges and universities are still at the initial stage of double creation curriculum construction. The double creation curriculum system focusing on practice is not perfect, and the specific training objectives are not clear [6]. The content of the curriculum is mostly related to competitions or employment guidance, this not only restricts the teaching effect for students, but also neglects the importance of entrepreneurship and innovation education itself. There is also a lack of systematic requirements for the preciseness and rigorousness of the content of entrepreneurship and innovation courses. In order to cultivate talents for double creation and improve the quality of double creation education, we must combine theory with practice, conduct targeted, purposeful and systematic training and all-around assessment for students through double creation courses. We must not carry out amateur education outside of the major. We cannot only look at the achievements and rankings of students, but also combine other knowledge and professional knowledge to achieve all-round development across borders.

2.3 Students' oneseft analysis

According to the statistics in literature [7], in the four consecutive years from 2018 to 2021, the biggest impact on college students' employment pressure is that their double creation capabilities need to be further improved.

Many college students find it difficult to find satisfactory jobs after graduation. Although they plan to start their own businesses, 70% of college students are afraid of starting their own businesses. They are afraid of failure and dare not try. Lack of self-confidence, initiative and independence, these also potentially affect the atmosphere of entrepreneurship and innovation education. However, a few college students dare to try to start their own businesses, but they encounter many problems in practice, for example, they do not really understand the national policies on double creation, they are not clear about the direction of entrepreneurship, they do not fully analyze the market environment, and they lack new ideas about entrepreneurship. In addition, some college students lack confidence in entrepreneurship due to the influence of family concept factors. They believe that entrepreneurship is not doing their job properly, and this path will definitely lead to failure. Especially in many one-child families, parents give too much indulgence, resulting in the lack of ability to bear hardships and resist pressure. In a sense, these factors will affect the development of double creation education for college students.

3. Cultivation of innovative thinking ability

Innovative thinking, that is, creative thinking, is a combination of visual and abstract thinking [8]. It is innovative thinking in the traditional way of thinking, and makes ingenious breakthroughs and special innovations to bring a more simple and understandable way to society. The thought and logic of learning is the core of innovation and creation, which requires optimizing college students' learning and training, and consciously educating and vocational training college students.

3.1 Innovative thinking characteristics

Strengthening the training of innovative thinking has the characteristics of transcending time and

space. This characteristic can stimulate and inspire students' innovative thinking. To cultivate college students with innovative thinking characteristics in the new era, we must cultivate college students' abstract thinking based on the combination of decentralized thinking and comprehensive thinking, form a new way of thinking that combines imagination, and promote their training and thinking.

3.2 Enhance innovative thinking

The education of innovative thinking awareness is one of the educational methods to enhance students' innovative thinking [9]. It is a new model to promote college students' training according to the needs of objective development. Among them, innovation persistence is a power to create objective requirements. Only with strong academic curiosity, strong thirst for knowledge and conscious people can we better understand the innovative development thinking of open people, firmly grasp more innovative development opportunities and move towards the road of innovation. First of all, college students must strengthen the cultural education to establish the concept of innovative development motivation; Secondly, we should strengthen the ideological education of establishing the concept of innovation and development as the main body, and break through the traditional ideological education fetters of seeking stability while maintaining stability and abiding by rules, so as to cultivate new era college students who are brave in innovation and have ideological awareness.

3.3 Enhance innovation quality

The most important comprehensive quality of college students in China is that they can creatively complete their work under various natural and social conditions. In order to achieve the goal of skill development, colleges and universities must change the training methods and set up creative thinking courses combining practice. Only in this way can we make full use of college resources and maximize the cultivation of students' innovative thinking, innovative ability and innovative spirit.

3.4 Improve practice-based double creation capabilities

Colleges and universities should strive to integrate practice and theoretical learning, and take practice as the purpose of learning and education. The reason is that practice has absolute advantages in improving students' theoretical level, operational skills and innovation ability. IEC compound talent education requires learning theories and trying to participate in various practical activities. For example, participate in robot competitions, SCM programming competitions, intelligent automobile design competitions, etc. In addition, the school should focus on cultivating students with strong abilities and attach importance to the practice of double creation teams; While completing the tasks of double creation, the team should also integrate the spirit of "helping and guiding" and the spirit of "innovative practice" into students' study, life and work, so that students can benefit for life and become truly useful people to society.

