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Research on the Construction of Curriculum System in the Perspective of New Engineering: A Case Study of "Network Technology"

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Abstract: In recent years, with the development of AI technology and the requirements of ideological and political education in courses, universities need to establish a complete knowledge system and systematic thinking, and organically integrate ideological and political elements (such as network ethics and craftsmanship spirit) into courses, thereby shaping students' sense of patriotism and professional mission, and achieving a dual improvement in technical ability and values. At the same time, it is necessary to promote the deep integration of teaching models and technology empowerment, and reconstruct teaching scenarios with intelligent technology to enhance teaching flexibility and accuracy. On this basis, the high-level nature of courses should be enhanced to tap students' learning potential.

Keywords: network technology; instructional design; system construction

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1. Research Status of New Engineering Curriculum System

1.1. Domestic Research Status

1.1.1. Course Reconstruction through Interdisciplinary Integration

The new engineering curriculum system emphasizes breaking down traditional disciplinary barriers and promoting interdisciplinary integration. Scholars such as Wang Kun propose integrating resources from basic disciplines like mathematics and physics to construct interdisciplinary course modules centered on artificial intelligence and big data, and optimizing the practical teaching system through school-enterprise cooperation[1].

1.1.2. Industry-Education Synergy Model Oriented towards Practice

The current curriculum system places greater emphasis on industry-education integration, with teaching content updated driven by industrial demands. For instance, the Metallurgical Engineering major at Hebei University of Engineering has jointly built a practical base with enterprises and integrated English courses with information technology to cultivate internationalized engineering talents.

1.1.3. Empowering Teaching Innovation with Intelligent Technology

Intelligent technology is deeply integrated into course design, promoting teaching model transformation. Scholars such as Wang Zhan propose that personalized learning platforms and virtual simulation experiment systems based on AI are widely applied in new engineering courses, which can enhance teaching efficiency.

1.2. International Research Status

In the UK and the US, universities have established interdisciplinary research centers (such as MIT Media Lab) to break down departmental barriers and promote the deep integration of engineering education with information technology and management science, forming a "technology + business + design" composite course ecosystem. They adopt practice-oriented methods such as project-based learning (PjBL) and case teaching, centering on students and strengthening their autonomous exploration abilities[2].

2. Development Trends of New Engineering Curriculum System Construction

2.1. Deepening Industry-Education Integration and Platform Co-construction

In the future, the curriculum system will pay more attention to school-enterprise collaborative education, promoting the alignment of course content with industry standards through the co-construction of industrial colleges and joint laboratories. For example, Fudan University has integrated resources from multiple research institutes to establish the "Institute of Computing and Intelligent Innovation", forming an integrated training model of industry-university-research.

2.2. Dynamic Optimization and Competency-Oriented Reform

The curriculum system will develop towards modularization and flexibility, establishing a "demand feedback → dynamic adjustment" mechanism. For instance, by analyzing big data to track industrial technology trends, the course structure can be optimized in real time. At the same time, the course goals will be reconstructed based on a "problem perspective", strengthening the cultivation of core qualities such as engineering ethics and innovative thinking[3].

2.3. Teaching Model Innovation Driven by Technology

Virtual reality, generative AI, and other technologies will deeply empower teaching scenarios, promoting the popularization of new models such as blended teaching and immersive experiments. For example, intelligent algorithms can be used to recommend personalized learning paths, enhancing teaching accuracy.

3. Overall Thoughts on the Construction of New Engineering Curriculum System

3.1. Follow the knowledge system architecture from basic to professional, to application, and to cutting-edge technology.

In the traditional course knowledge system, the teaching of "Network Technology" mostly focuses on the imparting of theoretical knowledge, and students have difficulty encountering practical problems. There is still much room for improvement in practical application ability. In the construction of the innovative curriculum system, the teaching process will be designed according to the innovative teaching system from basic to professional, to application practice, and to cutting-edge technology. Focusing on the demand for high-quality network technology talents by new productive forces, students' practical ability and knowledge innovation ability will be cultivated.

