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CDIO Based Optimization of Urban Planning Personnel Training Courses in Forestry Universities

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Abstract On the basis of analyzing existing course system of urban planning discipline, this paper came up with a framework for optimization of urban planning personnel training mode and course system, oriented towards training practical engineering personnel and based on CDIO engineering education and teaching platform. Then it made empirical study on setting of the urban planning discipline in Northeast Forestry University. It proposed changing the original "3 + 2" course system, exploring and optimizing the course system, improving teaching effect of urban planning personnel training courses, and raising planning and design ability of students.

Key words Training mode of urban planning personnel, CDIO engineering education, Optimization of course system

In 2013, Urban Planning Discipline Instruction Committee (UPDIC) promulgated *Guidance Specifications for Undergraduate Course Urban and Rural Planning in Institutions of Higher Education*, setting forth new broad range guidance specifications. At present, China's urban and rural planning takes on dual characteristic. On the one hand, the development is rapid. By the end of 2012, more than 190 universities have set the urban planning discipline. Total enrollment reached 37 000, ranking the first in the world. On the other hand, there is a large gap between training level and teaching content. Objective of urban planning needs changing from architecture to urbanology, and then to urban planning^[1]. Urban planning personnel training should change from focusing on spatial form to diversified urban public policies. These internal and external factors need local universities making adjustment in method of personnel training and setting of course system.

1 Development of the urban planning discipline

The urban planning discipline is mainly divided into architecture based urban planning and economic geography based urban planning. As a result, their training direction and emphasis point are different. Urban planning personnel training mode mainly consists of two types; one focuses on physical form of urban planning, namely, land use planning and functional zoning; the other focuses on non-physical form of urban planning, relationship between urban areas and other regions, and the relationship between urban economy, society and environment. China enters the rapid growth stage of urbanization. Transformation of old towns advances with construction of new districts. Thus, it needs numerous architecture and urban planning personnel, especially specialized personnel engaged in physical planning. Non-physical planning personnel remain in cultivation period and the market demand is little. In

2011, the urban and rural planning broke away from the architecture, providing a new opportunity for the urban planning discipline. This new discipline should reduce basic courses of architecture basic teaching platform, increase macro planning content like regional planning course, optimize original course system combining examination demand of registered planners, and focus on overall structure of specialized education and cultivation of comprehensive quality, innovation ability and vocational skills of students. Besides, it should pay attention to penetration of multiple disciplines and development of planning theories. Furthermore, it is required to enhance the solid foundation, broad range, high quality and ability education with basic ability of planners as the core, and strengthen adaptation and development potential of students. Only through these, may it be favorable for development of the urban planning discipline and cultivate specialized personnel suitable for demands of urban development.

2 Setting of the urban planning personnel training courses in forestry universities

Since forestry universities have advantages in forestry, ecology, forest and landscape disciplines, their urban planning discipline has characteristic of ecological urban planning. Taking Northeast Forestry University as an example, the urban planning discipline was founded in 2002. At first, it relied on civil engineering. Limited by school running conditions, the foundation is not mature for running schools, as well as influence of regional economy, environment and school running concept, Northeast Forestry University proposed "architecture + urban planning" school running mode, i. e. "3 + 2" teaching mode. Three years of architecture platform plus two years of urban planning knowledge forms the group course system with basic course of architecture as the thread. At the master level, Northeast Forestry University was granted with two first – level master stations, architecture and urban planning disciplines. However, with gradual mature school running conditions, gradual improvement of qualified teachers, further increase of

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students, and excellent rate of entrance exam for post graduate and employment rate, original course system setting becomes unsuitable for urban planning discipline development, and "waling on two legs" course system must be transformed into an independent urban planning course system. At present, the construction of urban planning courses realizes steady development and has preliminarily established urban planning and architecture integrated discipline system. It is urgent to establish proper urban planning discipline course system with characteristics of forestry schools under the guidance of *Guidance Specifications for Undergraduate Course Urban and Rural Planning in Institutions of Higher Education*. And it conforms to demand of discipline development for implementing comprehensive teaching with combination of physical planning and regional overall planning, giving prominence to the objective of

training planning and design personnel, strengthening training of skills, attaching importance to combination with engineering practice, and formulating pertinent urban planning discipline training scheme.

3 Engineering education and teaching mode

3.1 CDIO model CDIO (Conceive – Design – Implement – Operate) is an innovative educational framework for producing the next generation of engineers. It manifests close connection of the model with engineering production. This model is simple and has high adaptability. Thus, using concept of this model to carry out teaching for students in design discipline is highly operable, and it is quite suitable for the architecture discipline (Fig. 1)^[3].

