

Application of TRIZ Theory in Innovation and Entrepreneurship Education of Electrical Automation Major

Wenchao Ma, Ying Li

Zaozhuang Vocational College of Science and Technology, Zaozhuang, Shandong, China, 277599

Abstract: Innovation and entrepreneurship education is one of the main contents of modern education, focusing on universities to enhance students' comprehensive literacy and match the increasingly severe employment situation. This article takes the electrical automation major as an example, first analyzing the goals and current problems of innovation and entrepreneurship education in this major. Based on this, it analyzes the advantages and methods of applying TRIZ theory in innovation and entrepreneurship education in the electrical automation major. It discusses the construction of information databases, strengthening guidance applications, emphasizing application closed loops, and emphasizing real-time applications, serving the innovation and entrepreneurship education activities in the electrical automation major and providing some reference for students' growth and development.

Keywords: TRIZ theory; Electrical Automation major; Innovation and entrepreneurship education; market demand

1. Preface

TRIZ (Theory of Innovative Problem Solving), also known as the theory of intelligence extraction, is an engineering and technological innovation method proposed by Soviet patent expert Genrich Achille. The core of this theory lies in the analysis of a large amount of literature and data, based on which an invention problem solving system centered on the evolution law of technological systems is derived. This system has been widely valued in modern management activities, including educational management. As for innovation and entrepreneurship education in the field of electrical automation, influenced by professional changes and social environment, students need to enhance their innovation awareness and entrepreneurial ability on the basis of mastering basic knowledge and practical skills. This objectively requires schools to do a good job in management activities to avoid the problem of education lagging behind students' growth needs[1]. At the same time, in recent years, the speed of economic development in China has tended to stabilize. Under the new normal of development, the employment pressure on students has increased. In this context, exploring the application advantages and methods of TRIZ theory in innovation and entrepreneurship education in electrical automation majors has certain practical significance.

2. Objectives of Innovation and Entrepreneurship Education in Electrical Automation

2.1 Improving students' abilities

The basic goal of innovation and entrepreneurship education in the field of electrical automation is to enhance students' abilities. From a macro perspective, as early as 2012, China had already made regulations through the "Basic Requirements for Entrepreneurship Education and Teaching in Ordinary Undergraduate Schools", requiring universities to pay attention to entrepreneurship education. Innovation and entrepreneurship education, which is based on this foundation, mainly focuses on cultivating students' innovative qualities and entrepreneurial abilities. Universities are required to cultivate students' innovative thinking and entrepreneurial ability training in stages and levels, so that students can master skills other than basic knowledge and practical skills. Even if students cannot gain favor in the job market with basic skills, they can still obtain more opportunities through innovation and entrepreneurial thinking. In addition, the development of electrical automation major is advancing rapidly, and strengthening innovation and entrepreneurship education can also match the characteristics

of the major, enabling students to continuously improve their professional level[2].

2.2 Optimizing Student Thinking

The organization of innovation and entrepreneurship education in the field of electrical automation also helps optimize students' thinking. This role is reflected in two aspects: firstly, innovation and entrepreneurship education focuses on professional changes, which can keep students' thinking active; secondly, this education has a clear internal connection with the job market, which can expand students' thinking from different perspectives such as employment, development, and entrepreneurship. If a considerable number of students have excellent abilities but are unable to find employment smoothly due to various factors and receive high-quality entrepreneurship and innovation education, students can start from the perspective of entrepreneurship, investigate the market, raise resources, provide technology and products to the target market, and replace employment with entrepreneurship, rather than being confined to finding existing positions, to achieve diversified personal development thinking.

2.3 Service Professional Construction

The electrical automation major has typical modern and high-precision characteristics, based on information technology, statistics, etc., with a fast development speed and strong dynamic product updates. Conventional organizational theory teaching and practical teaching can enhance students' abilities, but their role in professional development is not prominent. Strengthening innovation and entrepreneurship education not only serves students' growth and improves their thinking, but also helps promote professional development. If universities recruit and collect employment information from the market, they can understand the characteristics and changes in the requirements of employers for students majoring in electrical automation. Based on this, innovation and entrepreneurship education can be organized, and students' abilities can be improved. The design of professional courses and content management in universities are also more targeted, which helps to improve the level of professional construction.

3. Current issues in innovation and entrepreneurship education in the field of electrical automation

3.1 Prominent Information Gap Issues

The current innovation and entrepreneurship education in the field of electrical automation is not comprehensive enough, and there is a problem of information gap. The information gap is reflected in two aspects. Firstly, students have insufficient understanding of professional changes and forms of employment and entrepreneurship. A considerable number of students only master the content of textbooks and basic skills, and have insufficient exposure to the rapid changes in electrical automation. They also lack a clear understanding of the market's human resource allocation and shortage situation, which is not conducive to their employment and entrepreneurship, and also affects their innovation ability. Secondly, schools are unable to provide dynamic information that is sufficient to meet the comprehensive growth of students. Some school textbooks are updated slowly, and there is insufficient collection of information on social changes and professional development, resulting in an information gap between educational management and professional development.

