

Studio-based Training Model for Applied Talents in the Engineering Majors

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Keywords: Studios, Training Model, Applied Talents, Engineering Majors

Abstract: The college of Engineering and Technology of Zunyi Normal University has explored and practiced a studio-based applied talents training mode in the engineering majors. Compared with the traditional talent training mode, the studio-based mode has the following characteristics: aiming at the complementarity between extracurricular training and in-class training, jointly supporting the talent training goal of Emerging Engineering construction; by interest-oriented, establishing student teams and promoting student to independent study; improving the students' innovative ability by innovation and entrepreneurship training program of undergraduates and academic competitions; focusing on the applicability and developing the practical application skills of the potential job. This paper clarifies the motivation, content, guarantee mechanism and application effectiveness of the studio-based mode, and summarizes the inspiration of the studio-based mode.

1. Introduction

In 2015, the Ministry of Education of the People's Republic of China issued the "Guidance on Leading the Transformation of Local Undergraduate Universities to Applied Types" [1] (hereinafter referred to as "Guidance"). The Guidance points out that as the economy enters the "new normal", the personnel training structure and quality of current higher education are not yet adapted to this revolution, especially the shortage of applied, composite and innovative talents. The Guidance proposes to promote the transformation and development of some local undergraduate universities to enhance the ability of local universities to serve regional economic and social development. At the 19th National Congress of Chinese Communist Party, presidency Xi Jinping made a keynote report [2]. The report once again clearly pointed out that "China Economic development has entered a series of profound changes such as the 'new normal'", and clearly requires "improving the vocational education and training system, deepening the integration of production and education, school-enterprise cooperation", and "achieving the connotative development of higher education."

Combining the training objectives and construction priorities of engineering majors, the College of Engineering and Technology of Zunyi Normal University actively explores the measures and ideas of higher education reform in teacher construction, curriculum system, teaching methods and practical teaching in the context of the transformation of general universities into application, and trying to establish a new training model for the cultivation of innovative and applied talents in engineering majors in local universities.

2. The origin of "studio-based" talent training model

The studio-based teaching model originated from the cradle of modern design education—Bauhaus [3]. Up to now, more than 300 universities with art & design majors have adopted the "studio-based" teaching model.

Relatively speaking, the exploration of engineering majors in undergraduate universities started late in this field, but also achieved some achievements: the College of Mechanical and Electrical Engineering of Hohai University conducted a study on the practical teaching mode of "design studio" in engineering colleges [4]; School of Materials Science and Engineering of North Minzu Uni-

versity carried out a training model of practical and innovative ability of engineering majors based on subject competitions [5]; College of Mechanical and Electrical Engineering of North Minzu University conducted the personnel training model research in engineering colleges for ethnic universities [6]; Georgia Institute of Technology established the invention studio as “makerspaces” and effectively promote the innovation, creativity and entrepreneurship of engineering students [7]; India's Mysore Medical College also applied the "studio system" teaching model in medical education [8]. It can be said that the core concept of the studio-based on "the combination of theoretical knowledge and practical training, highlighting the ability to create innovation" still has a profound impact on world education.

