Innovation of Educational Philosophy and Exploration of Teaching Practice of "Integration of Knowledge and Action" in Higher Education

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Abstract-**Under the background of national innovation-driven development and higher education reform, the innovative development of the educational philosophy in higher academies have become an inevitable trend. In this paper, based on the analysis on the myeducational philosophy of higher education and higher academies in China and other countries, the teaching philosophy of "integration of knowledge and action" was proposed. The reform of innovative practice teaching for undergraduates was effectively promoted by innovative practice strategies including constructing the "tree" of knowledge system, complementing the first classroom with the second classroom, and implementing the "undergraduate tutor system", etc. The results of teaching practice verified the effectiveness of "integration of knowledge and action". In addition, the suggestions on the development and reform of the teaching philosophy in higher academies have been proposed based on the summary of the teaching practices and activities.**

Keywords-higher educational reform, teaching philosophy innovation, "tree" of knowledge system, talent cultivation

I. INTRODUCTION

Implementing the innovation-driven development strategy and emphasizing that scientific and technological innovation is the strategic support to enhance social productivity and national strength are China's major development strategy, which has an overall view, faces the whole globe, focuses on the key issues, and boosts the whole development. With the further development of the reform and opening up policies in China, the higher reform has also ushered into a new historical period.

The rapid-changing high-tech battlefield requires talents with a comprehensive knowledge structure, higher scientific literacy (including innovation ability) and overall quality. The changes in higher demand require higher academies to change their educational philosophy and personnel training objectives accordingly. The teaching philosophy of higher education is the soul of talent cultivation. With the change in the training objectives, the rational adjustment of the teaching philosophy has become necessary for the development of higher academies.

Throughout the development history of the institutions in China and other countries, the educational philosophy that complies with the time requirements and the personnel training tasks has played a leading role in the development of the institutions. This paper aims to analyze the current educational philosophy of colleges and universities in China and other countries and to propose an educational philosophy for higher colleges and universities to the requirements of times. In addition, some suggestions were provided based on the practice of the educational philosophy in the author's institution. These suggestions can hopefully provide some guidance for the development of the education in higher colleges and universities.

II. ANALYSIS OF EDUCATIONAL PHILOSOPHY AND HIGHER EDUCATION IN COLLEGES AND UNIVERSITIES IN CHINA AND OTHER COUNTRIES

Educational philosophy is a signpost for the development of education. Higher education is an engine of innovation in the development of science, culture and art for a country. Zhou Yuanqing, a famous educator in China, said that "With regard to the reform of the education, the reform of the educational philosophy is the lead, the reform of the education system is the key, and the reform of teaching content and the curriculum is the core" [1]. Based on the connotation of the higher education concept, the

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most important thing of education is to solve two problems: one is the cultivation of talents in higher education, and the other is the self-development of the higher education. In this process, the innovation of the higher education concept is the precursor [2]. Therefore, the innovative development of the educational philosophy must focus on the core issue of what kind of people need to be trained in colleges and universities.

Harvard University has summarized its educational philosophy as follows: Education should provide a foundation for students to develop self-reliance and lifelong learning habits so that they can develop knowledge, enhance understanding, and serve the society in their future lives. Since the foundation, Stanford University has considered the cultivation of "useful" people as its educational purpose. Stanford University has evolved from a non-dominant local university to a world-class university, making an invaluable contribution to its educatees, American society, and entire humanity. The development history of Standard University proved the significance of the educational philosophy to the schooling education [3].

As a world-renowned higher education, the United States Higher Education at West Point has always adhered to the elite education concept and established the cultivation of the future leaders as the core mission. The objectives of talent training in the West Point clearly stated that "Cultivate leaders with good education, excellent professional skills, strong physical fitness, and noble moral standards." Under the guidance of the elite education concept, a large number of talents have graduated from West Point. Thus the West Point has established its position in higher education and become a world-class university [4]. Although the educational philosophy is invisible and intangible, it influences every teacher and student on campus every single moment. Educational philosophy is the soul of a university and the spiritual faith of developing a first-class university.

The Development of education should start with the development of educational philosophy. This assertion was perfected explained by the eight basic concepts on the modernization of education proposed in "China Education Modernization 2035". The basic educational philosophy in China in the future are as follows: place greater focuses on moral integrity, comprehensive development, individual-oriented development, lifelong learning, teaching students according to their aptitude, the integration of knowledge and action, integrated development, and joint contribution and shared benefits.

