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Reform and Practice of "Seven-in-one" Applied Talent Training Mode for Mechanical Majors

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Abstract: The article explores the reform and innovation path of talent cultivation in local colleges and universities in view of the common problems such as asymmetry between the cultivation of applied talents and applied requirements of mechanical majors, failure of teaching contents and methods to meet the real needs, low practical application ability, weak innovation ability and weak competitive consciousness of students. In the reform of applied talents training mode of mechanical majors, this paper has improved and implemented the applied talents training mode of "theory, practice, scientific research, production, association, certification and competition" after unremittingly exploration and practice, and analyzed the connotation and innovation points of "seven-in-one" applied talents training mode of mechanical majors. The three major initiatives and seven ways to implement this model are proposed in this paper. Through the application and practice, the model is integrated into the training program. Relying on the construction of governance system and throughout the whole process of training, the students yield great results and their employment rate is improved. The improvement of the quality of training talents of mechanical majors proves that the application effect of the talent training model is remarkable, with good operability and good promotion and application value. Therefore, this model can serve as an example for the reform and innovation of training talents of mechanical majors in local colleges and universities.

1. Introduction

Serving local economic construction, cultivating high-quality applied talents and taking the road of building application-oriented universities are the inevitable trends of reform and development of local undergraduate colleges and universities. Talent cultivation mode determines the goal and specification of talent cultivation in colleges and universities. However, the running conditions, comprehensive strength and service orientation of different colleges and universities are different so the talent cultivation mode may be different from school to school. Due to the constraints of concept, mechanism and resources, the applied talent cultivation mode is not yet well adapted to the needs of China's economic construction and social development, and it is difficult to cultivate high quality applied professionals. Many scholars have conducted a lot of research and practice on this, and formed many talent training models that suit their needs. Most scholars believe that the way out of talent training mode lies in: firstly, to establish the core concept of student-oriented and do a

good top-level design; secondly, to establish a mechanism of multi-stakeholder consultation to form an ideal talent training mode; thirdly, to integrate and optimize educational resources to lay the material foundation of talent training mode innovation [1]. In recent years, local colleges and universities have implemented the strategy of "building application-oriented universities" and made fruitful work in many aspects, such as changing concepts, improving mechanisms, designing programs and building resources, and have made more achievements in the reform of applied talent cultivation mode. Among them, the "seven-in-one" applied talent training model of mechanical majors has significantly improved the overall quality of talent training and the strength of professional schooling through reform, practice and application.

2. Analysis of the Problem of Talent Cultivation Mode in Universities

In the past decade, many scholars have made a lot of researches on applied talent cultivation model and achieved many results. Most of the achievements rely on their own advantages and explore the talent models which are suitable for and highlight the advantages of their universities [2-4]. However, the whole process of applied talent cultivation is not fully optimized and integrated, and there is some disconnection between teaching and practice, scientific research, production, certification, association, competition, etc. [5, 6]. After conducting a number of surveys and researches, this paper finds that the following problems still remain to be solved.

2.1. Asymmetry between Talent Training and Application-oriented Requirements

The cultivation of discipline-oriented talents emphasizes academic research, theoretical study and disciplinary knowledge while it ignores the technical study, practical exercise, and application ability. The "Seven-in-one" focuses on the whole process of growth of applied talents, implements multiple intelligence cultivation, and strives for all-round development.

2.2. Teaching Content and Methods Do not Meet the Real Needs of the Problem

The discipline-oriented model focuses on the integrity of the system, with strong theoretical teaching and a single teaching method; the application-oriented model focuses on the matrix of application knowledge and ability, with strong practicality. Therefore, it is necessary to optimize the teaching contents and reform the teaching methods.

2.3. Low Professional Practice Application Ability of Students

The technical expansion of mechanical specialties with limited school hours leads to insufficient professional practice training and low professional practice application ability of students. Only through the whole process, diversified and uninterrupted practical training can students effectively improve their professional practical application ability.

2.4. Low Quality of Professional Courses Study

The low teaching efficiency of mechanical courses with many students leads to low learning quality. Only by creating rich and diversified teaching resources such as three-dimensional and dynamic can universities improve teaching efficiency and ensure the quality of learning.

2.5. Weak Innovation Ability of Students and Weak Sense of Competition

Most students are dependent and focus only on course learning, lacking innovation and competition training. Through sound innovation assessment mechanism and platform, students' innovation and competition ability can be improved.

