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Discussion on the Training Mode of Mechanical Talents Oriented by Innovation and Entrepreneurship under the Background of New Engineering

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Abstract: Under the background of new engineering, higher requirements have been put forward for the training of application-oriented undergraduate mechanical professionals. Students not only need to have solid basic knowledge and application technology of mechanical related theories, but also need to have certain innovation and entrepreneurship ability. This paper analyzes the current new engineering under the background of innovative entrepreneurial ability oriented applied undergraduate mechanical professional personnel training mode related problems, put forward the strengthening innovation entrepreneurship education and mechanical professional course integration, reasonable advance innovative entrepreneurial ability oriented mechanical professional practice course teaching reform, teaching fusion, improve teachers and students innovative entrepreneurial consciousness of a series of new engineering background to innovative entrepreneurial ability oriented talent training strategy, in order to provide reference for the cultivation of innovation and entrepreneurship ability of applied undergraduate mechanical majors under the background of new engineering.

1. Introduction

Since 2017, the Ministry of Education has actively promoted the construction of new engineering, pointing out that undergraduate universities should play a main role in engineering science and technology innovation and industrial innovation, and put forward new requirements for the training of engineering talents in colleges and universities [1]. For applied undergraduate course colleges and universities, mechanical professional as a typical professional in the construction of new engineering, and the solid guarantee of engineering products manufacturing strength, how on the basis of the existing talent training mode, to explore the innovative mechanical professional personnel training mode, and promote mechanical professional by traditional engineering education to support industry 4.0 talent output training target transformation has become the primary task

facing the applied undergraduate course colleges and universities.

In view of the current applied undergraduate mechanical professional students training mode has not fully adapt to the new engineering background of the actual training goal, this paper through the analysis of the current mechanical professional talents training mode, put forward the new engineering background to innovative entrepreneurial ability oriented talent training strategy, strive to applied undergraduate mechanical students to become industry needs of engineering science and technology innovation talents.

2. Current situation analysis

In recent years, with the continuous promotion of the new engineering construction concept proposed by the Ministry of Education across the country, how to implement the diversified training of innovative talents has become the focus of the teaching reform of application-oriented undergraduate universities, and also the development trend of the new engineering construction. As a typical major of applied engineering, the training of innovative and entrepreneurial talents in mechanical majors under the background of new engineering emphasizes the practicability of the theoretical knowledge learned in the process of student training, the intersection of various professional courses and the comprehensive application of innovation and entrepreneurship. New engineering machinery talents should have strong engineering practice ability, innovation and entrepreneurship ability, and can promote the development of high and industrial compound talents [2-3]. At present, although colleges and universities have actively made some achievements in cultivating the new mode of mechanical talents oriented by innovation and entrepreneurship ability under the new engineering background of engineering, there are still the following problems on the whole.

2.1. The integration degree of innovation and entrepreneurship education and mechanical professional courses is insufficient

Innovation and entrepreneurship ability is an important indicator for the cultivation of mechanical talents in application-oriented universities under the background of new engineering. At present, application-oriented universities have basically formed the upsurge of innovation and entrepreneurship education for college students [4-5]. However, the training mode of mechanical talents has not been fundamentally changed, innovation and entrepreneurship education and mechanical courses have not been deeply integrated, and there is a lack of mechanical talents training system matching with the improvement of students' innovation and entrepreneurship ability. In terms of the overall structure of curriculum construction, colleges and universities generally set up independent innovation and entrepreneurship courses to improve students' awareness of innovation and entrepreneurship. However, such innovation and entrepreneurship courses are generally general elective courses, lacking the construction of innovation and entrepreneurship knowledge system integrated with the mechanical specialty itself, which makes the mechanical specialty students unable to deeply understand the relationship between innovation and entrepreneurship knowledge and professional courses, and it is difficult to effectively improve their professional quality. On the other hand, colleges and universities are unable to carry out scientific and reasonable guidance planning when formulating courses, most of which are based on the relevant experience of transportation, while their own curriculum research and innovation foundation is weak, so they cannot carry out curriculum design and teaching planning scientifically.

In addition, the curriculum system should be a systematic integration of theory and practice，the current theoretical and practical courses are in an unbalanced development. The theory and practice of innovation and entrepreneurship courses for mechanical majors in most colleges and

universities are out of line, and the practical operation of students still needs to be further strengthened and expanded. At the same time, the penetration and integration of various disciplines are insufficient, which also makes the construction of the innovation and entrepreneurship curriculum system face great difficulties, and thus affects the formation and development of innovative thinking.