3.2. Build a collaborative education mechanism of industry-education integration

By integrating the advantages of both university teaching and enterprise projects, the implementation process of enterprise projects is introduced into the teaching process to enhance the practicality of teaching content, promote the formation of a closed-loop learning model for students' basic knowledge, professional knowledge, and application skills, and enable students to master a complete knowledge system of network technology, ensuring that the course content remains consistent with industrial development and the talent demands of enterprises[4].

3.3. Cultivate knowledge and ability in challenging new theo

The course content should serve the national development strategy for engineering and the “13th Five-Year Plan”. At the same time, introduce new theories and methods with cutting-edge technologies into the classroom to guide students in conducting original innovation exploration and project design, thereby fostering students’ initiative, knowledge, and innovative awareness.

3.4. Oriented by outcomes, continuously improve the training objectives and teaching activities

The course construction follows the concept of international engineering education professional certification, centered on students and oriented towards results and continuous improvement. A teaching plan based on standardized project practice reports, new practical patents, and software copyright applications is formulated to explore the cultivation of new engineering application-oriented talents that are in line with the high-quality development of the new era.

4. Overall Framework of “Network Technology” Course Construction under the Perspective of New Engineering

The overall framework is divided into six parts: the core value system of the course, course content design, teaching methods, practical teaching platforms, evaluation methods of the course, and implementation and effectiveness. As shown in the following **Figure 1**. The “Network Technology” course takes “Knowledge & Application Innovation Ability & Quality (KIAQ)” as the core value system, aiming to cultivate application-oriented innovative talents who can use network technology theories and technologies to solve complex problems, and achieve effectiveness in the three-dimensional educational requirements of knowledge, ability, and quality. The course content design is the core of the teaching implementation plan, which includes theoretical teaching knowledge points, teaching content, and teaching objectives of the course; practical teaching knowledge points, practical content, and teaching objectives of the course; and the course content innovation mechanism. Teaching methods comprehensively utilize classroom lectures, case teaching, MOOCs, project practices, and other “online + offline” combined teaching methods. On this basis, project application practice requires students to apply the theoretical knowledge and practical skills they have learned to complete actual network networking projects, thereby cultivating students’ application innovation ability to solve complex problems[5].

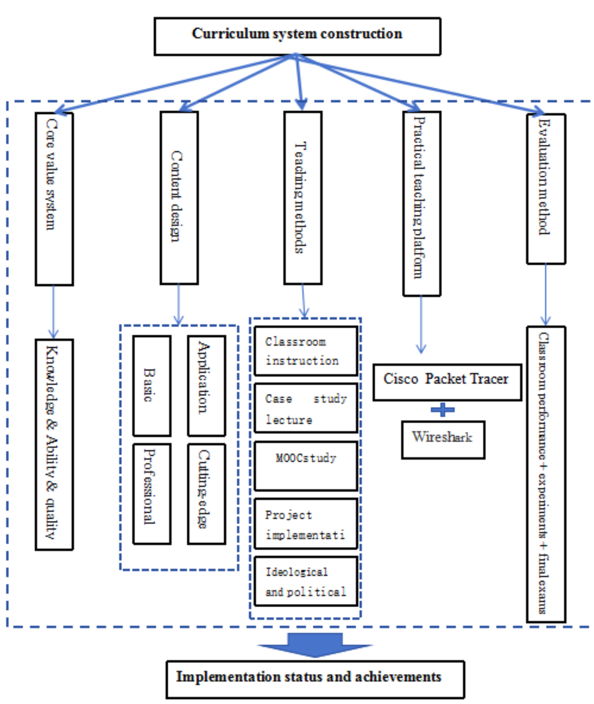

Figure 1. Overall Framework of “Network Technology” Course Construction under the Perspective of New Engineering

5. Main Contents of the Construction of the "Network Technology" Course from the Perspective of New Engineering

5.1. Overall framework

5.1.1. Core value system structure of the curriculum

The "Network Technology" course takes "Knowledge & Application Innovation Ability & Quality (KIAQ)" as its core value system, aiming to cultivate application-oriented innovative talents who can solve complex problems by applying network technology theories and techniques, and to achieve results in the three-dimensional educational requirements of knowledge, ability and quality for students (as shown in **Figure 2**). The connotation of the core value system of the curriculum includes:

The core value system must reflect the era's characteristics of new theories, new technologies and new applications in the new engineering era, and highlight the corresponding talent cultivation strategies that are adapted to the development of the data communication industry. The demand from multiple fields is the driving force for the current development of the network technology industry. It is necessary to highlight the ideas of theory, methods, software technology, and cross-field integration[6].

