

# Exploration on the Teaching Mode of Knowledge Direct Acquisition Based on Engineering Training

Jincheng Li\*

*School of Aerospace Information  
Aerospace Engineering University  
Beijing, China*

Fengkun Yu

*School of Aerospace Information  
Aerospace Engineering University  
Beijing, China*

Ailing Li

*School of Sergeant  
Aerospace Engineering University  
Beijing, China*

**Abstract-It is a hot topic to study the college students' innovation consciousness and ability cultivation. This paper explores the current situation of engineering college students' lack of innovation consciousness and ability, the importance of the teaching concept of direct knowledge acquisition to the cultivation of undergraduate students' innovative consciousness and ability, and proposes a teaching model based on engineering training to strengthen direct access to knowledge and improve the innovation ability of undergraduate students. This study may give some useful references for improving the innovation ability of undergraduates.**

**Keywords-engineering training, direct access to knowledge, reform in education, innovation ability**

## I. INTRODUCTION

In the context of "mass entrepreneurship" and "mass innovation" advocated by the state, strengthening and promoting education reform and improving the innovation consciousness and ability of undergraduate students have become one of the major topics concerned by educators. Cultivating engineering and technical talents with innovative spirit and ability is the foundation of building an innovation-oriented country. The root of "innovation" is practice. Dissatisfaction with old theories, technologies or schemes in practice is the driving force for innovation or creation. Engineering training is an important form of science and engineering teaching. Science and engineering teaching attaches great importance to experiments. First, it is for the support of academic theory. Second, it is to cultivate students' invention habits. The latter is more important for engineering training or experiment.

It is more efficient to acquire knowledge directly through observation, analysis, induction and summary in the process of engineering training. As a supplement to classroom teaching, teaching through direct knowledge acquisition will play an important role in promoting students' innovation ability.

## II. ANALYSIS ON THE CURRENT SITUATION OF INNOVATION ABILITY TRAINING OF ENGINEERING COLLEGE STUDENTS IN CHINA

### A. *The Teaching Content Lays Particular Stress on the Indirect Imparting of Knowledge, and It is Difficult to Stimulate the Creativity of Students*

At present, the popular textbook writing mode in Chinese colleges is still based on the construction of students' subject professional knowledge system. Through systematic learning, students can establish the structure of professional knowledge. The specialized basic courses learned in class are boring and difficult to understand. The teaching content is not closely related to students' current actual cognition. Many tool courses, such as advanced mathematics and engineering mathematics, mainly focus on theoretical derivation and computational analysis, leading to their in-applicability as tool subjects. Quite a lot of students don't know what they can do after completing the course and why do they have to learn, just remember a bunch of formulas and do a lot of exercises. But how to use these professional basic tools or knowledge in engineering practice, many students neither know nor care.

Traditional classroom education, which emphasizes indirect teaching of knowledge and only focuses on knowledge accumulation, leads to that students have been passively accepting the knowledge points taught by teachers in class and the atmosphere of active learning is very poor. In addition, the heavy calculation and numerous knowledge points that need to be memorized cause that students' imagination cannot be stimulated. For scientists, it is difficult to generate original ideas without rich imagination, let alone innovation and creation.

### B. *It is Necessary to Strengthen the General Education Which is Conducive to the Formation of Modern Scientific Thinking Methods*

The formation of scientific thinking methods is an important prerequisite for students to have innovative ability. Guo Bingwen, a master of modern education in China, believes that the nature of Chinese education for thousands of years belongs to the education of pure literature, philosophy and morality. There is little practical education of modern significance, and there is no knowledge that requires experimental methods or inductive

reasoning. This is the root of the backwardness of social life and science before the great educational reform in modern China. The experimental methods and inductive reasoning used in science are important contents of modern general education [1].

General education is conducive to promoting the all-round development of people. Nowadays, the development of society requires more and more knowledge, ability and cultural quality. To successfully integrate into social life, individuals must have higher comprehensive quality and multiple talents. This requires that school education should strengthen the concept of general education, promote students' all-round development through classroom teaching, teachers' personality influence and campus culture edification, in order to better meet social requirements. Whether it is general education or higher education, it is necessary to attach importance to general education.

