

Explorations of Compound Talents Cultivation of the Academy Education under the Background of “Emerging Engineering Education”

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Abstract: To meet the needs of the new economic development, the “emerging engineering education” requires the cultivation of high-quality compound talents with strong abilities of practice, innovation and international competitiveness. The academy system, as the useful supplements of the running mode of modern universities, focuses more on the general education and discipline integration, the second classroom and self-management, collaborative education and teacher-student community than the traditional college system. Therefore, it is more conducive to the cultivation of students’ compound knowledge structure, common features of compound ability and compound thinking model. It has become a helpful exploration of the current cultivation mode of compound talents in China.

Introduction

The Ministry of Education officially launched the “emerging engineering education” plan in 2017 to approach the challenges of the new technologies and the international competition of new industries as well the active layout of the development of engineering and science and technology talents. From the perspective of “emerging engineering education”, it can be found that compound talents are the starting point and the end-point of talent cultivation in colleges and universities in the new economic era. Therefore, it is of great theoretical and practical significance to explore the common features of compound talents in theory and to find ways to improve the interdisciplinary ability of college students in practice both for the improvement of the quality of personnel training in colleges and universities and for the implementation of the national “emerging engineering education” plan.

Common Features of Compound Talents

Generally speaking, compound talents are those with solid foundation, broad knowledge, strong abilities to use knowledge, scientific and innovative spirit, proficiency in international conventions, down-to-earth working style and good exchange ability in language and culture, that is, those with one specialty with various skills ^[1]. As for the common features of compound talents, the existing studies have not reached a consensus, but it can be seen that through comparing different studies the compound talents generally have the following three features: the compound knowledge structure, the compound capacity characteristics and the compound thinking mode. Compound knowledge structure refers to fundamental theoretical knowledge and basic skills of two (or more) specialties or disciplines which are cross-cutting, mixed, and infiltrating each other, integration of arts and science, and of science and technology. Compound capacity characteristics are distinguished by abilities of learning, innovation, practices and social adaptability, and to independently acquire and update knowledge as well as to apply the knowledge to propose solutions. Compound mode of thinking refers to a wide range of thinking which is mainly divergent, multi-dimensional and

non-linear. It has a wide interest in learning and is good at exploring the internal relations and laws of things from various angles, aspects and levels.

Reform of College Academy System

Background of the Reform of Academy System. In the present turbulent period of social and economic system reform, China is urgent to vigorously promote the structural reform of the supply-side of higher education and strengthen the function of high education in serving the society. However, the drawbacks of the current students' management system of colleges and universities make it difficult for higher education to meet various demands of society. To adapt to the changing social environment, promote China's economic transformation and build an innovative country, there is a pressing need for higher education to explore a pattern which is more effective and more in line with the requirements of the times. As a result, the academy system came into being.

Advantages of Academy System Reform over the Talents Training Model of the Traditional College System. Although the academy system of each college and university has different development modes and characteristics in the specific implementation process, in general, it has the following advantages compared with the talents training model of the traditional college system.

First, academy system emphasizes the integration of general education and disciplines. At present, China has been adopting the former Soviet Union's professional training model, focusing on enhancing students' professional knowledge and skills to meet the needs of the national industrial development. However, the "college-school(department)-class" three-level talent training system is not conducive to the communication among students of different schools and majors; in the career-oriented curriculum system, general education courses are easy to become formalized. With the current rapid development of "emerging engineering education", experts from all over the world generally believe that "the cracks in science and liberal arts in the modern world are bound to bond with humanities." Therefore, schools and universities urgently need to strengthen the general education to cultivate engineering and scientific talents who will become leaders in humanities.

The academy system effectively makes up for the deficiencies of professional education functions of secondary colleges. It helps students establish self-awareness and values, improve students' humanistic literacy, and optimize and improve their knowledge structure by offering general education courses integrated into credit management system, or designing modular general education courses or plans independently. The academy system also implements a mixed-room system, which distributes students of different grades and majors to a dormitory room, thus breaking the gap between disciplines and strengthening the horizontal exchange among students of different majors, which is conducive to the knowledge intersection, integration and infiltration in different disciplines. For example, Shantou University began to implement the international benchmark credit system in 2002 and nearly 70% of the professional courses are available for students of other majors, which provides more options for students, but at the same time weakens the concept of class. In 2003, the mixed dormitory system was implemented to strengthen the interdisciplinary cultivation of students of different majors and grades, and to promote students to learn from each other. However, it also has brought impacts to the traditional student management system. In order to adapt to the reform of the credit system and mixed dormitory system, Shantou University established the first four-year residential college—Veritas College, for undergraduate students in 2008. It implemented the academy system in October 2017 which ensured that each dormitory covered students from at least three majors. It also helps students broaden basic knowledge of humanities and social sciences through general education courses such as learning and courtesy, classics reading and so on.