2.6. Students' Lack of Motivation for Professional Learning after School

Most students emphasize classroom over extracurricular, do not pay attention to the development of their personal expertise, and do not have enough professional learning after school. By improving the extra-curricular credit scheme, building professional associations and teams, and establishing multiple platforms such as authentication platform, the space for students' personal development can be greatly expanded.

3. The Content of "Seven-in-one" Applied Talent Cultivation Model

3.1. Theoretical Basis of "Seven-in-one" Applied Talent Training Model

Gardner's theory of multiple intelligences suggests that there is an imbalance in the development of the eight human intelligences. Therefore, the learning of application-oriented-student needs to be broad in order to stimulate the potential of multiple intelligences and promote comprehensive development. The "seven-in-one" talent cultivation model focuses on the whole process of cultivating applied talents, tries to explore students' intelligence potentials in seven aspects, so as to promote the comprehensive development of students' professional ability and quality.

3.2. Content of "Seven-in-One" Applied Talent Training Model

Local colleges and universities have been exploring and practicing unremittingly in the reform of the training mode of applied talents for mechanical majors. Thanks to their efforts, the seven-in-one applied talents cultivation model (Figure 1) of "theory, practice, scientific research, production, association, certification and competition" has been improved and implemented. The detailed information is as follows.

Theory teaching: modularization of teaching contents and competence of teaching objectives; focus on cultivating basic knowledge and basic quality.

Practical teaching: project-based teaching content and skill-based teaching objectives; focus on cultivating professional skills and practical abilities.

Scientific research innovation: synergistic form of scientific research and application of innovation goals; focus on cultivating innovative spirit and innovation ability.

Production practice: base-oriented of production practice and post-oriented of practice process; focus on cultivating posting ability and collaboration spirit.

Professional association: professionalization of the association team and collaboration of the association work; focus on cultivating team spirit and personality masters.

Occupational certification: industrialization of certification types and institutionalization of management forms; focus on developing vocational skills and professional ethics

Disciplinary competitions: Disciplinization of professional competitions and organization of competition sessions. Focus on developing comprehensive ability and competitive strength.

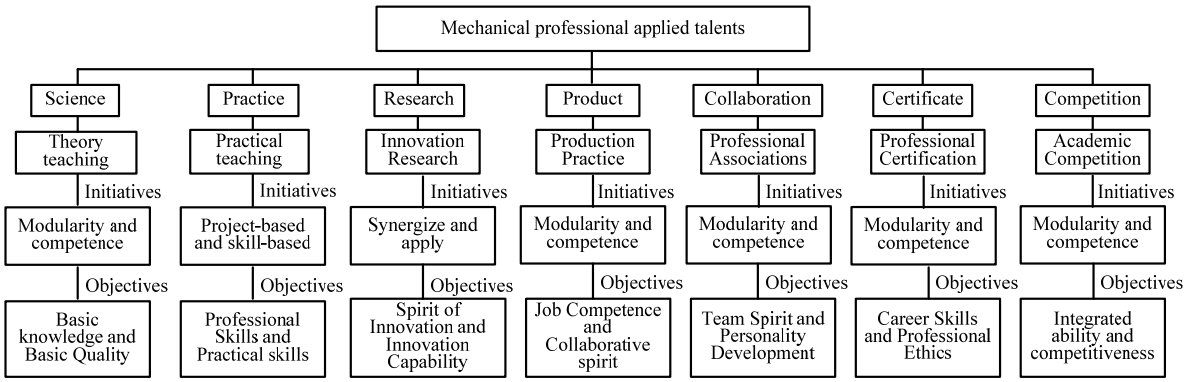

Figure 1. "Seven-in-one" applied talent training model

This model is integrated into the cultivation program to ensure the "seven-in-one" of cultivation objectives; relying on the construction of the governance system to ensure the "seven-in-one" of the implementation process; throughout the whole process of cultivation to achieve the "seven-in-one" of stage objectives; optimizing and integrating resources to achieve the "seven-in-one" of teaching contents. Though integrate the professional education teaching resource during the whole training process, the "seven-in-one" applied talent training model has successfully make its reform goals a reality so that the comprehensive professional teaching quality can be greatly enhanced. The reform goals include integration of theory and practice, combination of class and production, collaboration of teaching and application as well as in-class and after-class, synchronization of projects and innovation, integration of professional and certification and the organization of association and competition.