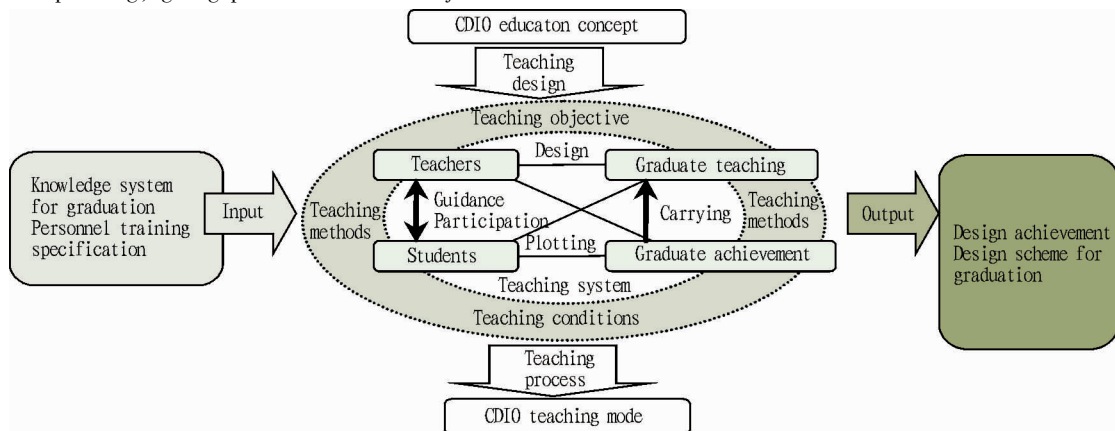


Fig.1 Model for course teaching system of design discipline

3.2 Concept of CDIO model Model education is to conceive an education oriented towards technology foundation, place engineering education in specific environment of life cycle of product system, fully manifest process of engineering education, and value the rudimentary knowledge and practical ability. The objective of model is to describe demand of enterprises with basic principle of engineering, emphasize application ability, cultivate skills of conceive, design, implement and operate system, and adapt to modern design environment^[4]. With clear train of thought and levels, this course system is devoted to narrowing the gap between theories of engineering education and practical operation ability. Northeast Forestry University selected CDIO concept as guiding theory and

formulated new training objectives: to train specialized personnel meeting requirements of forestry urban planning with creativity, systematic thinking ability, multi-discipline knowledge, and excellent management and communication ability. Teaching achievements run through the whole teaching process, as shown in Fig. 2. From Fig. 2, we know that traditional graduation design teaching theory is characterized by passive design of students and passive guidance of teachers. Introducing CDIO engineering education concept, through comparison and theory transplantation of practice teaching, it can be transformed to an interactive teaching mode with CDIO teaching as main line and students-first.

