

Exploration and Research on Curriculum Reform Based on the ability training of mechanical innovative design post

-- take the course of fundamentals of mechanical design as an example

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Abstract: in order to meet the requirements of digital mode innovation in manufacturing industry, better serve regional industries, and help enterprises' digital transformation and upgrading. Based on the national professional teaching standards and enterprise job requirements, according to the talent training program, the integration of "post competition certificate new research", and the reconstruction of teaching content based on the development of design ability; Taking the cultivation of innovative talents as the goal, based on the post design process, the teaching is implemented with the combination of virtual reality and "four fusion and five progression".

Key words: innovation ability; Post course competition certificate accommodation; Value added evaluation; Curriculum ideological and Political Education

With the development of the times, scientific and technological innovation has become one of the most important core competitiveness of all countries in the world. Innovation is the driving force of the times. National development and national rejuvenation are inseparable from innovation. "Fundamentals of mechanical design" is a professional basic course for NC technology major, aiming at engineering application ability and innovation ability, insisting on putting innovation at the core of the overall development of the manufacturing industry, and striving to become a real innovation power, which requires a large number of engineering and technical talents and innovative R & D high-end talents.

1 Background of curriculum teaching reform

Fundamentals of mechanical design is highly theoretical. It covers many formulas, concepts and charts. The content is boring and monotonous. The knowledge points of the course are many and scattered. The traditional teaching mostly adheres to the characteristics of the subject. The theoretical derivation process is complex, and the principle description is not easy to understand. It is difficult for students to learn and improve their interest in learning; The content is too old and abstract, lack of combination with actual projects, and the cultivation of students' autonomous learning and creative thinking ability is not enough; The lack of teaching resources, the lack of experimental and practical training conditions, the lack of integration of engineering practice and theoretical knowledge, and the difficulty of integrating new technologies, new means and new processes into the traditional teaching content in time lead to the lag of teaching in the development of manufacturing industry.

Traditional teaching generally has many problems, such as too much course content, less class arrangement, more principle elaboration, less practical teaching, more classroom teaching, and less local operation. Students can not "know what it is, know why it is", and can not really understand the principles, resulting in students' lack of engineering knowledge and innovation practice experience, and can not connect the knowledge points learned with engineering practice. Moreover, it does not have the demand for innovative R & D-type high-end talents who keep pace with the times.

2 Practice and exploration of curriculum reform

1. teaching reform concept

Implement the education concept of "integration of innovation and application first" and the innovative talent training mode, connect with the post standards of mechanical design engineers in manufacturing enterprises, introduce the professional skill level standards for 3D model design of mechanical products, adopt new design tools, new manufacturing processes, new operation specifications and other contents, and "dual" reconstruct the project modular curriculum content in schools and enterprises, "Combination of work and study, unity of knowledge and practice". In the process of teaching implementation, the course team is jointly built, loose leaf textbooks are developed, resource platforms are built, schools and enterprises jointly build and share training rooms, highlight the students' main body, and integrate ideological and political elements such as "national self-confidence, craftsman spirit and manufacturing power" into classroom teaching projects, Cultivate high-quality technical and skilled talents in the equipment manufacturing industry with the professional ability of digital design and the professional quality of "emphasizing standards and specifications, being realistic and innovative, and having responsibility", and help make China 2025.

(1) "Post course competition certificate" integration

We will deepen the integration of industry and education and school enterprise cooperation, promote innovation and entrepreneurship education and labor education, closely combine the concept of competition with the improvement of the talent training system, enhance students' employment competitiveness, and broaden employment and entrepreneurship channels.

1) Introduce new processes, technologies and specifications, and connect module teaching tasks to real posts

Guided by the needs of the industry, the core course content of the course has been updated, adjusted and optimized, focusing on strengthening the cultivation of professional students' mechanical digital design and manufacturing technology application ability.

2) Promote learning through competition, apply learning to practice, and combine learning with practice to stimulate students' interest and innovation

Through competitions, such as the industrial design technology competition of the national vocational college vocational skills competition, we can understand the frontier trends of professional development, establish the teaching reform concept of "taking projects as the carrier, work tasks as the guide, and action oriented", so as to standardize and standardize skills teaching and promote teaching improvement. Take the competition as the medium to organize and carry out various school competitions.