Establish connections with the knowledge points of the course content related to real application scenarios to help students better remember, understand, digest and apply the knowledge they have learned, and assist students in mastering the theoretical basis, basic algorithms and basic skills in network technology, thereby enhancing students' scientific logical thinking and comprehensive cognitive abilities in network technology engineering practice.

Innovation ability is one of the core elements of modern talents. The innovation ability of computer networks refers to the ability to propose new theories, new methods, new skills and solve new core network technology business problems. The course objective is to require students to significantly enhance their mastery of network technology knowledge, problem-solving skills, practical application abilities, and innovation capabilities[7].

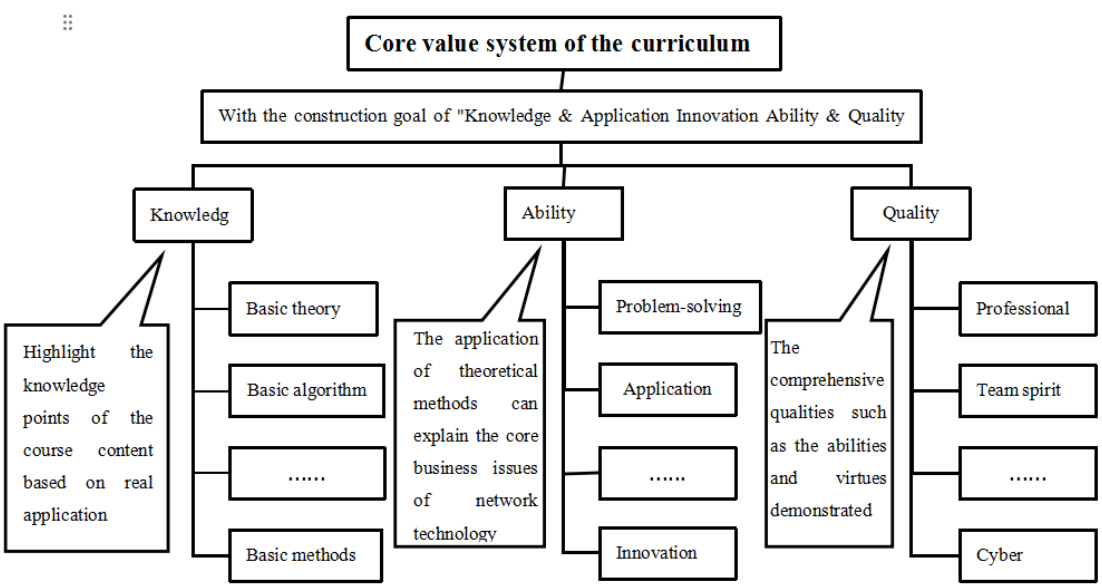

Figure 2. The core value system of the "Network Technology" course from the perspective of New Engineering Disciplines

5.1.2. Course content design

The design of course content is the core of the teaching implementation plan. According to the core value system KIAQ of the "Network Technology" course and the overall thinking of course construction.

The theoretical teaching knowledge points of the course include two aspects, namely basic knowledge and professional knowledge. The basic knowledge includes the concept and fundamental tasks of the network system. Flow control analysis methods and other contents. In the theoretical teaching knowledge points, application case course experiments are supplemented to help students master the basic theories in network technology networking. Advanced learning about network software requires students to complete it independently using MOOC resources and does not occupy teaching hours.

5.2. Knowledge points, practical contents and teaching objectives of the practical teaching links of the course

The practical teaching links of the course consist of two major parts: project application practice and cutting-edge technology project practice. The practical teaching link of the course is based on the CDIO engineering education concept, namely Conceive, Design, Implement and Operate.

5.3. Innovation mechanism for course content

The course content innovation is based on the CDIO engineering education concept and oriented towards application and innovation capabilities. It aims to enhance students' engineering skills in networking, dual-message handshake, and virtual network design, making them understand that network technology is not merely about learning theories and algorithms, but also a means to solve practical engineering problems. The innovation mechanism of course content is reflected in the abilities of conception, design and implementation[8].

