Curriculum Setting and Significance of Embedded Education in Application-Oriented Universities —— A Case Study of Jiangsu University Jingjiang College

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Abstract: The education mode of higher education in China is upgrading and transforming, and the embedded education mode arises at the historic moment. Application-oriented universities need to reposition the teaching courses and methods of embedded education mode from the purpose of cultivating embedded talents with innovative and entrepreneurial ability. Jiangsu University Jingjiang College uses embedded education mode to set up embedded courses. As a basic research of embedded teaching method, starting from the meaning of "embedded" in the computer system, by expanding and embedding the multi-category plug-ins of the system, the computer system teaching is combined with artificial intelligence and diversified embedded resources to carry out teaching, thus expanding the innovation and entrepreneurship education practice of computer, engineering education and other professional talent systems. The core goal is to cultivate students' innovative consciousness, give full play to the advantages of educational background and cross-disciplinary integration, explore entrepreneurial opportunities from cross fields, and improve students' innovative and entrepreneurial competitiveness and success rate. By offering various forms of embedded courses, such as general education courses, subject basic courses, professional courses, quality development courses and practical courses based on software engineering specialty, the graduates of software engineering (embedded) specialty have professional skills and more personality, creativity, imagination, innovation spirit and pioneering ability. Construction of progressive curriculum system, so that students' theoretical knowledge and practical skills acquisition process is closely and coherent, step by step to improve students' comprehensive quality. The embedded education model can enable students to be comprehensively cultivated in terms of ideological, vocational skills and comprehensive quality improvement in a three-dimensional and flexible new education method, so that students can obtain a broader display platform in the face of the social needs of applied talents, and truly achieve the mutual embedding of education and practice. At the same time, the school judges whether the educational goal is consistent with the local economic needs, dynamically adjusts the student training program, and achieves a win-win situation for students and society.

Keywords: Embedded Education, Innovation and Entrepreneurship, Practice, Application-Oriented University

1. Introduction

Under the new development trend of mass entrepreneurship and innovation, the passion and potential of innovation and entrepreneurship are further released. Innovation and entrepreneurship education, as an inevitable product of national development, can only be scientifically combined with discipline and professional education to achieve the current educational purpose of application-oriented universities. As an important form of innovation and entrepreneurship education, embedded education mode is not only the support platform of innovation and entrepreneurship education, but also an important way to realize the goal of innovation and entrepreneurship education. At present, the innovation and entrepreneurship education courses in Chinese universities are mainly carried out in three forms: subject courses offered by management colleges or innovation and entrepreneurship

colleges, general courses offered throughout the school, and 'embedded' courses offered in combination with the characteristics of various disciplines. [1] Associate Professor Cossard, a subject librarian of the University of Maryland (UMD) Architecture Library, and Dr. Gournay, a teacher of the UMD School of Architecture, jointly constructed a unique architecture honor course in 2001, which embedded information literacy education in the subject teaching. [2] The Swedish Medical Library has also implemented embedded teaching in its information literacy education. Their educational goal is very clear, that is, to enable students to apply scientific principles to information processing problems. [3] The embedded education model allows students to come into contact with different types of enterprises and institutions in different semesters, carry out social practice in advance, match social needs, broaden the direction of learning, and ultimately cultivate diversified talents that meet the needs of national development, enterprise needs, professional counterparts, and both moral and academic. For application-oriented universities, how to reposition the courses and methods of embedded courses is an important issue in the training of undergraduate talents.

2. Development of Embedded Education

Embedded education mode is to integrate the concept and idea of entrepreneurship education into various disciplines, develop diversified subject entrepreneurship courses [4], emphasize the coordinated development of subject education and innovation and entrepreneurship education, so as to realize the full coverage and personalized goal of entrepreneurship education for all students.