(2) 3D model design of 1+x mechanical products vocational skill level certificate injects new vitality into the reform of teaching mode

Introduce the certificate standard, take the certificate standard and documentary evidence accommodation as the breakthrough point, carry out the docking of professional standards, curriculum standards and the connotation of "X" certificate, realize the process convergence and accommodation in the specialized ability, quality, knowledge, general ability and leading knowledge, and achieve the effective docking between the professional skill level standard and the professional talent training scheme. Dismantle the knowledge points, skill points and literacy points of the professional skill level standard, accurately match and reorganize them with the knowledge points, skill points and literacy points of the course, implant them into the existing courses, and improve the integration of professional talent training programs and students' professional ability needs.

2. facing the design position, integrating the post competition and certificate innovation, and reconstructing the teaching project of "design ability development"

In order to adapt to the development of new technologies of digital design and manufacturing and new business forms such as collaborative design and interactive design in the new era, the professional post ability of manufacturing enterprises is investigated. Based on the real job requirements of mechanical engineers, the course content has been scientifically sequenced and modularized by connecting with national professional standards and enterprise job standards, and introducing professional skill level standards, new design technologies, new manufacturing processes and new operation specifications.

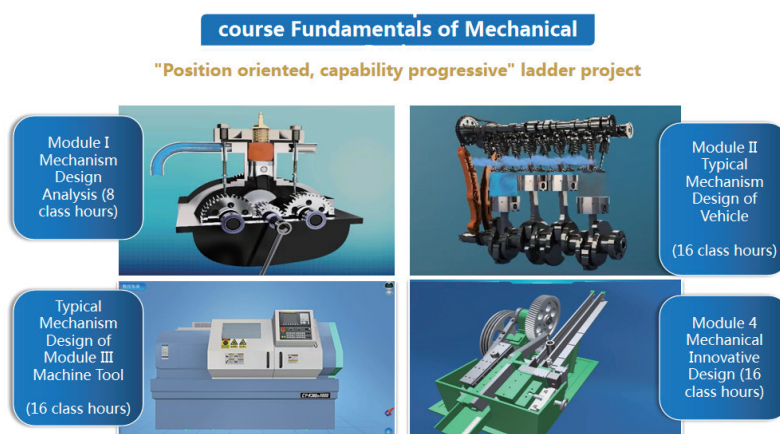


Figure 1 content reconstruction

The theoretical knowledge of mechanical design is integrated into the implementation process of engineering projects. The theoretical teaching is combined with the practice of design projects. While mastering the basic theories and methods of mechanical design, the teaching process highlights the training of mechanical design skills, the training of mechanical engineer's post ability, the ability to analyze and solve problems and the ability to coordinate production, and the cultivation of labor spirit, inquiry ability. The craftsman quality of large countries, such as innovation ability, actively adapts to the needs of the equipment manufacturing industry in the new era.

3. implement the teaching strategy of "four fusion and five progression" according to the post process and the actual learning situation

Driven by real posts, projects and processes, strengthen the process and specifications of design posts, build a teaching environment and organize teaching according to the requirements of mechanical design posts, introduce design plug-ins and small programs in the teaching process, use new methods and tools of mechanical design, and truly reproduce the mechanical design process. The teaching link is the product design link, Reducing complexity to simplicity overcomes the "fear of theory" psychology and stimulates learning interest; The new organic integration of class, post, competition and certificate, the introduction of enterprise expert evaluation, the guidance of students' standardized design with work norms and standards, and the influence of enterprise philosophy on professional quality.

Based on the job requirements and in view of the students' lack of application ability of digital design software, CAD software and online design tools are selected to enhance the application ability of digital and intelligent tools by combining virtual and real; Aiming at the problems of weak autonomous learning ability and lack of motivation for theoretical learning, we should make VR resources, improve the construction of two platforms for students to learn at any time, consolidate the theoretical foundation and overcome teaching difficulties with the help of information technology; Select the learning tasks of workflow and cognitive ability rules, and develop loose leaf textbooks

with enterprise experts to make students familiar with the enterprise design workflow; Set up innovative design links, introduce experts and enterprise engineers to share cases and impart experience, stimulate students' interest and cultivate innovation and entrepreneurship.