3. The connotation and characteristics of "studio-based" talent training model

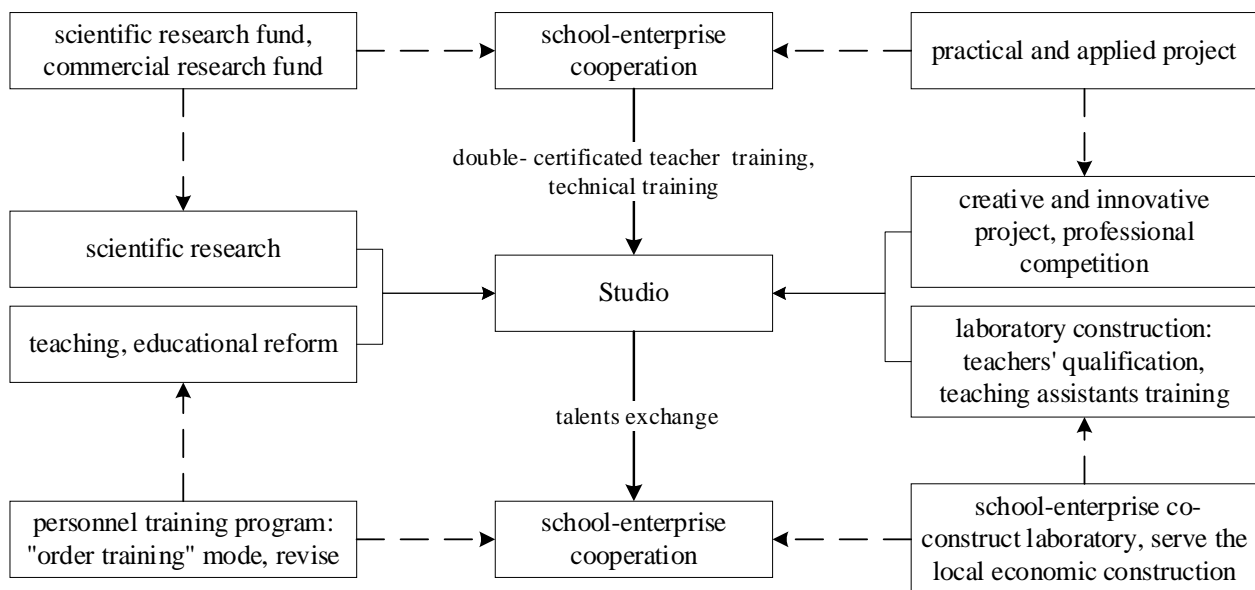


Figure 1. The connotation and characteristics of proposed "studio-based" talent training model

The studio-based innovative and applied talent training model proposed by the College of Engineering and Technology of Zunyi Normal University closely follows the “Guidance” of the Ministry of Education. As shown in Figure 1, the new studio-based model is clearly centered on the studio, supported by the teaching and research office, with the teacher team as the core, interest-oriented, regarded innovative and applied talents as the training goal, aimed at improvement of the atmosphere of learning and education. Also, new studio-based model treated the professional competition as important link, the double-skilled construction as the driving force, and the school-enterprise cooperation as the breakthrough.

In "studio-based" mode, the student growth path is shown in Figure 2. From the beginning of university, as the freshman, the students can apply to join the corresponding studio according to their interests and professional direction. The students will be completed under the guidance of the teacher from professional courses, curriculum design to graduation thesis(design). Once students enter the studio, they have a lot of roles. They can be project members, teaching assistant, and laboratory student leaders. And they also can enter company as the internship or prepare for the graduate school entrance exam with the help of the studio tutor. At the end of the undergraduate period, the studio director can also recommend employment units for students or recommend postgraduate schools to help their further studies. The College of Engineering and Technology is actively exploring and practicing to make the new "studio-based" talent training mode as the breakthrough for the transformation of our college and even our school.

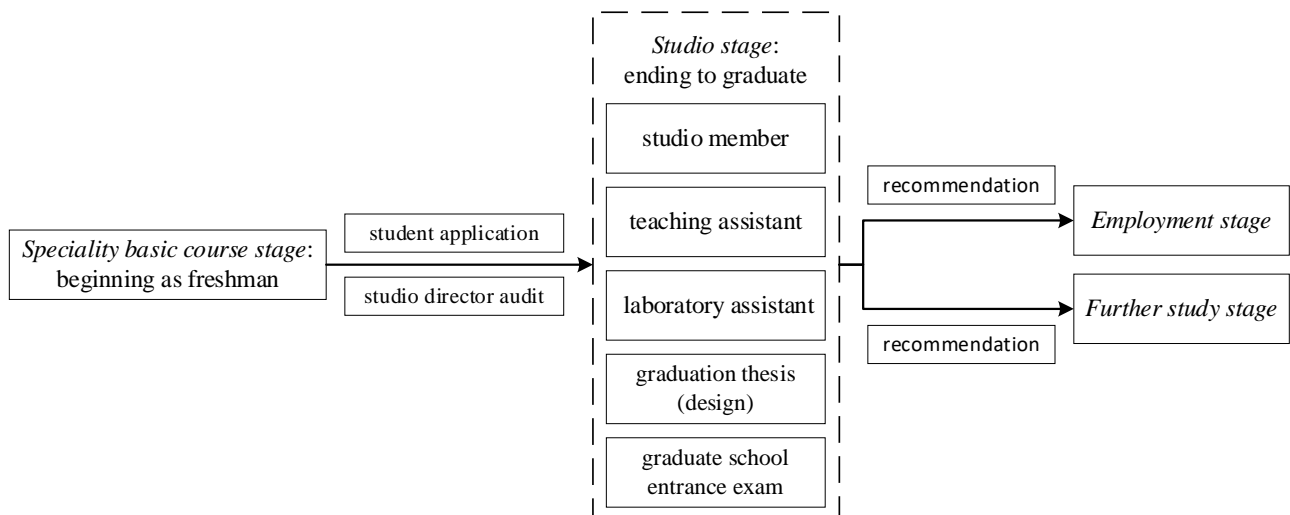


Figure 2. Growth path in the proposed "studio-based" talent training model

4. The main content of "studio-based" talent training model

4.1 Forming a studio-based innovative application talent training model

Taking the studio as the carrier, the project and the competition as the breakthrough point, through the establishment of a sound studio management system and the student growth mechanism, strengthen the initiative of students' extracurricular learning, and highlight the cultivation of the ability of innovation and entrepreneurship, to make up for the shortcomings of the conventional classroom teaching and experimental practice teaching mode and to meet students' understanding of the integrity and complexity of engineering problems. At the same time, through the whole process of specific projects and competition of the studio, students can effectively improve the systematic planning of a large number of extracurricular times, and enhance the team spirit and also reduce the pressure of student management.