4. Determination of training principles and scale

To cultivate college students' independent innovation ability and entrepreneurial initiative thinking ability, it is necessary to integrate innovation driven entrepreneurship practice education activities into the entire teaching process of college IEC talent training, and carry out comprehensive reform [10]. The independent innovation ability and social employment service ability of college students are cultivated through IEC talent education and training courses independently designed by colleges and universities, which is an important talent training mode to continuously improve the

comprehensive professional ability and quality of innovative and innovative talents in colleges and universities. IEC talent training is a complex, heavy and systematic project [11], which needs to break through the strict boundaries between disciplines, so that students can learn knowledge and thinking methods of different disciplines, different fields and different thinking modes. The United Nations Educational, Scientific and Cultural Organization believes that the double creation education model can cultivate individuals who are bold and pioneering [12]. Colleges and universities should first establish the following basic principles when carrying out the training project of compound IEC talents [13].

Firstly, under the actual premise that enterprise innovators and entrepreneurial movement members have various development needs, determine the overall scale of enterprise development. University enterprises, together with various countries and the international community, should take the development needs of entrepreneurial talents as the starting point, combine their own professional characteristics, and determine the training objectives and training specifications of IEC composite talents according to local conditions, so that the training of composite talents has a set of scientific high-level quality training system.

Secondly, diversified talent training mode. If the double creation education model in colleges and universities wants to have a unique focus on entrepreneurship logic education and distinctive educational characteristics, it must establish more entrepreneurship training and management models different from other college enterprises' innovative technical talents. Different colleges and universities have different entrepreneurial development logic characteristics and different human resources development, and there are great differences in the training direction of colleges and universities to cultivate IEC compound talents. Therefore, we can not completely copy the training model of other universities to cultivate our innovative and entrepreneurial talents. The best way is to establish the IEC talent training program with the characteristics of our university under the background of innovation and entrepreneurship.

Educators in colleges and universities believe that [14], it is very important to closely combine the education of innovative technology and entrepreneurship talents in colleges and universities with the education of students' ideological, theoretical and political quality, give full play to the guiding and exemplary role of students' ideological, theoretical and political quality education, and use correct scientific outlook on life, values and social outlook to guide students to correctly move forward in their thinking direction. Focusing on IEC talent education in colleges and universities, we will focus on strengthening the education of scholars' entrepreneurial ideology, theory and political quality. Through the collaboration of colleges and universities, we will build a basic system of education, give full play to the basic function of "all staff, all process and all direction" collaborative education of teachers and students in colleges and universities, and realize the fundamental task of "cultivating people by virtue".

Then, we should have the ability to draw inferences from others. The purpose of using different education modes to cultivate IEC talents is to build a relatively scientific and complete educational theoretical system applicable to the cultivation of professional quality of compound innovative talents as soon as possible [15]. However, under different education modes, they all believe that it is necessary to correctly handle the complementary relationship between the education of composite ability training, the education of generalists training and the higher professional and technical education, put the strengthening of the training and construction of IEC composite talents in a key position, cultivate students' professional theoretical knowledge and various technical abilities, and focus on cultivating college students' ability to solve production, service and management. The compound talents with the ability of technological innovation and employment creation have great potential. If we can effectively integrate and develop resources and apply them to the cultivation of double creation talents in China, we will better help college students to improve their ability to

continue employment and entrepreneurship, and make greater contributions to promoting the sustainable development of China's national economy and society.

Finally, pay attention to practice. School enterprise cooperation is one of the better practical cultivation methods, and the school enterprise cooperation platform plays a guiding role in the innovation and entrepreneurship of college students. Many college students on campus think too much about innovation and entrepreneurship. They are often fed with chicken soup of the soul on the Internet. When they see others succeed, they think they can do it. They are too confident and neglect others' methods of success. The university enterprise cooperation platform is the link between universities and the social market. By visiting successful enterprises, students can more intuitively understand the failure cases of entrepreneurship, find out problems and enlighten themselves, avoid making the same mistakes when starting businesses in the future, and also let students better understand the social status quo and future key development directions, and find out which aspects of talent are more scarce. Finally, we should guide them to the right path of double creation in their thoughts and actions. At the same time, according to the feedback of the enterprise, the school can also train talents in a targeted way, and set up relevant courses in combination with the current market situation, focusing on the cultivation of students' practical ability.

