PIONEER
ACADEMIC PUBLISHING LIMITED

Journal of Progress in Engineering and Physical Science
ISSN 2709-4006
www.pioneerpublisher.com/jpeps
Volume 2 Number 3 September 2023

The Construction and Implementation of Practical Teaching Model for Cultivating Application-Oriented-Talents in Mechanical Engineering

Hongkui Jiang[1]

[1] Xingzhi College Zhejiang Normal University, Jinhua 310000, Zhejiang, China
Correspondence: Hongkui Jiang, Xingzhi College Zhejiang Normal University, Jinhua 310000, Zhejiang, China.

doi:10.56397/JPEPS.2023.09.06

Abstract

Strengthening the training of application-oriented-talents and improving students' engineering literacy is an important issue faced by applied local undergraduate institutions. Practical teaching plays a particularly important role in the cultivation of application-oriented-talents. Taking the practical teaching in the field of mechanical engineering as an example, this article elaborates on the construction model and practical effects of practical teaching for the training of application-oriented-talents.

Keywords: mechanical, application-oriented-talents, practical teaching

1. Introduction

Application-oriented-talents refer to skilled individuals who can apply mature technologies and theories to practical production and life. With the adjustment of China's higher education structure, graduate education has gradually replaced the task of cultivating research-oriented talents at the undergraduate level. Most universities have positioned the goal of undergraduate talent cultivation as the development of application-oriented-talents with solid theoretical knowledge and strong practical abilities. How to strengthen the training of application-oriented-talents and improve students' engineering literacy has become important issues for local undergraduate institutions focusing on applied education.

Practical teaching, as an essential content of college teaching, is an effective way to consolidate theoretical knowledge and plays a crucial role in the cultivation of application-oriented-talents. The construction of a practical teaching system not only emphasizes training students' basic competencies but also focuses on enhancing their practical awareness and meeting their needs for independent practice. Practical teaching activities need to follow a progression from simple to complex, initially developing students' professional cognitive through experiments in cognitive, verification, and training and then through

professional experiments to further improve the degree of students' cognition of professional knowledge.

The practical teaching for the cultivation of application-oriented-talents has not only knowledge objectives, but also skills objectives and qualities objectives. In terms of knowledge objectives, through practical teaching, the cultivation of application-oriented-talents need to continuously enhance scientific literacy and broaden the scope of knowledge. Regarding skills objectives, practical teaching combines theory with practice, enabling students to apply their acquired knowledge to solve practical problems and improve their abilities in teamwork, innovation and creativity. As for the qualities objectives, these are fostered through curriculum-based practical teaching and campus cultural activities. Through practical courses teaching, students develop a correct outlook on life, values, and world outlook. Through campus cultural activities, students can cultivate their sentiments, broaden their horizons and stimulate their potential.

2. Issues and Proposed Solutions

In the current practical teaching process for cultivating application-oriented-talents, the following issues exist. (1) There is a disconnect between theory and practice. (2) Students lack a strong engineering awareness. (3) The problem of the imperfect training system of engineering practical ability.

To effectively address above problems and achieve the objectives of practical teaching in terms of knowledge, skills, and qualities, we combine the characteristics of engineering machinery major, through planning, positioning and construction of the major, and according to the needs of the core competence of the mechanical major, through expanding the connotation of talent training, building professional course groups, co-building intelligent manufacturing platforms, optimizing the practical training system, strengthening faculty development, reforming the teaching model etc. new measures. Through the concept of "integration and innovation," we have established an educational philosophy for talent cultivation. Through the "expansion of connotations," we have constructed a distinctive practical teaching model for the training of application-oriented-talents in the field of mechanical engineering.

3. Model Construction and Practice

3.1 Update Philosophy

We have established the educational philosophy of "integration and innovation, expansion of connotations" and scientifically design an innovative applied undergraduate talent cultivation system. Through thematic discussions, we have identified integration and innovation as the starting point to expand the connotations of talent cultivation. By building an on-campus and off-campus practice platform, integrating in-class and extra-class teaching resources, and optimizing the teaching system of theoretical and practical courses, we have revised the undergraduate training program of the mechanical engineering, built a multi-level engineering practice ability training system, focused on cultivating students' mechanical and electrical comprehensive ability, engineering design and innovation ability. We guide students to develop the ability to identify problems through practice and to innovate when solving these problems, within an atmosphere of continuous learning and doing.

3.2 Establishing the System

We have constructed a hierarchical and progressive system for developing engineering practical skills, integrating engineering literacy education into the entire talent cultivation process. A hierarchical and progressive engineering practical skills training system of "basic ability cultivation layer → comprehensive ability cultivation layer → engineering application ability cultivation layer → innovation ability cultivation layer" is constructed. The engineering practical skills training system covers the entire process of talent cultivation in the mechanical engineering in undergraduate, creating conditions for strengthening the cultivation of students' engineering literacy.