4. The Way to Implement the "Seven-In-One" Applied Talent Training Model

4.1. With Application as Orientation, Doing well in, Top-level Design and Integrating the Model Integration into the Program to Ensure the Training Objectives of the "Seven-in-one"

To connect the mechanical major and industry, the universities need to be application-oriented and do well in top-level design. Through study and training, multiple research and comprehensive demonstration, this paper has revised the talent training program and integrated this model into the talent training program to ensure the "seven-in-one" training objectives and solve the problem of asymmetry between talent training and application-oriented requirements.

4.2. With Quality as the Center, Promoting Model Reform and Relying on the Governance System to Ensure the Implementation Process of the "Seven-in-one"

With the talents quality as the core, the reform of talent training mode has been promoted. . Based on the projects of undergraduate quality project and teaching reform, the reform and practice of talent cultivation mode and application of the "seven-in-one" model have also been promoted. By formulating a number of systems such as *Implementation Measures of Undergraduate Mentoring System* and *Measures for Recognition of Classroom 2-3 and Innovation Credits*, and relying on the management system of "Integration of Teaching and Learning" (Figure 2), the implementation process of "seven-in-one" has been ensured from both institutions and management systems.

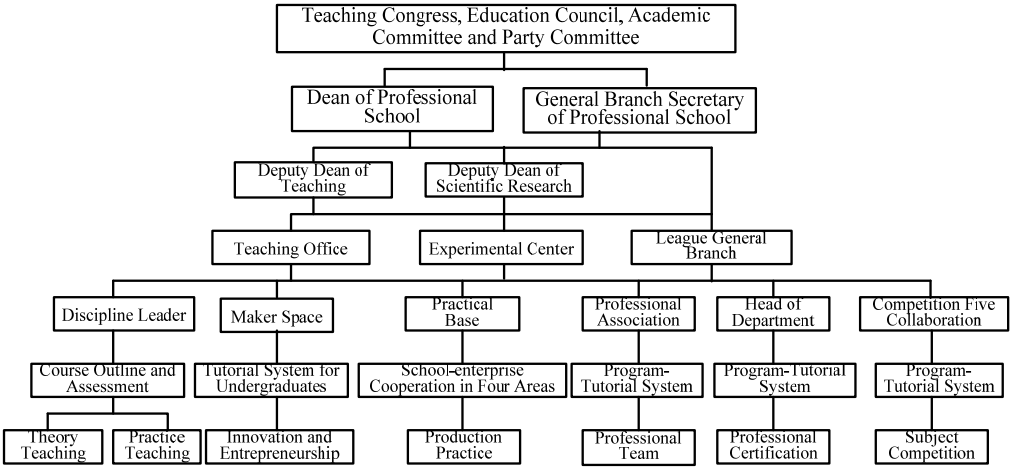

Figure 2. The "seven-in-one" "integrated teaching and learning" management system

4.3. With Competency as Orientation, Optimizing Process Resources throughout the Training Process to Play the Cultivation Function of the "Seven-in-one"

4.3.1. Strengthen Theoretical Teaching Construction and Reform with Application Ability as the Goal

Focusing on cultivating students' application ability, the universities should rely on the teaching research project led by high-quality course and implement modularization reform of teaching contents; they should create "diversified" teaching resources of applied courses such as the three dimensional and dynamic ones, implement "teaching and doing", SPOC, "Internet+" and other diversified teaching modes; and enhance process and application course examination reform. By doing so, the problems such as incompatibility between teaching contents and methods and poor learning quality can be properly solved.

4.3.2. Strengthen the Construction and Reform of Practical Teaching with Professional Skills as the Key

The universities should focus on professional skills, strengthen basic skills training, and increase practical credits to 40%. They should strengthen practical teaching reform, implement the construction practical teaching in the area of "project-based content, dynamic resources, application-oriented objectives and open management" of practical teaching, implement the "modularization of skills and actualization of content" assessment reform, and connect the assessment of vocational certification and practical courses. By doing so, the low professional practice application ability of students can be enhanced.

4.3.3. Expand the Space and Mechanism of Scientific Research and Innovation Guided by Innovation Ability

Guided by the innovation ability and relying on the practice base, training center and the maker space "Electromechanical Dream Workshop" and various innovation design competitions and other platforms, the universities should constantly expand the space and platform for students' scientific research and innovation, implement the multi-party cooperation mechanism of school-enterprise, school-university and school-internal, vigorously implement the project tutorial system for

undergraduate students, and effectively promotes students' projects, patents and theses. By doing so, students' weak innovation ability can be greatly improved.