3.2 Students' thinking is relatively rigid

The emergence of the Electrical Automation major is relatively short, but due to its prominent impact on industrial development, daily life, and commercial activities, its update speed is fast. This requires organizations that focus on innovation and entrepreneurship education for this major to pay attention to expanding their thinking, making students good at and willing to think, and matching professional and market changes. At present, there are still deficiencies in innovation and entrepreneurship education in some universities, leading to students' rigid thinking. As universities believe that the core of electrical automation majors lies in the research and application of modern technology, they focus on skill teaching and supplement it with various modern theories in their teaching work. However, they do not pay enough attention to the education of students' entrepreneurial ability and innovation consciousness, resulting in slow improvement of students' thinking patterns and abilities, which affects the growth of innovation and entrepreneurship ability.

3.3 Lack of Coverage in Campus Education

The lack of coverage in campus education refers to the deficiencies in content management and time management in some universities when carrying out innovation and entrepreneurship education for students majoring in electrical automation, which cannot cover most or all of the valuable content and lacks continuity in time. Some universities only organize innovation and entrepreneurship education based on changes in majors, without considering the current dynamics of employment in society. While students' innovation and entrepreneurship abilities have improved, the inadequate entrepreneurial environment still hinders their development. Some universities only organize innovation and entrepreneurship education during the graduation season, with most of the first, second, and third year focused on technical education and theoretical transmission, and the value of innovation education cannot be maximized.

3.4 Lagging behind market demand

One of the focuses of innovation and entrepreneurship education in the field of electrical automation is to match market characteristics, capture new changes in the professional employment market, and serve educational activities. Currently, some universities lack sufficient attention to this issue, resulting in innovation and entrepreneurship education in related majors not matching market characteristics and trends, and having limited influence. Some universities believe that the demand for electrical automation professionals in the market is constantly changing, and that improving students' professional abilities is sufficient. However, the direct correlation between their entrepreneurial and innovative abilities and market changes is insufficient, and they can be carried out by schools according to their teaching situation and basic plans. Their ideas are contrary to the talent needs of modern society, which is not conducive to students' comprehensive growth and may also cause their entrepreneurial and innovative abilities to lag behind the market.

4. The advantages and methods of applying TRIZ theory in innovation and entrepreneurship education in the field of electrical automation

4.1 Application advantages

4.1.1 Coping with Information Gap Issues

The application of TRIZ theory in innovation and entrepreneurship education in the field of electrical automation can help provide information services for schools and students, and solve the problem of information gap. From the perspective of common characteristics, TRIZ theory focuses on analyzing a large amount of data (early patent documents, now no longer limited to patent research, so the sources and categories of literature are also more extensive), understanding the specific situation of the target object, discovering patterns and problems, and using them as the basis for organizational improvement. In this mode, the innovation and entrepreneurship education materials organized by the school have a wide range of sources, considerable coverage and richness, and the information obtained by students is also relatively abundant. The problem of information gap caused by insufficient campus management and student self-management can be effectively addressed.

4.1.2 Expand students' thinking

The application of TRIZ theory in innovation and entrepreneurship education for electrical automation majors also helps to expand students' thinking. This theory holds that there are objective laws governing invention problems, and engineering contradictions that arise repeatedly in production practice can be created through direct analysis and prediction of related problems. Under this theory, students' learning thinking is no longer confined to the classroom or textbooks. They can engage in self-directed and exploratory learning through more methods and materials, and their learning of electronic automation professional content is more in-depth. At the same time, TRIZ theory holds that the evolution of products or technological systems follows a certain pattern, which also helps students grow and further master the principle of "seeing the essence through phenomena", laying the ideological foundation for the long-term improvement of entrepreneurial and innovative abilities.

4.1.3 Helps to improve the coverage of campus education

Applying TRIZ theory in innovation and entrepreneurship education for electrical automation majors can help improve the coverage of campus education. On the one hand, TRIZ theory is based on

a large amount of resources and can achieve content coverage. On the other hand, the application threshold of this theory is not high, and schools can apply it in their educational work in each academic year, which can stretch and cover the timeline. In the first year of college, schools can focus on cultivating students' habits of searching, reading, integrating, and utilizing literature as the first step in applying TRIZ theory. In the second year, students can be taught to analyze based on their knowledge of electrical automation and identify personal innovation and employment issues. In the third and fourth years, they can continue to consolidate the application of TRIZ theory throughout the university education cycle, ensuring coverage effects.

4.1.4 Matching market demand

One of the advantages of TRIZ theory is its ability to collect and integrate various types of information about the target to ensure the scientific validity of the research. In the innovation and entrepreneurship education of electrical automation majors in universities, applying this theory can help match market demand and enhance educational targeting. From a characteristic perspective, TRIZ theory holds that invention problems have predictability, attach importance to organizing research based on the laws of technological development and evolution, and intervene in the entire design and development process. The principle of this theory in the field of education is similar. Schools can analyze the future trends of electrical automation majors based on market characteristics and changes, thereby enhancing students' entrepreneurial abilities and encouraging them to self-management and optimize their innovation awareness in response to relevant changes, achieving targeted matching with market changes[3].

