

An Analysis of Current Education in Colleges for Mechanical Innovation

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Abstract — How to cultivate the innovative consciousness and creativity has been a core subject of furthering the quality in higher education in China. The main content of the subject involves: i) constructions of the curriculum systems, ii) carriers of innovation, software and hardware environments, iii) innovative atmosphere, iv) enlightenment and innovation of teaching methods,- which all together form a long, complex and systematic project. This paper analyzes the enlightenment of mechanical innovation, present teaching situations and existing problems of local universities, presenting the principal factors in influencing the creativity of college students and propose suggestions concerning instructors and students, hardware, software and other resources.

Keywords - cultivate innovative talents; mechanical innovative design; reform teaching method; construct innovation platform

I. INTRODUCTION

Innovative capacity is the core of national comprehensive national strength, while University of higher education is the backbone and foundation for the establishment of national innovation system. From the middle of the last century, To the United States State University of New York as the representative, more than 60 universities had set up innovative courses. In our country, the report of the Party's 17th National Congress clearly pointed out that improving the ability of independent innovation and building an innovation-oriented country are the core of China's development strategy and the key to improving the comprehensive national strength. What ' s more, China's "second Five-Year" plan also clearly pointed out that innovation-driven, implement the Strategy of "Prospering the Nation through Science and Education" and "Strengthening the Nation by Talents" , talent training from the social application to the complex, innovative talents change. Therefore, it is the core task of higher education in China to cultivate and strengthen university students' sense of innovation, to exercise and improve the innovation ability of them, to guide and inspire the enthusiasm of creativity.

1 The Bottleneck of Innovative Education in Colleges and Universities

Creativity is the soul of a nation, while institutions of higher education take the heavy responsibility of cultivating talents with innovative spirit and practical ability. As China's current higher education on the cultivation of innovative capacity is relatively weak, it cannot adapt to the development of national economy and the progress of society in some degree. So strengthening the innovative consciousness and creativity of students has been the most important subject of promoting quality education in China. The cultivation of innovation ability is the result of the collective action of school education, family education, social education and lifelong education. Primary and

secondary education focuses on the acquisition of basic knowledge, common skills, and approaches to learning and thinking, while University education focuses on the accumulation of professional knowledge, special skills and innovative capacity.

However, Innovative education is a long-term, systematic project, which cannot be solved by a few courses or some short-term activities. It involves not only the entire educational model but also the reform and innovation of educational environment. With the influence of planned education for many years, most colleges and universities have already realized some bottlenecks of students' Innovative education, and educational experts have also put forward some very good suggestions and programs. For instance, in the aspects of discipline construction and curriculum configuration, they suggested reforming the traditional education and teaching management system, to promote the development of student ' s personality. Meanwhile, they can promote achieving flexible credit system and school-roll retention system, allowing students who do not graduate to start their own businesses, etc. In the aspects of constructing a reasonable curriculum system, innovative general-education curriculums, more time and space for independent thinking should be offered to students. Emphasis should be placed on the importance of arts and sciences in university education. Implementing large subjects and large professional education to break the obvious curriculum boundaries. Heuristic teaching should be stressed while teachers are supposed to change their training mode and improve teaching methods. Change the traditional assessment methods of some courses. The new assessment model should not only focus on how much knowledge is mastered, but also examine students the ability to solve problems creatively. Try to guide student's attention to the analysis and the resolution of problems. However, the series of measures above is difficult to carry out completely,

comprehensively and systematically in a short period of time.

2 The current situation of implementing innovation education in colleges and universities

At present, more and more attention is paid to the education of college students' mechanical innovation ability in engineering colleges and universities. However, they have insufficient investment in mechanical innovation education and design competition for students. Policy support is lagging behind, which is also lack in sufficient measures to encourage teachers to increase the input and guidance of the competition, including the constructing of innovative experimental platform, organization and training system. Resources for innovative mechanical education is also disperse, which is not good for their training and improvement of innovation awareness and practical ability. Through the investigation of domestic colleges and universities of mechanical innovation education, and participating in guiding the "extra-curricular opening experiment" and "mechanical innovative design competition", we discovered some common problems that is not made by a department, an individual or a link, but a consequence of our nation, society, school, students and so on, which can be solved gradually by appropriate guidance and program adjustments. The next is analyzing one by one to deal with these problems successfully.

2.1 Some issues students have shown

① Weak innovation awareness and motivation. Due to the traditional educational concepts, planning system and professional settings, inculcation of curriculum system and other reasons in the past, some students have a weak sense of innovation and innovative thinking. A part of students are good at theory which is thin and cannot be put into practice by themselves. The one reason why they just like this is subjective initiative, which can be guided and educated. There is another reason attributed to teachers. Some teachers' class is boring, hard to understand, and no connection with the practical engineering cases, making students lose their interests, which is the foundation of innovation.