3.3 Establishing Platforms

Build an engineering practice platform based on improving the ability of practice and innovation, and build an integrated engineering literacy cultivation system. The formation of engineering literacy relies on engineering practice environment and atmosphere. Firstly, we have collaborated with multiple enterprises to establish off-campus engineering practice teaching platforms (bases). Through university-enterprise cooperation in curriculum and practical teaching, we have formed an

on-campus and off-campus integrated system for engineering literacy cultivation system, utilizing the products of these enterprises to develop case studies and implement project-based teaching. This approach allows students to "do real questions" in the teaching links of professional design and graduation design, cultivating their abilities in engineering design and innovation, fostering engineering awareness and habits. Secondly, we have established research institutes in collaboration with enterprises, constructing a cluster of professional courses to address the issue of theory-practice disconnect in the process of talent cultivation. For example, by co-building research institutes and design centers with enterprises, we can build practical teaching platforms with "scientific research team + innovation ability", build diversified practical ability training models, and highlight cultivation of application-oriented-talents in intelligent manufacturing. The third is to train talents in industry-academia cooperation, and carefully design industry-academia cooperation education modules. For example, multi-level hiring of part-time teachers from enterprises, classified management of part-time teachers, and formation of cross universities and enterprise engineering education teaching team. The fourth is to take engineering training + discipline competition as the second classroom. By organizing various disciplinary competitions and establishing associations, we create a favorable atmosphere where students prioritize application-oriented and technical skills, forming a new model of engineering practice teaching that integrates inside and outside the classroom. Enhance students' engineering literacy and expand their capabilities in electromechanical design innovation.

3.4 Strengthening the Process

We will enhance the standardized management of experimental training teaching, scientific research project training, and disciplinary competition training, emphasizing process management and implementation. We will modularize and integrate various aspects of practical teaching, reconstructing a theory-practice integrated and progressive practical teaching system that includes "fundamental experiments and practice → course design → comprehensive professional practice → industry-academia-research project practice → innovation training (disciplinary competitions) → graduation design."

3.5 Emphasizing the Results

Add the teaching link of professional skills standard assessment, and carry out the integrated design of college students' professional skills. Taking abilities as the core and technology as the medium, we have constructed a professional skills standard assessment content centered around "expressive ability → computational ability → design ability → application ability → innovation ability," and built a full-process engineering skills cultivation system to ensure the bottom line of talent training specifications and teaching quality.

4. Achievements in Practice and Innovation

Through the construction and implementation of the "integration of innovation, expansion of connotation" practical teaching model for the cultivation of application-oriented-talents in the mechanical engineering field, the mechanical engineering has established a diverse model for cultivating practical skills, innovated talent cultivation mechanisms, and enhanced students' engineering literacy and expanded electromechanical design innovation capabilities through the second classroom. This has addressed issues such as the incomplete practical skills cultivation system, the disconnect between theory and practice, and the lack of engineering awareness among students in the talent cultivation process. The project practice has brought about the following innovations:

1) Realize innovation in educational philosophy: The establishment of the talent cultivation educational philosophy of "integration of innovation" has created the mechanism of mechanical and electrical application-oriented-talents training for applied undergraduate institutions. It urges teachers to transform teaching methods and enhance practical abilities. Teachers teach in practical activities, and students learn through practical activities. Students experience innovation in practice and integrate innovation in practical training, achieving the teaching objectives of applied universities.

2) Realize innovation in talent cultivation mechanisms: The innovation in "expanding connotation" lies in the new form of industry-academia-research cooperation education. This is achieved through measures such as constructing a cluster of professional courses, establishing intelligent manufacturing

platforms, optimizing the practical training system, strengthening faculty development, and reforming teaching methods. By incorporating student associations into the credit system, organically integrating the first, second, and third classes, combining majors, fostering characteristic classes education of industry-academia cooperation in talent cultivation and expanding the connotation of talent cultivation. The practical teaching system for the cultivation of applied undergraduate talents in the field of mechanical engineering is scientifically and reasonably designed, innovating the mechanisms for talent cultivation and forming a new system for cultivating application-oriented-talents.

3) Realize innovation in talent cultivation pathways: By establishing both on-campus and off-campus engineering practice platforms with a focus on enhancing practical innovation abilities, a progressive engineering practice capability cultivation system has been constructed. This enables that engineering literacy education runs through the entire process of undergraduate mechanical engineering education. The cultivation of students' engineering practice ability has changed from a single ability training mode scattered in different teaching links to a comprehensive ability training mode with progressive levels, which has effectively improved students' engineering literacy and ability to solve practical problems.

5. Conclusion

This article has used the practical teaching of the mechanical engineering field as an example to elucidate the construction model and achievements of applied talent cultivation through practical teaching. Through project practice, the quality of talent cultivation has significantly improved, students' practical innovation abilities have noticeably increased, the teaching and research capabilities of faculty members have greatly improved, and the professional influence has continued to expand, which has been widely recognized by the society.

References

Wang Lijian, Zhang Huiyong. (2017). Analysis of practical teaching reform under the model of application-oriented-talents cultivation. *Journal of Luoyang Institute of Science and Technology (Natural Science Edition), 27*(03), 94-96.

Wu Dongsheng, Gao Hongwei, Sun Jingen, Yang Qing, Ji Zhenping. (2017). Reform of engineering practice teaching model based on school-enterprise collaboration for the cultivation of application-oriented-talents. *Education Modernization, 4*(24), 4-5+13.

Yu Caili, Wu Jian, Shi Yuqing. (2010). Enlightenment of the German FH practical teaching model on the cultivation of application-oriented-talents. *Journal of Zhejiang University of Science and Technology, 22*(05), 398-401.