In the early 1990s, 'learning factory' was born in the United States which is a kind of practical learning place with multiple functions for universities, enterprises and research institutions based on real production and management processes. It puts the learning process in the real production environment, and connects the learning process with the industrial production practice. Through the practice based on the real working environment, students can obtain knowledge and skills. The 'learning factory' was the bud of the development of embedded education mode. The WRCE (White Rose Centre for Excellence in the Teaching and Learning of Enterprise), which was jointly organized by York University, Leeds University and Sheffield University in 1999, studies the teaching reform of innovation and entrepreneurship education. The center proposes to implant

innovation and entrepreneurship elements into professional education modules, and penetrate innovation and entrepreneurship knowledge directly or indirectly in curriculum teaching, which promotes the further development of embedded education mode. [5]

In recent years, the concept of 'embedded' has been concerned by scholars in many fields in China, especially in the field of education. Some scholars have developed embedded teaching equipment according to the characteristics and needs of automation students and introduced it into practical teaching, forming a shared practical teaching platform. Some scholars put forward the importance of cultivating students' innovation through curriculum reform, and try to introduce CDIO education mode to carry out teaching reform of embedded system course. Some scholars also put forward their own arguments in combination with the training mode and reform method of contemporary university information literacy ability. In addition, some scholars have analyzed the use of 'embedded' models to solve problems related to college students' employment and school-enterprise cooperation from the aspects of innovation and entrepreneurship. [6]

3. Curriculum for Embedded Education

3.1. Abundant Curriculum Setting

Taking the software engineering (embedded) specialty of Jiangsu University Jingjiang College as an example, a series of innovative practical courses based on general education courses, subject basic courses, professional courses, quality development courses and subject competitions of software engineering specialty are offered (table 1). General education courses and subject foundation courses contain the required subject knowledge and entrepreneurial theory knowledge for software engineering majors. Quality development courses and practice links organize student internships, visit the production process of cooperative enterprises, and understand all the technologies needed in the process of product output in internships. By visiting the Maker Space and experiencing the process of creativity, students can open up innovative ideas in practice, guide them to tap the economic and social values hidden behind common technologies [7], to spontaneously establish interest groups and use the school's innovation and entrepreneurship platform for project design. Students can get corresponding credits by participating in project process design to stimulate interest and innovation.

Table 1. Distribution table of course credits and hours of software engineering (embedded) major in Jiangsu University Jingjiang College.

Category	Credit	Class hour or weeks		Percentage of credits			
		Class hour	Weeks	Required course credits	Proportion	Elective course credits	Proportion
General education course	57.5	1072	/	50.5	29.88%	7	4.14%
Basic courses of disciplines	39	404	/	31	18.34%	8	4.73%
Professional courses	32	528	/	18	10.65%	14	8.28%
Quality expansion	4	64	/	/	/	4	2.37%
Practice link	36.5	32	35.5	36.5	21.60%	/	/
Total	169	2400	35.5	136	80.47%	33	19.53%

The course of entrepreneurship education is not free from the professional courses, but to stimulate innovative thinking in various professional courses, transfer entrepreneurial thinking, organically combine entrepreneurship education and subject education to improve students' innovative and entrepreneurial ability.

3.2. Progressive Curriculum System

In order to realize students' access to science and technology competition, participate in project design, and join in entrepreneurial practice as soon as possible, professional cognitive practice, information retrieval and analysis technology, data structure, entrepreneurial foundation courses which are the basic courses of software engineering (embedded) specialty are opened in advance to sophomore. The purpose of adjusting the teaching plan is to enable students to master professional knowledge, participate in various discipline competitions and entrepreneurial