III. INNOVATION OF EDUCATIONAL PHILOSOPHY IN HIGHER ACADEMIES AND EDUCATION SYSTEM OF "INTEGRATION OF KNOWLEDGE AND ACTION"

Higher academies should use their core missions as the basic goal and integrate the goal of cultivating outstanding talents into the school's educational philosophy. The author believes that the teaching philosophy of higher academies

should use general education as the basis to cultivate comprehensive quality talents with common national will, unified ideology, excellent higher skills, excellent scientific literacy, and strong physical fitness.

A. "Unifying the Will and Facing the Future" – Connotation of the Educational Philosophy of Higher Academies

The main education mission of higher education is to strength the scientific, and cultural foundations of the students. Through the study and training in the colleges and universities, students should be able to obtain the rapid-learning ability and adapt to future training. On the basis of the educational philosophy of universities in China and other countries, the author proposed the elements of the educational philosophy in higher academies, as shown in Figure 1. Among them, "unified will" is one of the quality will requirements and "facing the future" is one of the competence requirements. The integration of both requirements reflects the core objectives of the training of talents in the troops.
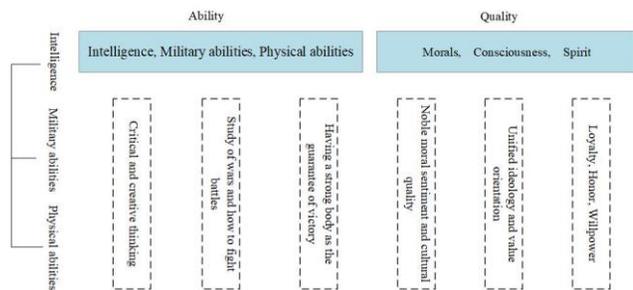

Figure 1 Educational philosophy of higher academies

B. Education System of "Integration of Knowledge and Action" under the Educational Philosophy of Innovative Higher Academies

The educational philosophy of "unified will and future-oriented" plays a guiding role in the educational activities of higher academies. Looking back at history, the traditional educational and learning philosophy in China is "study extensively, inquire prudently, think carefully, distinguish clearly, and practice earnestly." The "practice" is considered as the last part with highest significance of the education pathway. "Practice" is the completion of internalizing "knowledge", "learning", and "question" to quality through thinking (thinking and discriminating). Thus "Practice" is considered as the judge to ensure knowledge is internalized as quality and manifested as the behavioral ability [5]. "Integration of knowledge and action" is not only the essence of the traditional educational philosophy in China, but also the inherent requirement on the practice of the teaching philosophy, "unified will and future-oriented", of the current higher academies.

As shown in Figure 2, the author proposed the education system of "integration of knowledge and action" based on the educational practice in Communication

Engineering area. By adopting the "ladder" training mode, the concept of "integration of knowledge and action" has been applied into the teaching practice and achieved great outcomes. The "ladder" training mode refers to the three training levels, i.e., basic training, comprehensive training, and innovative practice according to the grade level of the students.

The innovative education system of "integration of knowledge and action" can be divided into four levels, i.e., classroom teaching, technology association, engineering training, and innovation training. The purpose of classroom