4.3.4. Deepen the Construction and Cooperation of Practice Bases with the Guidance of Post Ability

In terms of students' vocational job ability, the universities should focus on the construction of practical teaching bases for college students, establish production practice bases in which the professional chain is connected with the industrial chain, build a system in which enterprise experts and professional teachers are "double teachers" and workers and students are "students", explore various forms of "school-enterprise cooperation and industry-education integration" mode, and implement the "five common" mechanism of school-enterprise cooperation (Figure 3). By doing so, the low practical application ability of students can be greatly enhanced.

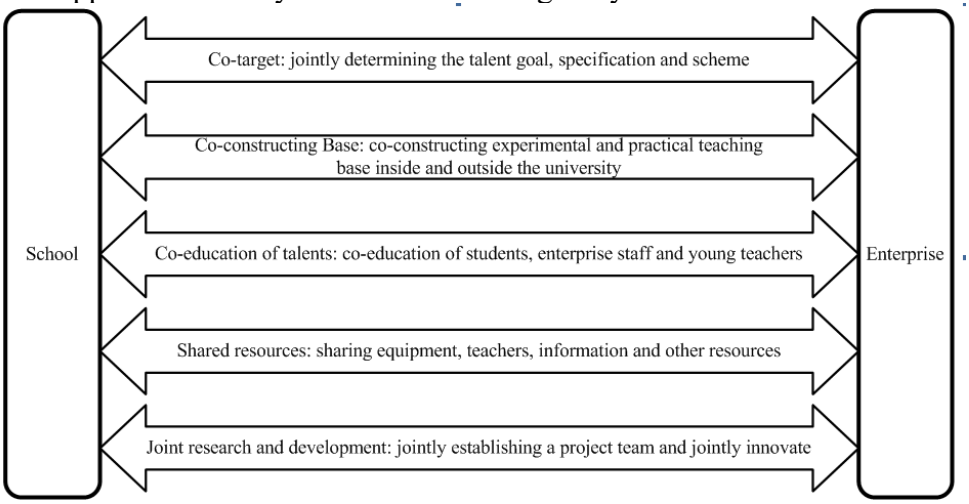

Figure 3. The "five common" mechanism of school-enterprise cooperation

4.3.5. Create an After-school Professional Platform and Team with Personality Development as the Guide

With personality development as the guide and undergraduate projects and class tutorial system as support, the universities should create after-school professional platforms and teams, establish several professional associations such as invention, CAD, and mechanical and electrical engineering application technology, realize the collaboration of professional associations, and undertake training and competitions. They should also rely on the school's maker space to create several innovation teams such as mechanical and electrical partners. By doing so, the problem of insufficient after-school professional learning can be effectively solved.

4.3.6. Promote Professional Vocational Certification and Connection with Vocational Competency as a Criterion

In terms of the enhancement of vocational ability and literacy, the universities should regard the requirements of talent training program and credit recognition method as the guarantee, rely on the platform of vocational skill identification station and practical training center, and rely on the system of department head, class and project tutorial system. At the same time, based on the industry career requirements, they should effectively combine the practical teaching content of professional courses and implement variety of vocational skill training and examinations. By doing so, insufficient motivation of students' after-school professional learning can be improved.

4.3.7. Focus on Discipline Competition and Construction with Comprehensive Strength as the Core

In terms of the comprehensive strength of majors, the universities should carry out various discipline and major competitions at all levels and realize the session of discipline and major competitions within the university. They should strengthen the construction of discipline and major competition mechanism, implement comprehensive quality assessment, credit assessment and competition reward system, and build a "five-coordinated" competition mechanism, which is sponsored by the academic affairs or league committee, undertaken by secondary colleges, evaluated by experts, co-organized by associations and sponsored by enterprises. By doing so, the problem of students' insufficient motivation and poor competitive consciousness in after-school professional learning can be effectively improved.

5. Innovative Application of "Seven-in-one" Applied Talent Cultivation Model

5.1. Process Innovation: Build the Integration of "Seven Links" in the Whole Process of Talent Training.

Based on the whole process of training applied talents in mechanical majors, the "seven-in-one" training mode takes the seven links of "theoretical teaching, practical teaching, innovation research, production practice, professional association, professional certification and discipline competition" as the key aspects to integrate education teaching resources. At the same time, the "seven-in-one" talent cultivation model is integrated into the professional talent cultivation program. The reform goals, including integration of theory and practice, combination of class and production, collaboration of teaching and application as well as in-class and after-class, synchronization of projects and innovation, integration of professional and certification and the organization of association and competition, have been realized. The "Seven-in-One" program enables students to have opportunities to participate in diversified training during their four-year campus life so that the students' overall ability can be improved and their technology application capability can be greatly enhanced.