Second, academy system emphasizes the second classroom and self-management. For a long time, there are rich and colorful extracurricular activities in colleges and universities in China, but few cultural activities based on students' dormitories. Miller, a student affairs expert, believes that accommodation can improve students' ability of public communication, and puts forward three goals for students' accommodation: first, to offer students a place to rest; second, to offer students a place for cultural exchange; third, to help students improve their accomplishment with the help of dormitory managers^[2]. The present dormitory life just achieves the first goal and the boring dormitory life easily makes the students who lack abilities of self-restraint and time planning indulge in the Internet after class, thus wasting precious university time.

The academy system gives full play to the function of educating people in dormitory life community, expands the scope of students' interpersonal communication by carrying out rich cultural activities in the second classroom, and improves their "four-self ability"(self-education, self-management, self-service and self-restraint). For example, the full-time mentors of Defeng College of Southern Medical University have set up six studios to carry out cultural activities according to the needs of students after investigation, thus forming the cultural characteristics of the college. Among them, the "Creator Workshop" enables students to use 3D printers and unmanned aerial vehicles according to their own interests, so as to enhance their capabilities of innovation and practice; the "Education Studio" which integrates the systematically planned ideological and political knowledge into activities can not only present dogmatic and boring ideological and political knowledge in a fun way, but also exercise students' abilities of expression, communication and cooperation by integrating and encouraging students to produce PPT, public speeches, or sitcoms by means of competitions; as for the "Worm Studio", the instructors led students to investigate the situation that local residents in Shunde who were infected with liver trematode eggs because they liked to eat raw fish. And by a series of social activities such as "social survey-pathological examination-report formation-publicity education", students were guided to serve the society and worship with their own professional medical knowledge to contribute to society and enhance their scientific research ability and social responsibility.

Third, academy system emphasizes collaborative training and teacher-student community. Since the implementation of mass enrollment of higher education in 1999, the number of students in colleges and universities in China has increased explosively, which has accelerated the popularization of higher education. However, the teaching concept centering on classrooms, books and teachers and the teaching method of large class teaching has hindered the development of students' individual development. In addition, since 1990, Chinese universities have implemented the principal responsibility system under the leadership of the Party Committee, the internal management system of universities has presented a typical bureaucratic structure. The efficiency of university management has been enhanced, but the top-down student management system formed under the highly centralized model makes students lack autonomy in self-management.

The academy system breaks through the bottleneck of traditional student management system. Under the form of a matrix structure between the academy and the school, students can not only learn professional knowledge in the school, but also expand humanistic literacy and exercise comprehensive quality in the academy. They can also communicate with students from different grades and majors to stimulate divergent thinking. The academy also implements the mentor system, which allows students to choose their mentors freely according to their wishes. The mentors are responsible for guiding students' study, employment and daily life, and providing solutions according to individual problems of each student, which makes it possible to cultivate personalized and differentiated talents. For example, Xi'an Jiaotong University adopts a matrix organizational

structure of student work management model. The academy's student work is managed by the academy, and the school is only responsible for teaching and scientific research. There are three types of faculty serving as student mentors in the academy: permanent mentors (instructors), who mainly help students solve problems in life and distress, and have a positive impact on students' personality formation, value orientation, etc; professors, who specialize in solving academic problems for students, and part-time mentors, who mainly are experienced students^[3].

Role of College Academy System in the Training Model of Compound Talents

Given the advantages of the modern college academy system over the traditional college system, the college academy system can play an active role in the cultivation of compound talents. The academy system plays an important part in the cultivation of compound talents in the following three aspects (refer with: Fig. 1).