2.2. The practical courses of applied machinery professionals tend to be formalized

At present, most of the colleges and universities under the background of new engineering applied mechanical professionals innovation entrepreneurial ability training understanding does not reach the designated position, also only rely on the traditional teaching mode, teachers' teaching as the center, pay attention to the theoretical knowledge, practice tend to form, professional course teaching theory teaching hours more, experiment and practice hours less [6-7] . The teaching course is seriously out of line with the engineering practice. The engineering practical application cases of theoretical courses are lacking or rarely mentioned in the teaching design, and the teaching content lags behind the application of production practice. The students don't know why learning this course, learning this course can have what idea, resulting in students' learning enthusiasm is not high, the phenomenon of low classroom participation, eventually lead to a lack of interest in course content, teaching quality fell seriously, innovative entrepreneurial consciousness is not well training, innovative entrepreneurial practice ability is not effectively improve.

In order to solve the above problems, although some universities have explored and promoted the reform of application-oriented talent training mode oriented by innovation and entrepreneurship ability, the reform tends to be stereotyped and the reform effect is not ideal. Such as only by reducing the theory of professional courses, increase experiment and practice hours to highlight the students' innovative entrepreneurial practice ability, lack of supporting systematic curriculum system reform, eventually lead to student theory course understand not thorough, professional knowledge is not solid, innovative entrepreneurial practice ability has not been effectively promoted, academic pressure greatly increased.

2.3. Teachers' lack of teaching ideas of innovation and entrepreneurship, and students' awareness of innovation and entrepreneurship is weak

At present, part of the long-term service in teaching line has rich teaching experience of teachers for students 'innovative entrepreneurship ability training does not reach the designated position, that applied undergraduate course universities mechanical professional should pay attention to the cultivation of students' professional ability and engineering practice ability, rarely involved in the process of teaching students' innovative entrepreneurial ability training related content, the lack of curriculum innovation entrepreneurship teaching idea. For most young teachers, itself has a strong theoretical research ability and accept the advanced teaching concept, but because of the engineering practice experience is less, in the process of teaching, professional knowledge, innovative entrepreneurial ideas, engineering practice problems cannot organic combination, cannot introduce appropriate engineering practice case, it is difficult to effectively cultivate students 'innovative practice ability, open students' professional knowledge applied to engineering practice innovation vision. At the same time, in the process of learning professional knowledge, students have a weak awareness of innovation and entrepreneurship, and the main purpose of theoretical knowledge learning is to cope with the exam, unable to effectively apply the theoretical knowledge to the competition projects, lack of enthusiasm for participation in professional competitions, lack of the cultivation of self-innovation consciousness.

3. Methods strategy

3.1. Strengthen the integration of innovation and entrepreneurship education and mechanical professional courses

In view of the goal of training mechanical talents in application-oriented undergraduate universities under the background of new engineering, the classroom teaching cases of the deep integration of innovation and entrepreneurship education and mechanical courses. With engineering typical high-tech mechanical equipment, previous students excellent course design works and subject competition entries for classroom example, combined with professional theory knowledge introduction, clear theoretical knowledge in the role in the process of innovative product development, make the theoretical knowledge "alive", let the basic theoretical knowledge to find application carrier, guide students to understand the theoretical knowledge in mechanical product design and optimization.

At the same time, open homework is designed, so that students can complete the innovative design or functional optimization of existing mechanical products in the form of groups, use project-driven inquiry and innovative learning methods, stimulate students 'innovative thinking, improve students' team awareness, and strengthen the deep integration of innovation and entrepreneurship education and mechanical courses.

3.2. Reasonably promote the teaching reform of practical courses for mechanical majors oriented by innovation and entrepreneurship ability

As a typical major of new engineering construction, mechanical engineering should not only have solid theoretical professional knowledge, but also require students to have strong practical ability and pay attention to the combination of theory and practice, so as to meet the practical requirements for the training of application-oriented undergraduate mechanical talents under the background of new engineering. Application-oriented engineering colleges should make full use of practical training resources, reasonably promote the teaching reform of practical courses for mechanical majors oriented by innovation and entrepreneurship ability, and reasonably carry out the design of innovative practice courses combined with the theoretical teaching content, so that students can consolidate their professional theoretical knowledge and improve their innovation and entrepreneurship ability in the process of completing practical courses.

Virtual teaching experiment platform is introduced or developed to break the limitations of traditional course supporting experiments, fixed experiment process and experimental site, realize the fundamental transformation from teaching-centered to learning-centered in practical courses, meet the individual needs of students, and complete divergent virtual experiment courses anytime and anywhere. Strengthen university-enterprise cooperation personnel training collaborative education system, achieve "university-enterprise cooperation, mutual benefit and win-win" new goal, the introduction of enterprise mentor, to solve the problem of engineering practice as a starting point, training students engineering practice experience, cultivate students' ability to solve the problem of engineering practice, to apply undergraduate mechanical students to become industry needs and have certain engineering practice experience of science and technology innovation talents.