5. Conclusion

Under the above innovative thinking training mode, college students can give full play to their own advantages to show their personal abilities. The essence of the innovative thinking and innovation ability of colleges and universities to cultivate IEC talents is a complex and systematic project, which requires the government, colleges and universities and relevant institutions to constantly study and explore, test and revise in practice, and form a deep, wide, multi-dimensional, practice based innovation and entrepreneurship talent training theoretical system through continuous improvement.

Acknowledgements

This work was supported by the general project of higher education reform of Chongqing Three Gorges University (No. JGYB2105), the collaborative education project of ministry of education (No. 202101046026), and the project of higher education reform of Chongqing (No. 203448).

References

- [1] Xiang Yin, Furong Xi. *Construction of the cultivation system of innovative and entrepreneurial talents for college students* [J]. *Chinese University Science & Technology*, 2015 (3): 75-77.
- [2] Yulin Chen. *Definition of innovative entrepreneurial enterprises* [J]. *Business Review*, 2016 (33): 1-2.
- [3] Yong Qi, Jiawen Wang, Xing Zhou. *An analysis of the mechanism of mass entrepreneurship and innovation policy promoting economic growth* [J]. *Science & Technology Progress and Policy*, 2019, 36(18): 15-22.
- [4] Li Yan. *An Investigation Report on the Policies of Local Colleges and Universities to Support College Students' Entrepreneurship -- Taking S University in Sichuan Province as an Example* [J]. *Education research*, 2019, 2(7): 31-33.
- [5] Longsong Bai. *Problems and reasons in the construction of the teaching staff of mass entrepreneurship and innovation education in colleges and universities in China* [J]. *Rural Economy and Science-Technology*, 2018, 29(5): 291-292.
- [6] Yue Hu. *Research on entrepreneurship education curriculum in the context of mass entrepreneurship and innovation* [D]. *Chongqing Normal University*, 2016.
- [7] Lei Liu, Mingjing Wen, Shuyuan Teng. *Countermeasures of improving college students' employment coping style and relieving employment pressure* [J]. *Modern Communication*, 2021(2018-4): 50-51.
- [8] Dana Duan, Li Cheng. *Stimulating students' creative thinking in teaching: thoughts and enlightenment based on theories about creative motivation* [J]. *Creative Education Studies*, 2018, 6(4), 279-286.
- [9] Deping Xin, Shengquan Zhang. *How to use modern educational media to enhance students' innovative consciousness and thinking* [J]. *Liberal Arts Guidance*, 2019(351):13-14.

- [10] Mingjian Li. *Personality characteristics and cultivation of innovative and entrepreneurial talents [J]. Chinese University Science & Technology*, 2014(8): 90-91.
- [11] Hua Ai, Yanji Zhou, Jianlei Zhao, et al. *Research on the Effect of Innovation and Entrepreneurship Education on College Students' Employment Competitiveness [J]. Beijing Education (Higher Education)*, 2016(3): 26-29.
- [12] Yang Liu, Feifei Shang. *Comparative study on ecological culture of innovative and entrepreneurial education between China and Western countries [J]. Journal of Shenyang University of Technology (Social Science Edition)*, 2018, 11(1): 87-91.
- [13] Yang Gao, Dongjuan Fu, Yu Shao. *Historical evolution, rationality analysis and suggestions of innovation and entrepreneurship education policy in China [J]. Journal of Innovation and Entrepreneurship Education*, 2015, 6(6): 18-22.
- [14] Furong Ji, Jianliang Wang, Haimin Li. *Research on the construction of teaching innovation team of vocational teachers under the background of strengthening the adaptability of vocational education [J]. ZhiYe JiaoYu*, 2021(36): 75-82.
- [15] Duquan Zuo, Jinjie Luo, Jie Liu, et al. *Research and Exploration on Double Creative Education for College Students – A Case Study of Mechanical Engineering Major [J]. Adult and Higher Education*, 2022, 4(3): 23-28.