4.2 Application Methods

4.2.1 Building an Information Database

The early TRIZ theory was relatively complex, and its application in innovation and entrepreneurship education in the field of electrical automation mainly focused on principles. Therefore, schools can first emphasize the management of raw resources and information, and attach importance to database construction. Multi-channel collection and centralized storage modes can be adopted, and schools can establish two major categories of offline and online information collection channels, as well as several sub categories. By focusing on web crawlers, offline libraries, etc., various information related to the development, employment, and entrepreneurship of electrical automation majors can be collected and stored in a unified database, which is open to teachers and students and encourages browsing and downloading.

For example, the current electrical automation majors generally pay attention to intelligent work. Colleges and universities can organize searches based on the Internet sharing pool, obtain resources related to "electrical automation intelligent work", rely on TRIZ theory to process, and set a number of keywords in combination with students' conditions and needs, including "the trend of intelligent work in X", "entrepreneurial returns in intelligent manufacturing industry", "intelligent design of machine tools", etc. After integration, they can get structured and semi-structured qualitative conclusions, which can be used to guide students' targeted learning, and simultaneously improve professional reserves, innovation awareness and entrepreneurial ability.

4.2.2 Strengthening guidance application

One of the characteristics of TRIZ theory is its large amount of information, so universities should attach importance to theoretical processing and guide students to use it reasonably in innovation and entrepreneurship education for electrical automation majors. In practical work, universities mainly focus on providing support through the Internet of Things and group models.

Universities can establish a highly open service network that covers various areas such as student apartments, canteens, gyms, laboratories, and teaching buildings. Students can access various resources related to electrical automation at any time by entering legal information (such as student ID numbers), so that their learning needs can be met at any time. At the same time, given the objective situation of a large amount of resources under the TRIZ theory, schools can also group students and have teachers analyze their characteristics. Students with strong entrepreneurial intentions, similar learning directions, and interests can be included in the same group (or divided into several groups if there are a large number of students), and targeted teaching can be organized for each group. For example, entrepreneurial groups can focus on providing various information related to the market entrepreneurial environment, main financing methods, debt repayment and operation, while innovation groups can

focus on providing the latest domestic and international trends, electrical automation development trends, and other content, so that they can receive more valuable guidance during their growth process.

4.2.3 Emphasize application closed-loop and real-time performance

Closed loop management mainly focuses on the process of applying TRIZ theory, forming a complete plan, ensuring that the application of this theory is fully controllable and can play the expected role. Three application modes can be adopted:

1) Database construction and indiscriminate use. Universities can utilize multiple channels to collect various resources related to innovation and entrepreneurship education in the field of electrical automation, and provide them to teachers and students without discrimination, organizing centralized teaching;

2) Diversified application methods. Each university can complete the collection and grouping of student information, provide targeted resources for guidance, and integrate relevant information flexibly according to the dynamic learning of students and groups;

3) Closed loop evaluation. After completing a stage of teaching, universities can evaluate the application of TRIZ theory based on the innovation and entrepreneurship education goals of electrical automation majors, analyze shortcomings, make improvements, and promote positive achievements.

Finally, considering the dynamic development of the electrical automation major, universities should also pay attention to the real-time application of TRIZ theory, maintain real-time collection of market information and professional technology development information, and even if the current content of professional innovation and entrepreneurship education has been determined, it should be supplemented and adjusted according to new market information and technology development information to serve students' growth.

5. Conclusion

In summary, the application advantages of TRIZ theory in innovation and entrepreneurship education in the field of electrical automation are prominent, and it should be given attention and sought to play its role in future work. From the current situation, the innovation and entrepreneurship education of electrical automation majors in some schools is not perfect, and the problems of students' rigid thinking and poor information are also prominent, which is not conducive to their comprehensive growth, innovative thinking, and entrepreneurial ability. Applying TRIZ theory to organize innovation and entrepreneurship education can provide certain solutions to related issues. In practical work, the main focus is on information database management, guiding applications, and also emphasizing the construction of application loops and real-time capabilities, so that students majoring in electrical automation can better understand the necessity and actual situation of innovation and entrepreneurship, and provide support for their growth and development.

References

- [1] Zhang Qi, Cui Yanlin, Wang Xiaoli. *Application of TRIZ Theory in Innovation and Entrepreneurship Education of Electrical Automation Major [J]. Home Appliance Maintenance*, 2025, (8): 28-30
- [2] Zhang Shaohui, Feng Yan, Wang Pu. *Research on the Integration Path of Professional Education and Innovation and Entrepreneurship Education in Vocational Colleges: Taking Electrical Automation as an Example [J]. Journal of Zhengzhou Railway Vocational and Technical College*, 2023, 35 (2): 71-73
- [3] Huang Wenjing, Zhang Qian, Li Junting. *Research on the Application of TRIZ Theory in Electrical Automation Technology Professional Education [J]. Modern Manufacturing Technology and Equipment*, 2021, 57 (11): 219-221