competitions as soon as possible, and grow up in the competitions. Students are required to complete all core courses in junior, such as computer introduction, programming foundation, Java programming (bilingual), web application development, demand engineering; software modeling and analysis, database system principle and application, algorithm design and analysis, software testing technology. At senior can evaluate the environment of project, select appropriate technical tools for complex project problems, predict and simulate complex problems. [8] By setting up various forms of courses and constructing a progressive curriculum system, Jiangsu University Jingjiang College makes the acquisition process of theoretical knowledge and practical skills closely and coherent, and improves students' comprehensive quality step by step. Figure 1 is undergraduate curriculum setting of software engineering (embedded) major in Jiangsu University Jingjiang College.
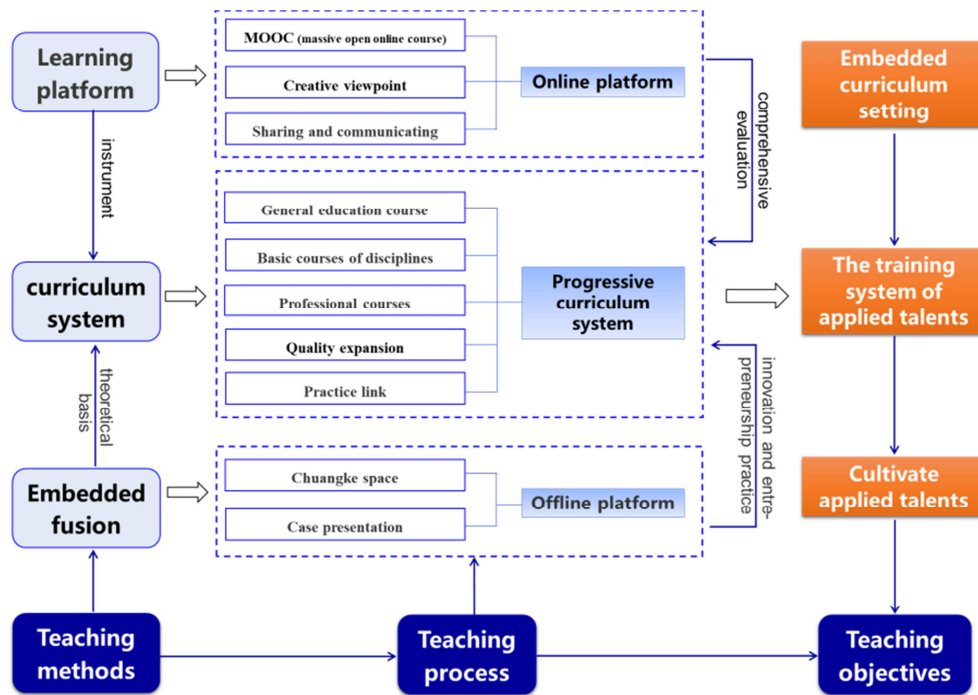

Figure 1. Undergraduate curriculum setting of software engineering (embedded) major in Jiangsu University Jingjiang College.

3.3. Training Technical Entrepreneurial Team

In order to examine students' ability to use theoretical knowledge for comprehensive project design, Jiangsu University Jingjiang College opens a comprehensive assessment course of practical skills at senior facing the major of software engineering (embedded). The optional course is opened to all students in the university. Teachers can specify assessment methods, such as participating in competition projects, organizing team development and design and ultimately in the form of elective credits into personal teaching plans. Table 2 shows the specific curriculum for the seventh semester (senior) of software

engineering (embedded) major in Jiangsu University Jingjiang College.

This approach can effectively promote the cross-integration between entrepreneurship education and engineering disciplines by the specific way to mix engineering disciplines with students from other different disciplines such as economics and management to organize a team, tap business creativity, participate in discipline competitions and entrepreneurship competitions. [9] At the same time, the school organizes a series of entrepreneurial activity courses, such as entrepreneurial plan competition, small and medium-sized enterprise internship, dialogue with entrepreneurs, independent entrepreneurial practice, etc., to

break the boundaries of disciplines and cultivate entrepreneurial spirit. This model can overcome the homogenization tendency of Chinese college students' entrepreneurship, get rid of the shackles of 'survival' entrepreneurship, take technological innovation as the foundation, give full play to the advantages of educational background and cross-disciplinary integration, and explore entrepreneurial opportunities from cross-cutting areas.

Table 2. The specific curriculum for the seventh semester (senior) of software engineering (embedded) major in Jiangsu University Jingjiang College.