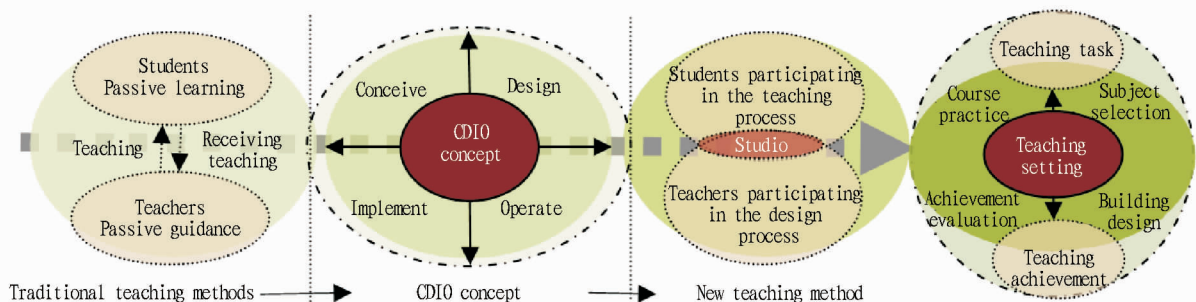


Fig.2 CDIO based teaching system

4 Construction scheme for course optimization

4.1 Optimizing conception scheme for personnel training courses

It is recommended to make clear inter-disciplinary urban planning personnel training objective combining self advantage and future social development demand. In other words, in the personnel training, universities should promote overall coordination and integration of theory and practice, specialization and creativity, thinking ability and operation ability, analysis ability and integration capability, independence and cooperation ability, to give prominence to diversified compound objective. For this, it is necessary to explore and study effective mode and approach for training of inter-disciplinary urban planning undergraduates, strengthen innovation awareness and comprehensive quality of students, and train them to excellent specialized personnel with solid foundation, broad knowledge, high ability and high quality, broad academic field of vision, and pragmatic work style. (i) Focusing on specialization and flexible discipline direction on the basis of general education and enhancing comprehensive quality cultivation. It is recommended to continue enhancing and improving the course system framework "planning and design plus related theories" combining with characteristics of the urban planning discipline and demand for comprehensive quality urban planning personnel. (ii) Manifesting combination of theory and practice, scientific research, to realize combination of discipline characteristic and inter-disciplinary personnel, and transformation of knowledge teaching to ability learning, and stress cultivation of students' knowledge acquisition and application and innovation and practice ability. Specifically, it is recommended to reduce in-class hours, integrate courses, strengthen position of urban planning core courses, adjust and increase proper elective courses, enrich connotation of elective courses, and make students freely and dependently select courses. (iii) Further making clear "2 + 3" training mode of urban planning discipline from rudimentary education to specialized technical education. The first two years focus on general education, basic knowledge and design basis of architecture and urban planning, and preliminary knowledge of urban planning; the later three years focus on transition from elementary education to specialized technical education, micro specialized knowledge to macro framework, and progressive integration of specialized courses, emphasizing cultivation of knowledge application ability, planning and integration ability, creativity and research ability^[5]. (iv) Stressing overall construction of course group, and strengthening integration and interaction of various courses in arrangement of teaching hours and organization of teaching content. Especially, it is recommended to make clear the relationship between planning design and core courses and elective courses, and build core course groups, including urban building type and design, detailed planning, overall planning, urban ecology and urban environment.

4.2 Strengthening reform of course design

4.2.1 Construction of course system. It is recommended to improve horizontal course group and "2 + 3" specialized education system combining elementary general education and specialization education, and build clear and prominent course system, to form "elementary education, specialized education, and practice edu-

cation" stages. Besides, it should take course design and related theory as main line, combine technology, culture and recognition and practice, and microcosmic, mesocosmic and macrocosmic levels. In the key construction, it is recommended to give prominence to construction of planning design and related theoretical courses, make clear relationship between obligatory courses and elective courses, and optimize management of practice teaching, to realize emphasizing backbone courses and broadening academic field of vision of students.

4.2.2 Overall construction of course group. Combining the overall teaching framework of "interaction of theories and design", it is expected to further realize integration and optimization of course groups. On the one hand, construction of course groups provides teaching scene for combination of theories and practice, and provides necessary theoretical knowledge for students, and offers adequate theoretical support for design. On the other hand, the objective of cultivating inter-disciplinary personnel lays down high requirement for science and efficiency of teaching organization. Thus, it is recommended to ultimately realize this objective through making clear functional division of teaching stages in teaching organization and ability cultivation, and through combined advance of many courses. In theoretical courses, it is required to further enhance thinking on social, economic and engineering problems. In design courses, it is required to strengthen combination of design and theories, integration of physical spatial form planning and rational analysis, and scientific planning; strengthen research type teaching, cultivate comprehensive thinking and argument ability of students; properly increase teaching time of early stage studies, and attach importance to cultivate ability of students in survey and research, analysis, and planning; pay attention to scientific and rational design methods and arrange special courses for the design, to provide special method support, as shown in Fig. 3.

4.3 Exploring the combined teaching course design mode

Firstly, teaching courses are open to the public. It is recommended to invite senior experts of related organizations or institutions to participate in teaching, communicate with students face to face, and broaden students' field of vision and preliminary understanding of complexity of urban planning. Secondly, teaching content should be closely connected with the practice. Universities should use basic advantages of national key discipline and take "production, learning and research combination" teaching strategy. Some teaching tasks of overall planning teaching and detailed planning teaching come from actual practice, which provides excellent practice opportunity for students knowing domestic construction situation and tracing frontier technologies. Besides, they should encourage teachers to integrate the state-of-the-art scientific research achievement and scientific research ideas into their teaching. Thirdly, it is required to strengthen practice teaching. In addition, it is required to improve organization and examination procedure for production practice and graduation design, to further strengthen construction of campus and social practice bases. Students should gradually establish research strategy and technical route integrating theory and practice, and broaden academic field of vision and sensitivity to other related disciplines.