teaching and technology association is to have students acquire existing knowledge quickly and indirectly through teaching method such as classroom teaching. The purpose of engineering training and innovation training is to enable students to directly acquire or discover new knowledge through training methods such as project practice. Based on the analysis on the education system of "integration of knowledge and action", basic teaching focuses on the training of instrumental rationality while practical or innovative teaching focuses on the training of the value of knowledge.
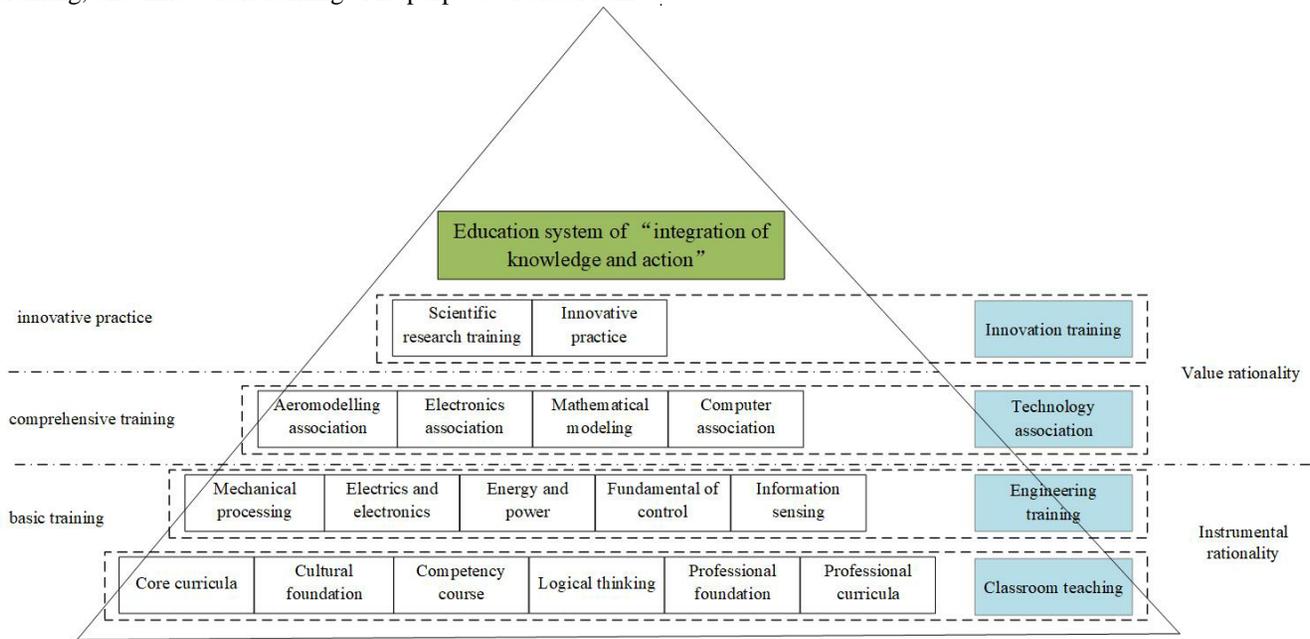

Figure 2 Education system of "integration of knowledge and action"

IV. PRACTICE AND ANALYSIS OF TEACHING PHILOSOPHY AND TRAINING SYSTEM IN INNOVATIVE HIGHER ACADEMIES

The educational philosophy is the soul of teaching institutions. However, like human beings, the existence of the soul relies on the body. Good educational philosophy can only exert an extraordinary leading role when it is implemented in teaching practice activities.

In accordance with the educational philosophy of "unified will and future-oriented" in higher academies and the education system of "integration of knowledge and action", teaching and training practice activities have been performed. In addition, based on several years of practical exploration and experience, the author proposed a series of useful teaching ideas and personnel training modes.

A. "Tree" of Knowledge System – the Core of Innovative Practice

The university trains talents for tomorrow's society. If the university is over-specialized, the cultivated talents will be limited by not only the low adaptability but also the lack

of the potential of sustainable development. The development of the "tree" of knowledge system for undergraduate students is based on the guidance of scientific methodology and the demand for the future talents with novel technology. The "tree" of knowledge system plays an important role in in science and technology innovation activities by improving the knowledge structure, especially the interdisciplinary and multidisciplinary knowledge structure. Taking the Communication Engineering as an example, the undergraduate students are trained to build a "tree" of knowledge system, in which communication is the "root", information technology is "trunk", automatic control, mechatronics, artificial intelligence, virtual reality, etc. are "branches". The "tree" of knowledge system can eliminate the professional barriers and improve the knowledge structure for undergraduate students.

B. Complementary Interaction between "First Classroom" and "Second Classroom" – the Source of Innovation

The future industrial revolution and economic development require practitioners to have a broad

knowledge, a broad vision, the adaptability and innovative thinking ability in an uncertain environment. In order to achieve the goal of "integration of knowledge and action", we created the "second classroom" with systemic and technological innovation and implemented the concept that "practice is not only to verify knowledge but more importantly also to directly acquire knowledge". The purpose of the "second classroom" is to encourage students to understand and verify knowledge as well as to acquire new knowledge through practice.