Curriculum category	Curriculum type	Subject	Credit	Total hours	Practical hours	Semester	Assessment type
Professional courses	Elective course	Streaming media technology	2	32		7	C
		Career planning and literacy	2	16		7	C
		Planning and scheme of IT projects	1	16		7	C
Quality expansion	Elective course	Innovation and entrepreneurship practice	1		1 week	7	
		Productive Practice	3		3 weeks	7	
Practice link	Required course	Professional education	0.5	4		7	
		Software project competition practice	2		2 weeks	7	
		Professional direction comprehensive practice	2		2 weeks	7	

3.4. Diversified Entrepreneurial Practice Activities

As a supplement to classroom teaching, Jiangsu University Jingjiang College has fully popularized the concept of innovation and entrepreneurship of students by organizing various innovative and entrepreneurial activities such as entrepreneur forum, entrepreneurship plan competition, SYB (Start Your Business) entrepreneurship training course and alumni public welfare forum. For example, students majoring in software engineering (embedded) are organized to visit China (Nanjing) Software Valley Entrepreneurship and Innovation City, exchange studies with entrepreneurial teams, and discuss long-term practice. Make use of practice base, form campus Maker Space; establish college students' creative alliance, regularly exchange ideas, promote creative transformation landing; college Students' Entrepreneurship Plan Competition and Creative Culture Festival are held annually to promote innovation. Through the development of diversified subject practice courses, the combination of 'theoretical full coverage' and 'personalized innovation and entrepreneurship ability ' is realized.

This mode is the dynamic compatibility of 'embedded education mode' and 'professional practice mode'. [10] Embedded education mode takes curriculum teaching as the carrier to infiltrate entrepreneurial content and cultivate students' entrepreneurial literacy based on professional knowledge. Professional practice mode is to carry out professional entrepreneurship practice projects outside the classroom that teaches students how to establish enterprises, master the skills required for the whole process of entrepreneurship, learn to manage and operate new enterprises, improve students' entrepreneurial competitiveness and success rate, and enhance students' social responsibility.

4. Significance of Embedded Education

4.1. Inevitable Choice for the Development of Applied Undergraduate Education

In 2001, 'some principles and opinions on the adjustment of undergraduate specialty structure in ordinary colleges and universities' pointed out 'vigorously develop the application-oriented specialty closely integrated with local economic construction. With the expansion of Chinese higher education scale and the acceleration of industrial structure adjustment, the social demand for high-level applied talents will be more urgent.' The education mode of higher education in China is upgrading and transforming, embedded education, a new talent training mode, aims to cultivate students' ability to propose and solve problems, innovation ability, risk awareness, creativity and business sensitivity. The general education of entrepreneurship reveals the general rules, basic principles and methods of entrepreneurship, so that the educated have entrepreneurial awareness, entrepreneurial personality and entrepreneurial ability to adapt to social changes. [11] Therefore, embedded education mode is an inevitable choice for cultivating applied talents.

4.2. Important Way to Determine the Direction of Training Applied Talents

When cultivating applied talents, colleges and universities must have a clear direction to ensure that all subsequent work is carried out in this direction. [12] Embedded education mode relies on various courses carried out by schools, such as professional general courses, subject basic courses, quality development, professional lectures, professional practice courses, etc., combined with existing social resources, enterprises are introduced into the classroom, and students are organized to actively participate in internships and project operations. The government, schools and enterprises cooperate closely with the needs of local economic construction and development, and use market regulation mechanism to scientifically select professional counterparts and high fit students' internship practice, so as to select a good direction for students' future employment and entrepreneurship.

4.3. Effective Means to Improve Students' Practical Ability

The construction of innovative education practice base, three-dimensional practical teaching resources and virtual space MOOC construction provide sufficient guarantee for

practice. [13] The embedded education mode with practice as an important means of education can effectively improve students' ability to adapt to society in the process of education, and lay the foundation for future innovation and entrepreneurship. It also can enable students to learn the macro nature of social problems and the sense of goal in the process of education. [14] Students in the process of practice for industry cognition to achieve international vision, master the cognition of globalization, learn from imitation, mistakes and reflection.

5. Conclusion

Applied talents are the main force to lead the development of the country. Schools use embedded education mode to cultivate students' pioneering spirit and ability quality, so that talents can have more personality and personality, creativity and imagination, innovation spirit and pioneering ability. This is equally important for everyone because societies and businesses tend to employ people with innovative spirit, independent work skills and other skills. The embedded education mode in domestic universities started later than that in European and American regions, and is still in the stage of learning and development. [15] In the future, universities should judge whether the results of education are consistent with social and economic needs through the feedback of students in practice, and dynamically adjust the training courses and programs of embedded education mode to achieve a win-win situation between students and society.

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