Figure 2 combination of virtual reality and optimization of resources to break through the teaching focus

The teaching was carried out through “project reconstruction to lay a solid foundation, competition participation to stimulate innovation, and 1+x certification to verify the effect”. Based on the working process of the mechanical design post and the achievement of the goal of digital design ability, combined with the characteristics of students' lack of autonomous learning, self induction and comprehensive application ability, the four integration (post, competition, certification, innovation and Entrepreneurship Education) was adopted. Five progressive (task introduction - knowledge reserve - Product Design - sharing and refining - expansion and extension) teaching strategies, using task driven, cooperative exploration and other teaching methods, carry out project teaching in virtual simulation training room and mechanical innovation training room, and improve the level of professional and technical skills in typical tasks.

4. relying on the data platform, explore value-added evaluation, and build a “three-dimensional three subject” evaluation system

Teaching evaluation focuses on process, synthesis, value-added and diagnosis and reform. With the goal of cultivating students' innovative ability, an intelligent evaluation system of process + result + value-added based on double platform big data is established to implement the whole process evaluation, 8-character spiral monitoring and early warning, and diagnosis and improvement. Teachers, students and business mentors are the three main bodies, dynamic evaluation of virtual simulation experiment platform and real-time collection of learning app. Evaluate comprehensive quality, strengthen process evaluation, and explore value-added evaluation. Develop a virtual simulation platform integrating workflow and intelligent evaluation, record learning behavior and data, and teachers adjust teaching strategies in time through learning portraits.

The process assessment evaluates the completion of students' tasks before, during and after class, and each task is linked based on the workflow. Pre class tests guide students' autonomous learning and evaluate data to guide teaching in class; In class tests promote students to actively explore and master core skills; After class tests promote students to consolidate core knowledge and improve innovation ability. The value-added evaluation does not account for the weight of the score, and is an additional score for the reward based on the evaluation, including two dimensions: the progress of knowledge and skills before and after the academic development assessment, and the improvement of the ability in the examination / competition / enterprise service / social service, etc; Basic literacy assesses the degree of progress such as learning attitude / initiative, promotes learning through evaluation, and is used to stimulate students' continuous improvement and stimulate their potential. Comprehensive evaluation of the course = process evaluation *60%+ summative evaluation *40%+ bonus points, total score ≤ 100 .

5. build a new paradigm of “one core, two main lines, and double helix” for ideological and political education, and gather ingenuity to cast the craftsman's soul

The curriculum ideological and political design takes the cultivation of innovative talents as the core, and the curriculum ideological and political framework with professionalism, industry identity and family and country feelings as the three fulcrum. The craftsman spirit of loving work, being rigorous and meticulous, keeping improving and being brave in innovation is integrated into the professional spirit of mechanical design, and the craftsman consciousness of emphasizing standards and specifications is strengthened. The craftsman quality of hard-working and keeping improving is revealed, Firm career ideals and career pursuit. The cultivation of professional quality and post core skills is a combination of two main lines, and the cultivation of morality and talents is in the same direction. Based on the “double helix”, that is, the four step upward spiral of “research innovation practice research” for the growth of teachers' team and “learning practice competition learning” for the growth of students' team, we should stimulate the vitality of innovation.

3 Conclusion

The construction of the course aims at the cultivation of high-quality technical and skilled talents, aims at serving the development of regional industries, takes the innovative design of typical tasks of enterprise mechanical design posts as the main line, and takes the cultivation of high-quality mechanical design technical and skilled talents as the core design. The design of teaching project pays attention to the combination of theory with practice, pays attention to the cultivation and construction of innovative thinking in the process of mechanical design, and should go deep into school enterprise cooperation, capture cutting-edge technologies, update and improve teaching

content, resources, and timely connect with new technologies and standards of enterprises, and adjust teaching content; Technology is changing with each passing day. We should keep up with the application of innovative technologies in advanced manufacturing industry, constantly improve digital resources, dynamically update loose leaf textbooks, further develop more adaptable cloud textbooks, dynamically understand students' personalized needs, and timely develop and improve high-quality teaching resources to meet the personalized and post needs of the new era; Use big data, artificial intelligence, etc. to collect and analyze learning data, set up value-added evaluation indicators according to teaching objectives, curriculum standards and learning characteristics, optimize evaluation procedures and implementation methods, and play the role of guiding and assisting students' development. Actively explore the "double teacher teaching" mode of school enterprise collaborative education, adopt virtual simulation + virtual and real combination of experimental platform, create a trinity classroom of theory, virtual and real, and effectively achieve the teaching goal.

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