The first classroom

Communication principle	Computer network	Aerospace communication
Microcomputer principle	Embedded system	Programming basics
Mathematics	Physics	Signal and system

Complementary

The second classroom

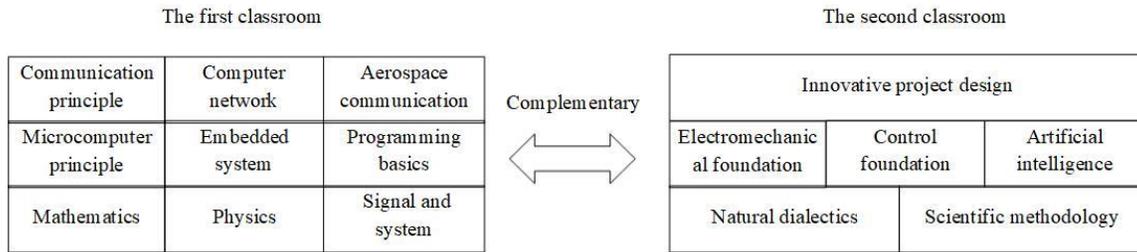| Innovative project design		
Electromechanical foundation	Control foundation	Artificial intelligence
Natural dialectics		Scientific methodology

Figure 3 Scientific and technological innovation training courses

The "second classroom" is the comprehensive, designed, and research practical teaching of theoretical knowledge and it is centered on inquiry. Through such practical teaching, not only the students' understanding of theoretical knowledge is deepened, but also the students' ability to explore the unknown is cultivated through practice. For example, the curriculum system for developing science and technology innovation ability in the Communication Engineering Major in the author's institute has been established, as shown in Figure 3.

C. "Undergraduate Tutor System" and "Undergraduate into Laboratory" – the Effective Measures for Innovative Practice

A series of effective teaching methods for innovative practice such as "Undergraduate Tutor System", "Undergraduate into Laboratory", "going out of the school, "practicing in the competition", etc. were performed, which ensured the development of innovative practice activities.

The tutor system is a unique training system for undergraduate students at Oxford University, which is one of the reasons of the excellent performance of Oxford University. The tutor system, although has the knowledge imparting process, focuses more on encouraging the learners to actively develop their ability of independent learning, independent working, and critical analyzing. Thus the essence of the tutor system is a theory that teaches young students to think independently [6]. The implementation of the "innovative tutor system for undergraduate students" is a useful supplement to the current undergraduate teaching system. The "Undergraduate into the Lab" activities will enable students to get close to the research environment, receive scientific research training, and lay the foundation for future success. "Going out of the school and practicing in the competition" plays a positive role in broadening the visions and improving the learning initiative and enthusiasm of the students.

D. Analysis on the Practice and Effect of the Innovative Ability Cultivation with "Integration of Knowledge and Action"

In the past three years, the author has continued to promote the innovative ability cultivation in the Communication Engineering Major in his university. More than 100 undergraduate and graduate students in Communication Major and Control Major have participated in innovative practice activities. The students have obtained impressive awards, including 1 international silver medal in the international and national university competitions, 3 national special prizes, 3 first prizes, 5 second prizes, and 2 third prizes. Based on the statistical analysis on graduates in the past three years, the outstanding paper rate was 20% for the students with the cultivation of innovative ability, which was double as high as that for the students without the cultivation of innovative ability. The advantages of cultivation of innovative ability in the outstanding paper rate, paper publication rate, and award-winning rate are shown in Figure 4.

Comparison of innovative teaching philosophy and training practices

Students without innovative practice
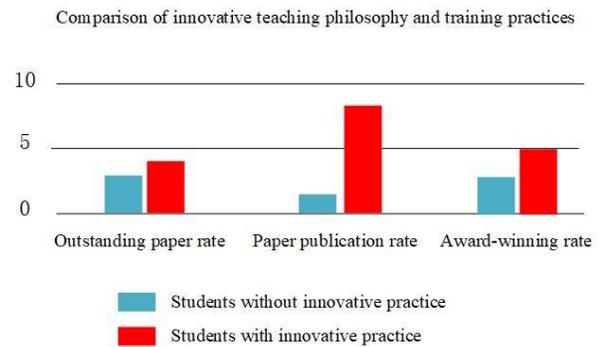Students with innovative practice

Figure 4 Comparison of innovative teaching philosophy and training practices

V. SUGGESTIONS ON THE INNOVATION OF EDUCATIONAL IDEAS IN HIGHER ACADEMIES

A. Reform of Educational Philosophy – the Prerequisite for Students' Cultivation of Innovative Ability in Higher Academies