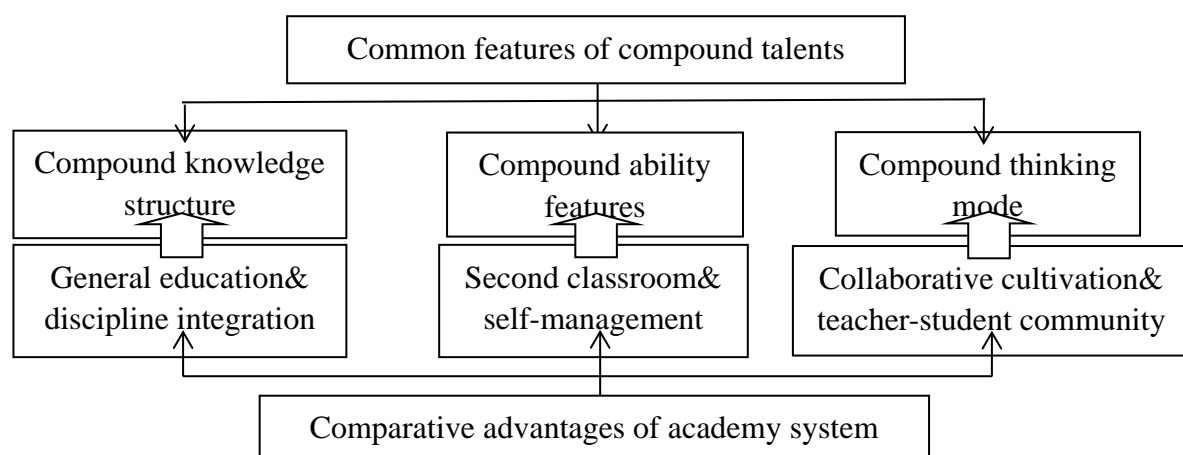


Figure 1. Role of College Academy System in the Training Model of Compound Talents

General Education and Discipline Integration of the Academy System Help the Formation of Compound Knowledge Structure. As mentioned above, the cultivation of compound talents requires a multi-level knowledge structure which achieves intersection, integration and penetration. The cross-industry and cross-domain new economy has spawned new disciplines with cross-border characteristics which require students to both have professional knowledge and technical ability to solve engineering problems, and global vision, humanistic spirit and innovative ability. The academy system, stressing the general education, carries out humanistic lectures or fundamental general courses to broaden students' knowledge to meet the requirements of knowledge structure for compound talents. Moreover, the interactive learning community of the academy system provides a platform for students to communicate with students of other majors. The intersection of different professional backgrounds and the collision of various thinking modes further realizes the goal of the cultivation of comprehensive talents with broad foundation and wide knowledge.

Second Classroom and Self-management of the Academy System Help the Cultivation of the Common Features of Compound Abilities. The cultivation of compound talents needs to cultivate students' abilities of learning, innovation, practice and social adaptability so that they can correctly manage and develop themselves. The "emerging engineering education" characterized by new ideas, new standards, new models, new methods, new technologies and new cultures demands students not only update themselves in time, but also apply what they have learned to solve practical problems creatively. The academy system stresses the second classroom, exercises students' comprehensive quality and improves their comprehensive and innovative abilities by the

development of cultural activities which are in line with the demands of the ability features of compound talents. The academy also encourages students to manage and serve themselves. Students can devote themselves to academy life more wholeheartedly by stimulating their enthusiasm to participate in management, thus promoting them to draw nutrients in the academy to grow and become talents.

Collaborative Cultivation of Academy System and Teacher-student Community Help the Shaping of Compound Thinking Mode. The cultivation of compound talents demands divergent, multi-dimensional and non-linear logical thinking, curiosity and thirst of knowledge for life. “Emerging engineering education” calls for the development of students’ critical thinking and creative thinking, thus forming systematic logical thinking ability. The academy devotes itself to the service and cultivation of students with the help of the flexible division with the college so that students can form flowing, flexible and unique thinking features in the blending and collision of knowledge in different disciplines, so as to meet the requirements of compound talents for thinking mode. Moreover, the academy implements the mentor system, which enables students to discuss and learn with their mentors closely by setting up a platform, so that students can form an ideological resonance with the mentors who have rich academic knowledge and life experience in a free and relaxed atmosphere, which is conducive to the cultivation of students’ creative thinking.

Conclusions

As the local response to the reform of international engineering education in China, “emerging engineering education” proposes to train high-quality compound talents with strong abilities of practice, innovation and international competitiveness. As a useful supplement to the running mode of a modern university, academy system has established a learning community with academy as a unit, carried out rich general courses and cultural activities, promoted the intersection and integration of disciplines, and constructed a platform for communication between teachers and students, which is the active exploration of the cultivation mode of compound talents in the new era.

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