4.2 Form the standard for setting up a studio

Based on the existing software and hardware facilities of the laboratory, according to the degree of software and hardware facilities to meet the projects functions, combined with the students' foundation of comprehensive ability and the demanding of innovation ability training, through the rational planning of the main research direction of the proposed studio to form the selection criteria for the laboratory upgrade to the studio. During the studio construction, adding auxiliary equipment and materials to meet the requirements of studio function integrity.

4.3 Develop a management mechanism for the studio

Based on the research direction of each studio, students who are interested are encouraged to join the studio, and the students could raise their research interests under the support of the studio software and hardware. Adhere to the studio open all-weather, implement student self-management, support students to theoretical study, exchange seminars, and experimental production of new ideas arising from the project research process, and gradually guide the studio to become the main place of residence for students. At the same time, strengthen the daily assessment of students' work content and input status, promptly persuade students who have no planning content, do not participate in studio discussions and activities for a long time, and work content that is not related to the research direction of the studio, to withdraw from the studio or to transfer to other studio with relevant research directions.

4.4 Develop a learning and growth mechanism for the studio

The project and competition with engineering application value are used as the work content of the studio, and targeted to the local characteristic industry and advantageous industries, providing technical support for serving local social and economic development. At the same time, relying on projects and competitions, it will promote the improvement of students' cooperation ability and time management ability.

In the execution of the project, it is carried out in the form of division of labor and cooperation. Through the review of materials and hands-on practice to complete the own module of the project, and the association and integration of the project modules are completed through regular exchanges mechanism. Meanwhile, the common problems encountered in the project are handled through the special lectures given by the studio instructors. Taking project research as the main line, through the above different forms of independent learning, the effective mastery and application of professional knowledge are improved.

5. The innovation of the "studio-based" talent training model

① The studio-based innovative application ability training, it highlights the independent learning and application of professional knowledge with local industry enterprise characteristics, making up for the shortcomings of conventional classroom teaching and experimental practice teaching mode, meeting students' understanding of the integrity and complexity of engineering problems. Through the systematic learning of the profession basic knowledge of the in-class teaching and the extra-curricular training of key technologies in the professional field, there will jointly promote the achievement of the goal of training talents in local universities.

② Through the management system of the studio, students are gradually gathered into the studio, which effectively diversifying and reducing the difficulty of student management, and promoting the benign transformation of the study atmosphere.

③ Through the learning and growth mechanism of the studio, students completed the systematic planning of a large number of extracurricular times. Through long-term focused training and accumulation, which effectively promoted students' understanding of professional knowledge systems and practical complex engineering problems.

④ Through the work content and operation mechanism of the studio, the students will be supplemented with the professional technical knowledge and the latest development information needed for the development of the local industry in a timely manner. The professional knowledge system built with the in-class teaching will support the local economic and social development. The ability to demand for professionals. At the same time, it has cultivated students' teamwork ability and time management ability.

6. The guarantee mechanism of the "studio-based" talent training model

6.1 University level

Relevant policies such as the "Implementation and Management for the Credits in Zunyi Normal University" were issued, which provided strong support for college students to participate in various extracurricular activities, various competition activities, innovation and entrepreneurial activities and social practice activities. The two excellent engineer education training plans of Electrical Engineer and Civil Engineer of Guizhou Province in our college are listed as pilots for teaching reform, giving strong support to policies and funds.

Zunyi Normal University strongly supports the College of Engineering and Technology in constructing the basic laboratories, open laboratories, and innovative entrepreneurial studios systematically. And guarantees the use of equipment and instrument, the funds of student activity and consumables, and provides guarantee to students for extracurricular training.

Zunyi Normal University has given policy inclination to the College of Engineering and Technology for introduction and training of high-level talents, especially the introduction and training of dual-skilled talents, and strongly supported and promoted the cooperation between Colleges and local enterprises in the construction of production, education and practice bases.

6.2 College level

The College of Engineering and Technology has established a practice teaching center, which is responsible for formulating a series of rules and regulations for the studio, and is responsible for actively implementing various security mechanisms at the university level. The student affairs office and teaching office in College supports students in all levels of innovation and entrepreneurship projects and discipline competitions, and coordinates student leave and remedial matters. The science and technology office actively provide literature search, download and transmission services for various innovative projects and competitions, and actively contact relevant institutions to implement various types of training work. The College encourages teaching and research offices to form a team to construct studio. The College try to simplify the approval process for the use of equipment and instrument, and actively establish cooperative relationships with local enterprises in Zunyi and actively encourage young teachers to further training, creating conditions for the construction of dual-skills. At last, the College links teacher evaluation and performance appraisal with the workload of studio construction.