### *C. The Teaching Process Emphasizes Theory Input and Verification, and the Guidance and Motivation of Students' Creativity Need to be Improved*

In the current university teaching, the loss of teaching art makes knowledge become an objective expressible and transmissible object, and gradually forms the teaching legality of teachers' "teaching and imparting teaching". The teaching material with logical deduction as its basic feature becomes the legal teaching track. Textbooks with logical deduction as the basic feature have become the "legal" teaching track. The so-called inspiration is to make students understand how to receive professional knowledge along this logical track. It is difficult for students to have a space for subjectivity [2]. Although this teaching mode has its advantages, its biggest disadvantage is that it is difficult to stimulate students' curiosity, which is the source of innovation.

The history of scientific development shows that the greatest driving force for many significant scientific discoveries and technological progress is the demand for economic and social development on the macro level, and the dissatisfaction of scientists in explaining unknown phenomena and their curiosity about unknown phenomena on the micro level. Therefore, in order to improve students' innovation ability, it is necessary to cultivate students' curiosity about unknown things, create an environment for free exploration, and strive to create various material conditions and platforms for students to explore unknown fields freely.

### **III. THE TEACHING MODE OF DIRECT KNOWLEDGE ACQUISITION**

Direct access to knowledge is a way for learners to actively put their thoughts and energy into acquiring knowledge through personal research and practice, which is an exploratory learning process. The indirect acquisition of knowledge mainly refers to the form of classroom teaching, in which teachers systematically impart the existing knowledge to learners through logical deduction.

Some scholars have suggested that in the initial stage of acquiring knowledge, logical deduction is secondary, but it is important to use non-logical methods such as imagination, guessing, and intuition to open the mind and seek ways to discover and solve problems so as to obtain knowledge and achieve the understanding of the essence of things [3]. The author believes that this view is correct. It is an important measure to pay attention to the direct acquisition of professional knowledge and the training of thinking methods, which are in line with students' learning habits and cognitive rules and conducive to improving the teaching effect. The teaching practice in many universities in China shows that engineering practice training is the main way for college students to acquire knowledge directly, which is not only conducive to students' faster and better understanding of the learning content, to enhance students' interest in learning, to improve the teaching effectiveness, and most importantly, to enable students to develop habits of exploring unknowns.

Innovation is the process or result of a motivated subject acting in a passive environment. In many cases, the process of creation is artistic. Through a variety of engineering training and teaching to strengthen the direct acquisition of knowledge, and vigorously cultivate students' awareness of active inquiry, active communication, stimulate the curiosity of students. Compared with the traditional teaching mode of acquiring knowledge indirectly in class, the direct acquisition of knowledge not only enables students to acquire new knowledge or skills more effectively, but also stimulates students' initiative to solve problems, which is conducive to the cultivation of innovative ability.

### **IV. TEACHING METHOD OF DIRECT KNOWLEDGE ACQUISITION BASED ON ENGINEERING TRAINING**

The history of technological development tells us that the fundamentals of technological innovation come from practice. New theories and new technologies are produced in practice exploration. In European and American higher engineering education, the engineering training of product design, technology development and industrial management, which are directly connected with social enterprises, is an important part of practical teaching. It focuses on cultivating students' independent learning ability, problem-solving ability, engineering awareness, cooperative communication skills, and teamwork and innovation spirit. Engineering training and classroom learning form a close system, with the times and advanced nature, to meet the requirements of society and enterprises [4]. Therefore, relying on engineering training to strengthen the direct acquisition of knowledge plays an important role in improving the innovation consciousness and innovation ability of college students.

#### *A. Engineering Training is the Supplement and Promotion of Practice Teaching and Theory Teaching*

Engineering training is an important form of practical teaching. Through the practice process of engineering

training, students can learn to think horizontally, learn to connect with reality, learn to comprehensively consider problems and deal with uncertain factors, and learn teamwork. At the same time, it can also promote theoretical teaching and enrich students' theoretical knowledge [5]. Engineering training can make up for the lack of theoretical teaching. Intuitive training forms and random failure problems are beneficial to maintaining and expanding students' imagination and strengthening students' ability to solve practical problems.