3.3. Integration of competition and education to improve teachers and students' awareness of innovation and entrepreneurship

Encourage students to participate in the National Undergraduate Mechanical Innovation Design Competition, the "Challenge Cup" competition, the "Internet plus" Undergraduate Innovation and

Entrepreneurship Competition and other discipline competitions, incubate innovative mechanical works in classroom teaching into competition works or mechanical products with certain market value, experience the specific application of professional knowledge in the process of improving works, develop innovative thinking, and understand the entrepreneurial process. We will guide students to actively apply for college students' innovation and entrepreneurship projects, strengthen students' understanding of the practicality of theoretical knowledge learned, the intersection of various professional courses and the comprehensive application of innovation and entrepreneurship, and train students to become high-quality and complex mechanical innovation talents under the background of new engineering. Teachers of specialized courses guide students to participate in the competition works. On the one hand, it can improve the innovation and entrepreneurship education concept of teachers of specialized courses. On the other hand, it can enable young teachers to accumulate engineering practical experience, and apply the teaching concept and practical experience obtained to the teaching work of mechanical courses, so as to continuously improve the innovation and entrepreneurship teaching concept of teachers of specialized courses.

4. Conclusions

With the continuous promotion of new engineering construction, higher requirements are put forward for the training of engineering talents in colleges and universities. As a typical major of new engineering construction, the talent training mode of mechanical major not only requires students to have solid theoretical knowledge, but also have engineering practice ability and innovation and entrepreneurship ability. This paper analyzes the shortcomings of the integration of innovation and entrepreneurship education and mechanical professional courses in the training of applied undergraduate mechanical professionals, and puts forward a series of reform measures. In order to reform the training mode of applied undergraduate mechanical professionals in the new engineering background oriented by innovation and entrepreneurship ability, it is proposed to strengthen the integration of innovation and entrepreneurship education and mechanical professional courses, and reasonably promote the teaching reform and teaching integration of mechanical professional practice courses oriented by innovation and entrepreneurship ability. It provides reference and suggestions for the cultivation of innovation and entrepreneurship ability of applied undergraduate mechanical specialty.

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Design and Practice of "Curriculum Ideology and Politics" in General Education Elective Course-- Taking "Foundation and Application of Industrial Robots" as an example (Project No. : NDJY2216).

Heilongjiang Province Higher Education Teaching Reform Project, Research on integrating innovation and entrepreneurship education into the talent training mode of mechanical engineering education (Project No. : SJGY20210639).

References

[1] Qi Liu, Guobing Mao. Exploration on the construction and comprehensive reform of materials science and engineering specialty under the background of new engineering construction [J]. Journal of Heilongjiang Institute of

Technology (comprehensive edition), 2019, 19(05):25-28.
[2] Peihua Gu. New Engineering and New Paradigm: Practical Exploration and Thinking [J]. Higher Engineering Education Research, 2020 (04): 1-19.
[3] Chundong Wu, Haichao Bai, Chunrong Qiao, et al. Discussion on the cultivation mode of students majoring in agricultural machinery in application-oriented agricultural universities under the background of innovation and entrepreneurship [J]. Agricultural Machinery Use and Maintenance, 2022 (08): 171-174.
[4] Xuedong Xu, Yuzhuo Men, Hui Liu, et al. Reform and practice of the education system of "integration of specialty and innovation, cooperation between industry and education" for mechanical majors from the perspective of new engineering [J]. Journal of Changchun University of Engineering (Social Science Edition), 2022,23 (02): 130-134.
[5] Yang Yang, Xin Li. Research on the application of entrepreneurship and innovation education in the training of mechanical professionals under the background of "new engineering" [J]. Nanfang Agricultural Machinery, 2022,53 (22): 191-194.
[6] Liangfei Fang, Xin Zhou, Xinyue Zhang. Exploration of the innovative model of practical teaching of mechanical specialty driven by discipline competition and big innovation projects in the context of new engineering [J]. Journal of Beijing Printing University, 2020, 28 (S2): 189-191.
[7] Min Jin, Xuehong De, Xing Liu. Exploration and research of school-enterprise cooperation in the development of practical curriculum resources -- taking mechanical design, manufacturing and automation as an example [J]. Heilongjiang Science, 2022, 13 (13): 159-161.