② Weak psychological quality. At the beginning of taking part in "extra-curricular opening experiment" and "mechanical innovative design competition", some students generally lack estimation of the requirements and difficulty of the experiment and competition. On the one hand, some students choose a huge topic which cannot come true obviously, even beyond their knowledge and ability. On the other hand, some students choose an ordinary topic which not worth being achieved. For most of all, their enthusiasm is gradually disappearing in the process of participation, the deepening of the problem and the practice process. When the difficulties exceed that in their expectations, they choose to end the process hastily, or even leave it to their teachers to finish, which makes an embarrassing situation that

students create topics while teachers carry works. To solve problems that born with students themselves, spiritual encouragement and professional teaching, on how to analysis and solve problems, are quite important for teachers to achieve, which makes them face the challenges together.

③ Lack of teamwork, full of utilitarianism. Under the current system, students set up the team, look for teachers and choose topics, all by themselves. In this situation, students of the first or second grade are full of enthusiasm but lack of professional knowledge, while students of the fourth grade are under the pressure of NEEP or employment. As a result, students of the third grade should be the backbone. Based on the considerations concerning the comprehensive assessment score, some students did nothing but developed this bad atmosphere. In addition, some students have a relatively strong personality and not good at team communication, which makes the plan depend on an individual completely.

2.2 Some issues teachers have shown

The purpose of organizing "extra-curricular opening experiment" and "mechanical innovative design competition" is to achieve The Butterfly Effect, which means waking up all the students in colleges and universities of innovative creativity and innovation enthusiasm by anticipating with teachers in every science and technology competition. At present, the workload of university teachers is generally approved by the academic workload and teaching workload, which then directly linked to remuneration. However, there are kinds of works cannot be checked by these rules, and what they need are teachers' professional ethics and dedication. Some colleges and universities haven't established a certification and assessment mechanism for innovation instructors in time so that many instructors get rewards and recognition only if their students' team achieved some achievements, whose possibility is few. As a consequence, it affects the enthusiasm and responsibility of teachers to participate in innovative activities, making the teachers not willing to participate.

2.3 Insufficient hardware

After students identify innovative topics and make up the innovative team, the colleges and universities should provide necessary hardware conditions for students, open up innovative laboratories, and coordinate the relationship between the various departments. For example, the acquisition and producing of woodworking materials, the purchase and processing of metal parts, electrical circuit-related components and tools, etc. Universities shouldn't just offer funds and wait students to purchase their own materials, which can take their lots of time in thinking and learning. Apart from above, student's financial ability is also should be taken into consideration. Funds must be in place on time, and do not allow students to advance their

own debts. The reality is that some colleges and universities lack the help of experienced master and dedicated processing workshops that are necessary for students' creations, consumptions of materials cannot be added in time and works produced rough. As a consequence, students' practical ability cannot get real exercised.

2.4 Innovative atmosphere is not strong

The creation of innovative atmosphere is the process of the joint efforts of all the print media, various disciplines, departments, and faculties, and it must be often grasped unremittingly rather than a mere formality. When "extra-curricular opening experiment" and "mechanical innovative design competition" are set up, no one would really understand the theme and significance of the competition if advocacy and mobilization are just taken by a banners, a press release, or a notice. Finally, the competition becomes a teaching activities, which a few students take part in. The result is contrary to the original intention.

3 Some thoughts and suggestions

① Create a good atmosphere for innovation, improve the innovative platform on the Internet to provide students' innovative design with discussion of space and cognitive channels. Colleges and universities should establish a special website for innovation. It is used of announcing various competition information, including schedule, plans, and rules. What's more, the information should be classified according to their organizers or types. If we did like this, students would know what competition can they participate, what professional knowledge do they need, and what useful skills can they learn. An online exhibition hall should be established on the website, which makes the students and teachers share their happiness of success, their experience of creating and their hardworking of teamwork through uploading excellent works to the Internet. The upcoming competition will be published in advance on the Internet, form a fixed competition system. Teams should be set up and trained in advance instead of preparing before the day the competition opening, even though the competition is just hold once in two years. Create a specialized forums, so that like-minded students would have a communicate platform where each other show ideas, learn from the problems. Establish a professor's information database of teachers. The teacher's professional and research direction are published online, and what the team's topics that would be guided are also published online, so the interested students can be targeted and not so blind to find a teacher. Meanwhile, guide and inspire Innovative potential of students and lead students from online games that are not conducive to learning activities by many ways like network carrier, broadcast carrier, forum lecture. If we control it in this way properly, it can also ease the psychological pressure of students, training people to behave in society

and find hope and self-confidence through teamwork and progress.