5.2. Methodological Innovation: Implement "Diversified" Reform of Teaching Methods and Approaches.

This result promotes the reform of "diversified" teaching methods and approaches. The universities can adopt multiple combinations of teaching situations in the areas of content and media, theory and practice, dynamic and static, classroom and production, project and application, lecture and demonstration. They can diversify teaching modes such as integrating "teaching, learning, practicing" and "teaching, learning, practicing, evaluating", conducting theory and practice, on-site teaching, project-based teaching, flipped classroom teaching. Also, the universities can diversify their teaching mode through– visualization of the objects, three-dimensional equipment, process dynamic, principle simulation, and processing simulation.

5.3. Content Innovation: the Implementation of Professional Teaching Resources "Diversified" Combination

The universities can implement "seven-in-one" model reform and realize "diversified" combination of teaching resources through the following ways. They can build multiple systems of teaching contents - theoretical system, practical system, and vocational system; integrate multiple

teaching contents - synchronization of knowledge and ability, and integration of theory and practice; provide multiple places for on-campus practice - classroom, laboratory, and workshop; and launch multiple cooperation for comprehensive practice - school-enterprise + school-local cooperation base, dual tutors, and internship - design - employment integration. Also, they can enhance the scientific research and collaboration - teacher-student collaboration, school-enterprise collaboration, and school-local collaboration; provide multiple innovation and entrepreneurship platforms - maker space, scientific research project, college students; innovative entrepreneurial training plan program, and innovation studio; develop diversified teams --invention association, CAD association, and mechanical and electrical engineering application technology association; hold multiple discipline competitions - Mechanical Innovation and Design, Comprehensive Engineering Ability, Challenge Cup, Metallography, Advanced Drawing, Innovation and Entrepreneurship, Robotics, and Network Design; and certificate different kinds of vocations - center lathe, CNC Lathe, electrician, CAD, and CSWA.

6. Analysis of the Application of "Seven-In-One" Applied Talent Training Model

Since the research and practice of this model, the mechanical majors of local colleges and universities have achieved fruitful results in professional construction, teaching reform and scientific and technological innovation. Firstly, achievements have been made in curriculum construction such as municipal-level high-quality courses and school-level high-quality courses. Secondly, after teaching research and teaching reform, achievements have been made in quality engineering projects, teaching reform projects, teaching research papers, teaching achievement awards. Thirdly, achievements have been made in collaborative innovation between universities and entrepreneurs. Through the joint efforts, practical teaching bases and collaborative innovation centers have completed the construction, titles like enterprise experts and collaborative innovation experts have been obtained. Also, school-enterprise cooperation has obtained scientific and technological progress awards and yielded a lot in scientific research projects and invention patents thanks to the teachers' efforts. Fourthly, there are highlights of student teams. "Collaborative" associations such as invention, CAD and mechanical and electrical engineering application technology have been established, maker spaces and innovation teams have also been formed. Also, the teams formed by students have won various honors such as outstanding teams in social practice. Fifthly, vocational certification has its own characteristics. Vocational certifications like CAD/CAM, electrician, and machining have been popularized. Sixthly, discipline competitions have yield great fruits. Many students have won prizes in national drawing competition, robotics competition, mechanical innovation design competition, engineering training comprehensive ability competition and other professional competitions. Various kinds of university-level discipline competitions have been held in succession, and the competitions have been held for 1,000 person-times.

7. Conclusion

Through the application analysis of "seven-in-one" applied talent training mode, effects have been made in the teaching reform, the improvements have been made in professional construction, discipline construction and collaborative innovation of mechanical majors in universities, and the quality of mechanical majors' talent training has also been significantly improved. Many excellent talents can be found in each session of the graduates. This model is applied in engineering majors of local colleges and universities, and other colleges and universities have also learned from it, which is well received by peer experts. After years of practical application, this model is effective, has good operability and has good value of promotion and application. The overall experience is that:

top-level design is the key, mechanism construction is the root, platform and resource construction is the guarantee, optimization and integration is the focus, and reform practice is the driving force.

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