Under the guidance of the Liberal Education in ancient Greece, Humboldt proposed the educational philosophy of "academic freedom, teaching freedom, study freedom" and "development by science", and created a teaching model of general education, resulting in the academic position of Humboldt University and later Harvard University [7]. Nowadays, higher education is undergoing tremendous changes. Cultivation of innovation has become a trend and educational philosophy has been constantly updated from inheritance-dominant to innovation-dominant. The traditional education and teaching model based on imparting knowledge can no longer adapt to the social development. The teaching modes in major universities are developing towards exploring learning, practical learning, and cooperative learning to cultivate students' innovative spirit and ability. In addition, the teaching modes have changed from ability-oriented to value-oriented. The value orientation is ultimately based on the cultivation of students the ways to treat themselves, others, society, the country, and the world. Furthermore, the teaching modes have changed from the curriculum-centered to the student-centered. The focus of the teaching mode has changed from the cultivation of standardized personality to the cultivation of diverse personality.

In the long history, higher education was focused on the training of educatees to acquire a set of knowledge and skills that are useful for specific industries and positions. Most attention was drawn to the understanding of the key points of knowledge; however, the effective measures of cultivating students' independent and critical thinking ability were lacking, resulting in insufficient innovation capability of students. The innovation of educational philosophy is the premise of the innovative education, the innovation of the training mode is the basis of the innovative education, and the innovation of the management system is the guarantee for the innovative education for the students.

B. Free Academic Spirit – the Basis of the Cultivation of Students' Innovation Ability in Higher Academies

The essence of university development is the development academic atmosphere. Compatible and relaxed educational environment is a necessary condition to cultivate outstanding talents. According to Cambridge University, the purpose of learning is not only to acquire knowledge, but also to obtain a problem-solving method. The potential of students can be greatly developed in a relaxed and free environment [8].

In the practice of innovation ability cultivation, academic freedom is mainly reflected in the two aspects, i.e., freedom of teaching and freedom of learning. The freedom of teaching means that teachers are given complete freedom in the design of innovative training curriculum and the teaching process. The freedom of learning means that students can freely choose various courses offered by the university according to their personal strengths and interests and select majors according to their research interests and personal situations. In order to ensure students' freedom in the cultivation of innovation ability, we must adhere to the open-schooling concept, effectively implement the student credit system, and thus break the restrictions among majors and ensure students' free learning across majors and schools.

C. Student-Centered Teaching Measures and Management – the Fundamental Guarantee for the Cultivation of Students' Innovative Ability in Higher Academies

Students are the main body and the business card of a school. All the work of the school must be based on the cultivation of the students. Higher education institutions should establish a student-oriented and teaching-oriented educational philosophy. Among teaching, research, and management of a university, teaching should be placed in the first order. Various resources should be concentrated on the cultivation of students [9]. All the departments in a university must shoulder the responsibility of cultivating students. Every faculty and staff must be proud of serving students and focus on solving various problems and difficulties in their life, study and self-development. The higher education in the university should prepare students for the future work with healthy personality, good moral character, developed wisdom, and citizen's sense of responsibility and mission.

Student-centered management should also focus on the reform and innovation of teaching evaluation. The Special Research Group of China Higher Education Institute pointed out that it is necessary to continue promoting the transformation of the concepts and rules of teaching evaluation: from the "static quality concept", which focuses on the resources, reputation and output of the university, to the "value-added quality concept", which emphasizes on the changes and improvements of students by university education and meets the ever-expanding market demand; from the mode with the focus on the "teaching" of teachers to the mode with the focus on the "learning" of students, striving to develop a "learning"-centered education quality evaluation system which emphasize learning process and results to promote the students to continuously approach the teaching objectives of comprehensive development [10]

VI. CONCLUSIONS

In this paper, the guiding role of educational philosophy was analyzed in higher education, and the suggestion of integrating the educational goals of colleges into educational philosophy was proposed based on the fundamental status and role of higher college education in the trinity talent training system. In addition, the teaching philosophy of "integration of knowledge and action", which higher academies should adhere to, was

comprehensively explained in the paper. Furthermore, some suggestions were proposed on the development and reform of educational philosophy in higher education of higher academies based on the analysis on the practice and effect of "integration of knowledge and action" in the Communication Engineering Major in the author's institute. Hopefully the suggestions can provide useful support for the innovative reform of educational philosophy in higher education institutions, especially in higher academies, thus improving the education quality and completing the task of talent cultivation.

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