5.4. Teaching methods

Due to the limited class hours of the "Network Technology" course, it is necessary to complete all the contents of the "Course Construction Content" in **Figure 3**, which leads to the problems of tight class hours and heavy tasks. It is necessary to comprehensively apply a combination of online and offline teaching methods such as classroom lectures, case studies, MOOCs, and project practices to solve this problem. The classroom teaching focuses on the explanation of the basic knowledge, professional knowledge and the principles of cutting-edge technologies of network technology. Case teaching focuses on the course experiments of cases and the training of classic networking implementation. Moocs focus on strengthening mathematical knowledge. On this basis, the project application practice requires students to apply the theoretical knowledge and practical skills they have learned to complete actual networking projects, and cultivate students' application innovation ability to solve complex problems[9].

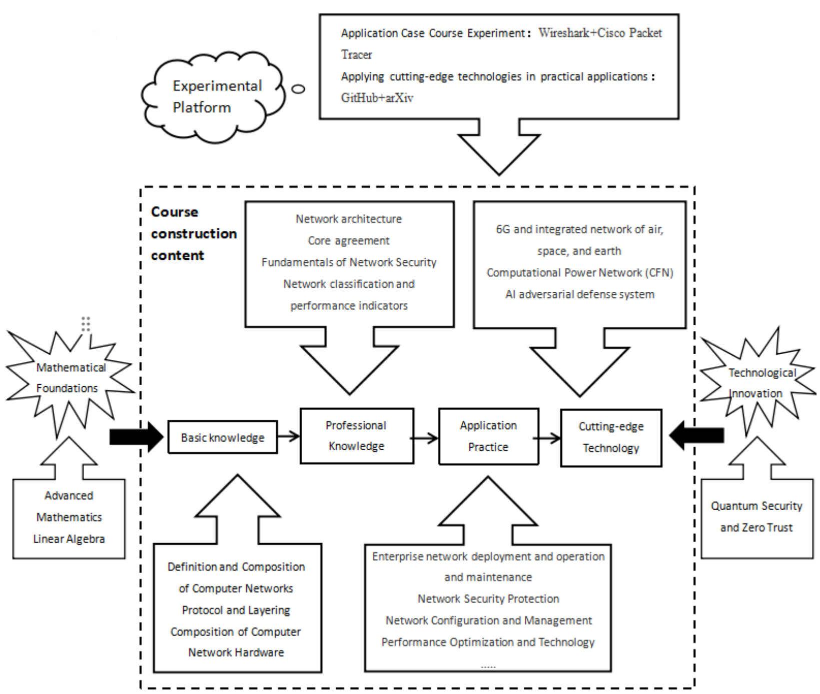

Figure 3. Course Construction Content

5.5. Practical teaching platform

The completion of course content must be supported by a practical teaching platform. This course has established a hybrid practical teaching platform of “online + offline”. The online platform includes IP address classification, data communication processing, and case course teaching, all completed by Chaoxing Online. The application practice project was completed by students building a platform using Cisco and Huawei software. The practical teaching of the entire course also follows the model from the basics to specialties, to applications, and to cutting-edge technologies, gradually cultivating students’ application and innovation abilities[10].

5.6. Evaluation methods for courses

The assessment method for this course is a closed-book examination. Comprehensive practical projects are used to assess students’ mastery of theoretical and experimental knowledge points in the course. The course aims mainly to assess students’ innovative abilities, with an important focus on checking their mastery and application skills of various knowledge points, including regular performance, experimental performance and final exam performance. The regular performance includes attendance, regular homework and classroom performance. The experimental performance consists of 8 experimental projects. The final exam is the result of a closed-book test. The proportions of regular performance, laboratory performance and final exam are respectively set at 20%, 40% and 60%[11].

6. Key and Difficult Points in the Construction of the “Network Technology” Course from the Perspective of New Engineering Disciplines

6.1. theory is disconnected from practice

Traditional textbooks lag behind the development of new technologies such as cloud computing and SDN. It is necessary to collaborate with the industry to develop loose-leaf textbooks and integrate real project cases from enterprises (such as cloud-network integration solutions).