The theoretical teaching and the practical teaching of engineering training jointly support the cultivation of students' quality and ability. The two cannot substitute each other and have their own educational rules. They must be organically combined and connected, and relatively independent. The educational characteristics of practical teaching are embodied in experiential, practical and training. This feature determines that engineering training is not a short-term process, but a lifelong process. The cultivation of students should be guaranteed by systematic training, which reflects the basic responsibility of the cultivation of process quality and innovation ability. It should be based on the engineering knowledge, through the training of basic skills, and finally be implemented in the concrete realization and gradual deepening of engineering projects. In the system of designing engineering training, the diversity, advancement and systematization of teaching contents are emphasized in the design engineering training system [6].

#### *B. Engineering Training is an Important Way to Inspire Students to Directly Understand Nature and Strengthen Engineering Consciousness*

Engineering consciousness is a highly sophisticated and highly organized person formed in the minds of people by combining the principles of natural science with the skills and experience accumulated by human beings in production practice and applying them to the practice of human use and transformation of nature. Brain function, is a high-grade special substance. People combine the principles of natural science with the technology and experiences accumulated in the production practice, and then apply them to the practical process of human transformation of nature. A highly developed and organized engineering consciousness formed in people's mind, which is a higher special substance [7]. Engineering training is practical and comprehensive, and the personnel involved in the training should have the willingness to explore actively.

The training of engineering cultural quality promotes the improvement of competition ability, promotes the cultivation of students' basic cultural knowledge and engineering cultural quality, helps students understand engineering, and improves their professional interest. To create a good campus cultural atmosphere that advocates engineering, pursues innovation, and promotes engineering spirit, cultivate the team spirit and competitive

consciousness of college students, develop a good style of study.

#### *C. Engineering Training is the Basic Platform for College Students to Practice Innovation and Entrepreneurship*

Innovation practice should be based on certain practical ability. In order to enable students to fully exercise and form practical ability, and to innovate on this basis, it is necessary to build an optional practical teaching system for students from low to high, from basic to professional, and to incorporate innovative practices into engineering training. This is not only beneficial for students to stimulate innovative thinking and exercise innovative ability in engineering practice, but also can directly combine innovative results with engineering practice to reflect the application value of creation, so as to better mobilize students' enthusiasm for innovation [8]. The famous bell laboratory in America is a paradise for scientific researchers, which has a superior research environment and gives researchers full freedom. It is the center of scientific and technological innovation in the United States. The engineering training center should be a paradise for students' innovation competition practice and a platform for students to carry out innovation practice activities.

For engineering colleges and majors, discipline construction and engineering training should be closely integrated. Use the concept of big training platform to build a training platform based on discipline direction. More comprehensive, open and research-based practical training contents can be designed on one platform, including cognition practice, engineering skill training, open experiment, students' innovative extracurricular activities group, teachers' educational reform base, professional course design and graduation design. Various practical training tasks enable students to master the knowledge and skills of system engineering technology, improve the quality of students, and inspire students' innovative thinking [9].

The practice of innovation competition is mainly through the form of extracurricular activities such as academic competition activities, innovation and entrepreneurship training programs, and innovative design competitions, so that students can comprehensively apply the knowledge of in-class learning and the basic engineering practice ability and innovation consciousness. Under the guidance of teachers, driven by the desire to explore the unknown technology field and the psychology of winning, students can give full play to their imagination, so that their design ability, innovation ability, team communication and cooperation ability can be fully cultivated [10].

## V. CONCLUSIONS

Direct knowledge acquisition is a comprehensive process of active inquiry and summary of knowledge acquired in practice. Exploring the unknown with curiosity and imagination is the source of innovation. Innovation is the initiative to change the status quo. The teaching concept

and method of directly acquiring knowledge is a teaching mode based on the teaching form of engineering training under the premise of maintaining students' curiosity and imagination. By constantly optimizing and improving the content and form of engineering training, we insist on building a platform for students' free thinking and training, which plays a good role in promoting students' innovation ability.

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