

Enhancement of College Students' Innovation Capability by constructing Scientific and Technological Innovation Team

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Abstract: Under the background of the construction of “New Engineering”, this paper investigates the construction of science and technology teams to enhance the college students' innovation capability. First, some existing problems focusing on the construction of science and technology teams are analysed, i.e. poor sustainability, low universality, imperfection of incentive mechanism and low effectiveness. Then some corresponding teaching reform measures are given in this paper to build a perfect science and technology team training mode, which is expected to improve the college students' innovation ability, cultivate students' innovation spirit, innovation ability and teamwork spirit. Moreover, this approach fosters the enhancement of students' knowledge and overall quality, establishing a robust knowledge reservoir and skill foundation. It equips students not only to adapt to societal demands but also to serve and succeed in their careers effectively.

Keywords: Innovation Capability; Higher Education; Scientific and Technological Innovation Teams

1. Introduction

The key to promoting the strategy of strengthening the country with talents and building an innovative country lies in the cultivation of high-level scientific and technological innovation talents. To accelerate the construction of “a strong country in education and talents”, and to break through the bottleneck technology, China urgently needs to improve the quality of people and accelerate the cultivation of various kinds of specialized and innovative talents. However, in the era of increasing importance of ability, literacy and wisdom, the batch education based on instilling knowledge is far from being able to adapt to the needs of the times. How to cultivate the scientific and technological innovation consciousness, innovation spirit and innovation ability of the contemporary college students to adapt to the development needs of the construction of the “New Engineering” is an important topic of research. Up to now it is also an important research topic for universities at home and abroad^[1-3].

The cultivation of science and innovation team is one of the effective methods to improve the innovation ability of college students, which is now widely concerned and researched at home and abroad^[4]. As early as the 1960s, the Massachusetts Institute of Technology (MIT) created the “Undergraduate Research Opportunities Program” to encourage undergraduates who meet certain conditions to participate in faculty scientific research projects. In the 1980s, the University of California, Los Angeles (UCLA) has also begun to support undergraduate students to participate in scientific research in a systematic manner. The university has set up by belonging to the humanities and social sciences, life and material sciences category of the two “undergraduate research centre”. In 1997, the University of California, Berkeley (UCB) set up the “Office of Undergraduate Research. Yale University has a mentored research program for some of its first-year students. The University of Applied Sciences of Germany has also strengthen students' practical engineering ability and scientific and technological innovation ability training, focuses on the application of scientific and technological knowledge, and teaches broad knowledge, including how to transform an idea into a competitive product skills, abilities, and so on, and cultivates a large number of engineers with the qualification of higher application-oriented talents. Besides, Chinese scholars have made a lot of research on innovative team construction, many top universities have carried out educational reforms based on science and innovation team building and achieved many results^[5-6].

Due to the characteristics such as hands-on engineering skills of automation major, the college students' participation rate of science and technology activities in this major is higher compared with other engineering majors, however, the current construction of science and technology team does not have a set of complete and mature cultivation mode, which makes only a few students can participate these activities, and it does not form the scale of the training of innovation ability of most students and the sustainability of the team's development, which makes the overall level of college students' scientific and technological innovation ability is greatly compromised. In order to change

this passive situation, it is necessary for us to learn from the successful experience of foreign universities, combined with the actual situation of our universities and the characteristics of the automation profession, to study a sustainable development of science and technology team mode and method. This paper is expected to provide a reference for the construction of scientific and technological teams in other related professions.

2.Current Problems in Building Science and Innovation Teams

At present, college students' scientific and technological innovation team has not taken up the important task of cultivating scientific and technological talents with independent innovation ability, the reason for this is mainly because of the imperfect cultivation mode of college students' scientific and technological innovation team, which is mainly characterized by the following aspects.

2.1 Insufficient Universality

Through the survey of automation students, it is found that most students have the desire to participate in innovation activities, but due to their limited knowledge structure and level, the awareness of science and technology innovation is lack, and the students do not correctly recognize the importance of participating in science and technology innovation. Some students participate in the teacher's research projects under the teacher's organization, which can better cultivate students' innovation ability, but this way belongs to the cultivation of elite innovation talents, which benefits only the students within the innovation team and has little influence on students of the same grade and students of all grades. Moreover, the number of research projects of teachers and various scientific and technological activities for students are limited, which can only satisfy a small number of students to participate in the research.

2.2 Weak Sustainability

At present, most universities can organize students to participate in various disciplinary competitions, especially for automation major, then the students can form some groups. However most college students' innovation teams are temporarily organized when declaring scientific and technological projects, and these teams, from their formation to students' graduation, are a kind of independent operation mode, which can't fully mobilize the creative enthusiasm of students outside the team. Moreover, some students declare science and technology projects based on the enthusiasm at that time, treating science and technology projects as a specific activity rather than as an opportunity to cultivate their own innovation ability, temporarily organizing a team when declaring the project, without the accumulation of knowledge in this area before declaring, and lack of patience to engage in long-term innovation activities after declaring, so that the scientific and technological activities do not achieve the expected results.

2.3 Low Effectiveness of Teachers' Instruction

The participation and guidance of professional teachers can guarantee the development of students' extracurricular scientific and technological innovation activities, which is also a kind of expansion of teachers' teaching and educating work, and teachers should play an active role. However, the current instructors in the students' scientific and technological activities in the performance of two kinds: On one hand, the role of teachers and instructors often falls short in adequately recognizing and harnessing the creative potential of students in science and technology endeavours. Some students may possess innovative ideas, but due to limitations in knowledge and objective conditions, they struggle to materialize their goals. On the other hand, excessive guidance from teachers in scientific and technological activities can lead to a situation where instructors dominate the primary research responsibilities, leaving students with only basic manual tasks. This approach fails to effectively cultivate students' innovation abilities in science and technology activities. Hence, exploring how to maximize the effectiveness of instructors within the innovation team constitutes a crucial research topic.