② Set up a professional guidance team. The success or failure of the innovative activities of students depends on the high level and relatively stable innovative instructor team. The common experience of world famous universities shows that high-level teachers are the key to determine the university's core competitiveness. Teachers' innovation enthusiasm, academic attainments and academic attitude will influence the students' innovative activities peacefully. At the same time, the team's engineering background should cover as many technical areas as are necessary for innovation. Through the complementarity between different disciplines of knowledge to provide a full range of innovative activities support for students. Of course, colleges and universities have to achieve the assessment and subsidies of teachers. What's more, participating in extracurricular practice should be taken into comprehensive evaluation system, mid-term assessment and annual inspection system. There is not only bonus but also subtraction and caveat in case some students' reason why they participate the competition is just for some comprehensive quality score.

③ Create a variety of innovative groups with the features for the disciplines, and cover part-time instructors. Groups cover all grades of students and relative disciplines are welcomed, for they take advantage of inheritance and continuity. But the group not only become a part of student union or branch of the college student branch, it must be equipped with specialized instructors. At the same time, by taking use of the second class, colleges and universities are supposed to hold a variety of academic lectures, science and technology report, experiments summary meeting and so on regularly. Through the publication of student essays and the guidance of implicating for patents to organize students to participate in teachers' scientific research, to expand professional vision, and to develop creative potential. Finally there could develop a atmosphere that full of innovative thinking and innovative spirit.

④ Establish the necessary hardware environment and provide innovative material support. By supplementing and opening the basic research laboratory and multi-functional professional laboratory, students can start their own innovative ideas by operating in hands. Teachers should demonstrate and promote the lab's content and functionality on the Innovation website to ensure that students understand how to use the equipment. As innovative experiments and contests for the electromechanical category need the cooperation between mechanical, electrical laboratory and the gold factory departments, we suggest integrating industrial design laboratory, mechanical basic teaching laboratory, electrical laboratory, and gold factory processing workshop, then opening up an independent mechanical

innovation base to provide rooms, necessary equipment and tools to students. So that students can obtain knowledge experience in a comprehensive, perceptual and creative environment, which can inspire the inspiration of innovation. Given the interdisciplinary nature of the discipline, it is important to emphasize that laboratory is a common platform for innovative education rather than a single subject.

⑤ Focus on propaganda and mobilization, strengthen psychological counseling. Propaganda work must be successful to make participants truly understand the importance of organizing mechanical innovative activities. Establish a correct view of the concept of competence and quality in the group of students to enhance the awareness of participation in scientific and technological innovative activities. Teachers should not only guide students on professional skills, but also pay attention to psychological state of the students to avoid the idea of abandoning competition. When problems occurs, reasons should be analyzed and solved in time. Finally a good situation between teachers, students and various functional departments to develop students' innovative activities developed.

⑥ Ensure adequate funding. While saving the use of competition funds, efforts should be taken to actively expand the sources of funding. Although colleges and universities provide financial support for mechanical innovative activities every year, the increase of participants makes the funding always stretched. In order to enable students not to lose the opportunity for innovative practice due to financial problems, teachers with research funding and business units with sponsor are encouraged to take part in it.

⑦ Improve the incentive policy of innovation. Colleges and universities can set up the innovation fund for extracurricular activities in science and technology, the credits for innovation and practice, and commend the innovation achievements. Through a good incentive mechanism, more students are willing to join in. Give a certain extra-curricular credits to students who finished extra-curricular experimental project, which also has a good effect on scholarship evaluation. Give teachers who participated innovative activities a certain amount of work, and job engagement policy linked. In addition, the characteristics of two different cross disciplines means more

than two teachers are needed, the order of their name is not important for workload.

4 Concluding remarks

National and social demand for innovative talents is imminent, while innovation ability is a system, complex, long-term project. If efforts are taken only after all plans and programs are completed, it will waste a lot of time, opportunity and cost. This thesis analyzes the enlightenment of mechanical innovation, present teaching situation and existing problems of local university, presenting the principal factor in influencing the creativity of college students and proposing some suggestions concerning instructors and students, hardware, software and so on. "Innovation and entrepreneurship" is not only the general direction of students in colleges and universities, but also a major theme of national sustainable development. Every effort that we have tried will make a positive effect on the achieving of "Innovation and entrepreneurship" by students, society and the nation.

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