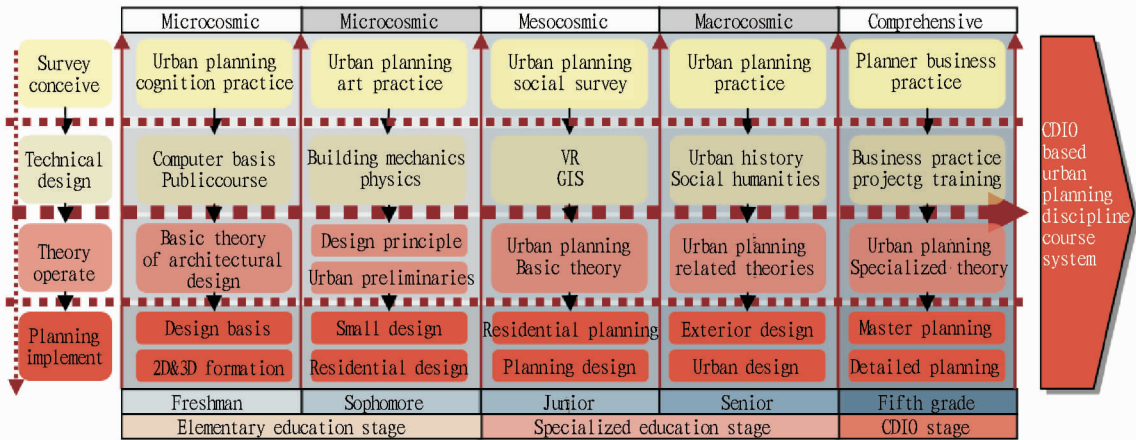


Fig. 3 CDIO based urban planning discipline course system

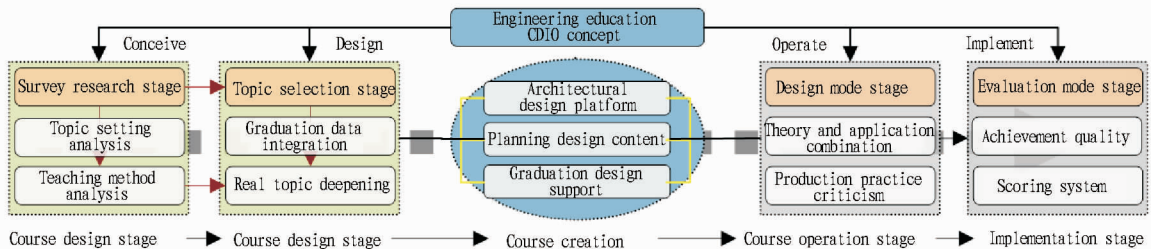


Fig. 4 Optimized mode for CDIO based urban planning discipline courses

4.4 Realizing course setting evaluation unit Firstly, the comprehensive mechanism is gradually perfect. Under the overall guiding theory, it is expected to set up open and initiative comprehensive education mechanism, improve integrated teaching, scientific research and practice mechanism, strengthen international exchange combined teaching mechanism, and improve such support mechanism as teaching management and conditions. Secondly, discipline characteristics are outstanding and prominent. With many years of untiring effort, it has basically established course setting evaluation mechanism with solid foundation, strict requirement, valuing practice, and comprehensive development, as shown in Fig. 4. In sum, course setting better integrates CDIO education concept and it is feasible to take the innovation road of combining vocational education of planner and engineering education. Through 5 graduation teaching practice and feedback, students can rapidly integrate into society and grow. The one-time employment rate reaches 100%, and the rate of entrance exam for post graduate is up to 50%, and students entering the design institutes have high adaptive capacity. Thus, it is recommended to establish and improve specialized teaching supervision system and evaluation mechanism, set up teaching archive, take on-line comment, quality of graduation design, issue of papers, and lesson competition evaluation as basis of assessment. Northeast Forestry University has cultivated double-professionally-titled teachers. Among 19 teachers, 5 obtained registered architect certificate, 8 obtained registered planner certificate, accounting for more than 70%. Its urban and rural planning discipline rank rises to the 26 in the whole country.

5 Conclusions

In the studies on overall optimization of urban planning specialized personnel training and course system, the "3 + 2" mode becomes gradually impaired development of the discipline. At present, the new *Guidance Specifications for Undergraduate Course Urban and Rural Planning in Institutions of Higher Education* stresses basic courses of architecture and enhances the system and compatibility of urban planning discipline construction. Therefore, it is required to make clear comprehensive teaching effect of teaching links, optimize the course system, and take CDIO based "3 + 2" mode as pilot project, to further improve teaching system of the urban planning discipline in undergraduate education^[6].

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