2.4 Poor incentive Mechanisms

Among the factors influencing the cultivation of innovation abilities in college students, aside from the prevailing teaching and research

conditions within educational institutions, instructors and students stand out as the two primary subjective factors impacting the efficacy of fostering innovation skills. Particularly in the current landscape of scientific and technological innovation activities among college students, instructors often engage in voluntary work, to the extent that some educators may be hesitant to guide students in their innovation pursuits. Hence, it becomes crucial to establish an effective system of constraints and incentives that can fully harness the enthusiasm of both teachers and students. This mechanism aims to prevent the occurrence of “three-minute enthusiasm” among students for scientific and technological subjects. Furthermore, it should encourage students who are eager to participate in scientific and technological innovation activities but may doubt their capabilities, fostering their active engagement. Additionally, understanding and optimizing the guiding role of instructors constitute another vital aspect of this research.

3. Team-Building Initiatives

Addressing the issues analyzed above, this section primarily outlines the corresponding corrective measures.

3.1 Universality Construction

We all know that the college students have a wide range of interests and hobbies, in order to improve the universality of science and innovation teams and attract more outstanding students to join them, it is necessary to support students’ innovative activities through multiple channels and spaces. Firstly, the team goals and training programs should be formulated according to students’ professional background, interests and skills, rather than being limited to existing scientific research competitions and research projects. Secondly, we need to teach students according to their abilities and emphasize on strengthening their leadership and teamwork skills. In addition, the common philosophy and values of team members will help them work better together, and regular meetings should be organized during the construction of science and innovation teams so that team members can share progress, problems and suggestions.

3.2 Sustainability Construction

In order to establish a long-term close cooperation science and innovation team, it is necessary to establish a good mechanism of transferring and helping generation, so that master’s degree students with certain experience can guide undergraduates and senior students can guide junior students, and set up a series of science and innovation topics of gradually increasing difficulty, so that students can gradually carry out the process of cultivating innovative ability of “introduction-improvement-contests This will enable students to gradually develop their innovative ability through the process of “introduction-improvement-competition-research”. In addition, team members are encouraged to present their project results in academic conferences, competitions and seminars, and internal and external evaluations are organized so that the team’s results can be professionally recognized and students’ enthusiasm for continuous participation can be fully stimulated.

3.3 Teachers Guide Effectiveness Construction

To enhance the effectiveness of teachers’ guidance in constructing student scientific and creative teams, we concentrate on refining teachers’ research directions. This involves aligning the objectives of student scientific and creative teams with individual aspirations and organizational arrangements, establishing corresponding laboratories, and ensuring instructors have ample resources, including laboratory equipment, funding, and research assistants. Also it needs to provide instructors with more platforms and free space, facilitating their engagement in various activities such as seminars, training courses, and academic conferences. Additionally, we encourage instructors to participate in enterprise production practices alongside their teams, fostering cooperative relationships between instructors and enterprises. This not only broadens their academic horizons but also provides teams with tangible industrial projects. Acknowledging the practical contributions of research teams in terms of work performance further reinforces the significance of these activities.

3.4 Incentive Mechanism Construction

In order to fully mobilize the enthusiasm of teachers and students, it is necessary to build a complete and reasonable incentive mecha-

nism. At the student level, scholarships, special funds, and merit awards should be set up to recognize the outstanding performance of the science and innovation team members in the projects and to fully stimulate the enthusiasm of the students; at the teacher level, it is very crucial to stimulate the enthusiasm of the instructors, so that they should formulate clear performance evaluation standards, set up incentive mechanisms based on the performance in teaching, scientific research, and student supervision, and give priority support to teachers who have participated in supervising the science and innovation projects of students in terms of scientific research conditions, title promotion, and so on. Teachers who participate in guiding students' scientific and creative projects should be given priority support in terms of research conditions and title promotion.

In reality, the aforementioned four components are interconnected. Firstly, the establishment of a reasonable reward mechanism can make both instructors and students to actively participate. Secondly, under the background of multidisciplinary crossover, expanding universality and attracting more outstanding students can help instructors in identifying and nurturing exceptional talents. Moreover, the continuous growth of student science and innovation teams empowers students to delve into more profound scientific research, establishing a robust groundwork for delving into advanced topics and potentially pursuing postgraduate studies. Simultaneously, students can become invaluable collaborators in teachers' scientific research endeavors. Through this collaborative partnership between teachers and students, there is a further opportunity to expand the joint cultivation efforts between educational institutions and enterprises, ultimately enhancing the school's social standing and reputation.

4. Conclusion

Guided by the educational concept of "student-oriented," this paper researches on the reform of the innovative talent cultivation mode within the automation specialty. The primary goal is to foster students' innovative abilities by drawing upon successful experiences from various universities regarding the construction of college students' innovative capacity. This paper endeavors to construct a sustainable model for the development of science and technology innovation teams, considering diverse factors that influence the cultivation of college students' innovative abilities and tailored to the characteristics of different students. Furthermore, by nurturing an intrinsic innovative spirit, refining their aptitude for innovation and teamwork, and fostering a comprehensive elevation in their knowledge, skills, and overall quality, students are poised to play a vital role in advancing the construction of an innovative nation. This alignment with the strategy of national development through science and education underscores the commitment to cultivating talents capable of contributing to sustained and forward-looking progress.

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