6.2. Abstract teaching of complex protocols

The hierarchical encapsulation mechanism of network protocols (such as TCP three-way handshake and IP sharding and reassembly) involves the intersection of multiple disciplines, and students are prone to cognitive gaps. Therefore, it is necessary to achieve visual teaching through Wireshark packet capture analysis. The dynamic behaviors of protocol state machines (such as HTTP connection management and BGP neighbor negotiation) are difficult to be statically displayed and rely on Packet Tracer dynamic simulation tools for auxiliary understanding[12].

6.3. Practical resource construction barriers

The virtual simulation platform needs to be compatible with multi-vendor devices (Cisco/Huawei) and support the construction of distributed experimental environments, which poses challenges to the depth of the teaching staff’s technical stack and the operation and maintenance costs.

6.4. There are significant differences in the abilities of students

Students generally have weak network foundations and insufficient logical thinking. It is necessary to design stratified teaching objectives (such as basic networking → intelligent operation and maintenance) and micro-lesson resource packages.

6.5. Organic integration of ideological and political education in courses

It is necessary to embed ideological and political elements such as the Cybersecurity Law and data sovereignty awareness into teaching modules like DNS hijacking prevention and privacy protection technology to avoid knowledge fragmentation caused by “hard implantation”.

Disclosure statement

The author declares no conflict of interest.

References

[1] Florence X T R, Jesse E, Lin Y X, 2025, Disentangle the Curriculum and Structural Effects of Math Pathway Reforms: Evidence from Maryland Community College System. Research in Higher Education, 66(6): 39-39.

[2] Jiang X H, Li Q, Gu M X, Zheng S K, 2025, Thoughts on Cross course Teaching of Electronic Information Major in Factory based Learning System. Computer Informatization and Mechanical System, 8(4): 76-79.

[3] Guo Y, Kang D, 2025,Research on the Reconstruction Path of the Internet of Things (IoT) Professional Curriculum System from a Wide-ranging Business Perspective. Contemporary Education and Teaching Research, 6(8): 89-97.

[4] Winchester D E, 2025, Reimagining the Undergraduate Medical Education Systems-Based Course: an example for the Cardiovascular System. Critical Pathways in Cardiology: A Journal of Evidence-Based Medicine, 12(3): 126-129.

[5] Maarten G, Bonnema J, Roberto R G, van Zijl R, 2025, Electric Vehicle System Design Course—Implementing Synthesis-Oriented Education. World Electric Vehicle Journal, 16(8): 475-475.

[6] Laura B, 2025, The hidden curriculum of the Amazon future engineer educational program. Frontiers in Education, 10: 1611252-1611252.

[7] Robert N, Rahul K, Rebecca T, et al., 2025, Paracentesis complication rates and use of ultrasound: impact of a point-of-care ultrasound training course in the veterans affairs healthcare system. BMC Medical Education, 25(1): 1161-1161.

[8] Dou A Q, Cheng H, 2025, A Study on the Reform of English Curriculum for Vocational Bachelor's Programs under the Integration of Eco-Translatology and Artificial Intelligence. Education Insights, 2(8): 42-52.

[9] Peng N, Cheng C, Li X W, et al., 2025, Research on the Construction and Implementation of Ideological and Political Teaching System for Swimming Courses in Colleges and Universities. International Education Forum, 3(7): 217-222.

[10] Chen B Q, Lu X C, 2025, Exploration and Practice on the Construction of Postgraduate Curriculum System for Chemical Engineering and Technology under the "Double Carbon" Strategy. International Education Forum, 3(7): 30-36.

[11] Theresa A, Roberts K S, 2025, Positive effects of the Letterland curriculum on kindergarteners' word reading skills and engagement behaviors: A comparison of two programs. The Journal of Educational Research, 118(5): 486-499.

[12] Sultan M A, 2025, AHP-MOORA framework for longitudinal evaluation of Pharm.D program learning outcomes: a tool for Saudi pharmacy programs accreditation and curriculum enhancement. Frontiers in Medicine, 12: 1628510-1628510.

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