7. The application of the "studio-based" talent training model

7.1 Application prospects and promotion value

With the rapid development of industry, especially in the rapid development of new economic fields such as big data, internet of things, artificial intelligence, network security, and great health, the disciplines involved in the industry are becoming more and more cross-cutting and technology is becoming more and more updated. In the process of adaptation and docking industry upgrading and development, the engineering talent training goal must not only meet the traditional and basic common theory and knowledge system, but also must aim at the rapid learning ability, knowledge retrieval ability, composite knowledge application ability and innovation ability. The studio-based innovative application-oriented talent training model is a feasible way to explore in this context, and summarizes the specific management mechanism and the growth mechanism of students' extracurricular learning, forming a complete and feasible implementation. According to the different fields and regional characteristics of the engineering majors of various universities, under the guidance of this model, the extracurricular teaching will be supplemented to the in-class teaching and jointly support the construction of "New Engineering".

7.2 Application of results

Up to January 2019, the College of Engineering and Technology of Zunyi Normal University has built 11 studios and opened to all students, including industrial design, machining, robotics, mechatronics, single-chip applications, PLC applications, engineering inspection, architectural design, structural mechanics, soil mechanics, material mechanics. And according to the practice teaching center, the studios are divided into electromechanical and civil engineering practice platforms for overall planning and management. Through the management system, the studio has effectively planned the extracurricular time of students. Combined with the project-based learning model, it has greatly guaranteed the effective development of students' extracurricular training and improved the professional quality and innovation ability of engineering students.

7.2.1 The educational concept and training system have been widely recognized by peer institutions and have produced good demonstration effects.

During 2014-2018, Zunyi Normal University exchanged seminars with several schools in and outside the province, such as Shanghai Normal University, Taiwan Tunghai University, Guizhou University, Guizhou Normal University, Zunyi Vocational and Technical College, Guizhou Aerospace Vocational and Technical College. The model is used for reference by many institutions such as Zunyi Vocational and Technical College.

7.2.2 Students' scientific and technological innovation ability has been affirmed, and the new talent training model has achieved results.

As the main place for students' innovation and entrepreneurship training, the students use the open management model to independently prepare for the event and implement the project. Through long-term accumulation and practice, the students also make breakthroughs in the national professional competition and the national college students' innovation and entrepreneurship training program. Up to January 2019, the studios have prepared and undertaken 7 school-level professional competitions; the studio students participated in the national college students' professional competition under the guidance of the instructors, and won 12 national awards and 34 provincial awards. There are more than 80 training program projects (including 14 national-level projects and more than 30 provincial-level projects) being approved.

At present, the studios have absorbed more than 150 students through the open system. At the same time, more than 60 students in 2013 and 2014 have graduated from the studios.

In addition, the students also independently carried out research according to their own interests, completed a total of 17 projects (works), one of which has registered company to be incorporated into the University Student Pioneer Park, and another project has completed the model production.

7.2.3 Excellent achievements in scientific research and teaching reform.

The studio also serves as a support platform for teachers' scientific research projects and a place for corporate technology services, providing a way for high-level scientific research projects to integrate into teaching, enabling students to gain opportunities to participate in teachers' research projects, effectively promoting the quality of personnel training and the professional level of the discipline. Up to January 2019, a total of 7 of 35 provincial research projects hosted by the studio instructors were integrated into the student training. A total of 18 students directly participated in the research project of the studio instructor. In addition, more than 20 students participated in the enterprise service project. Through these projects, students and local enterprises have established good communication channels. A total of 16 students from grade 2013 and 2014 also directly obtained employment through studios.

8. Summary

Local universities should cultivate qualified applied talents for the local region. It is necessary to study the appropriate innovative and applied talent training mode based on the characteristics of local undergraduate students and the teaching rules of engineering majors. Taking the construction of the engineering professional studio of Zunyi Normal University as an example, this paper analyzes the connotation characteristics of the new "studio-based" mode, the students growth path in the studio, and discusses the concrete measures and methods of the "studio-based" model in combination with the implementation plan and evaluation system. The specific measures and methods provide a reference for the transformation and development of local universities. In the future, we need to focus on how to provide teachers and students with more humanized environment, how to stimulate the enthusiasm of enterprises to participate in the construction of the studio, how to broaden the source of the project, how to increase the funding for laboratory construction, and further, how to provide relevant policy support mechanisms for teachers and students.

Acknowledgments

This research was financially supported by the Cooperative Education Project of Ministry of Education of China (No. 201701074015, No. 201701061006), the Excellent Talent Education Training Program of Education Department of Guizhou Province of China, Undergraduate Teaching Content and Curriculum System Reform Project of Education Department of Guizhou Province of China (2017520084).

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