

Teaching Reform Practice of Communication Courses Based on Ability Training --Taking Communication Principle as an Example

Lina YU^{1*}, Hengji HU^{2**}

¹School of computing Shandong Xiehe University Jinan China

²School of computing Shandong Xiehe University Jinan China

Abstract. With the development of the new generation of information technology, there is a shortage of compound application-oriented talents to meet the needs of the post. In combination with the actual situation of communication courses, explore the path of student ability training. Taking the course of Communication Principle as an example, the training objectives, teaching content, teaching mode, evaluation mechanism and other aspects are analyzed and designed to achieve the training of students' post competency.

1 Introduction

The report of the 20th National Congress of the Communist Party of China proposed that "promote the development of strategic emerging industry integration clusters, and build a new generation of growth engines such as information technology, artificial intelligence, biotechnology, new energy, new materials, high-end equipment, and green environmental protection".^[1] The National "Fourteenth Five Year Plan" also focuses on the development of a new generation of information technology. During the "Fourteenth Five Year Plan" period, the national layout of digital infrastructure construction is reflected in the construction of a high-speed ubiquitous, integrated, interconnected, secure and efficient information infrastructure to enhance data perception, transmission, storage and computing capabilities.^[2] With the rapid development of related industries, the shortage of industrial talents has a particularly prominent impact, which urgently requires high-quality applied talents with strong post competency.^[3]

2 Existing problems

The course of Communication Principle is a required and core course for electronic information majors, which is the basis for realizing information transmission. It plays a connecting role in the teaching system of electronic information majors and plays a key role in the whole process of cultivating the ability of system communication direction. The existing teaching process has the following problems.

2.1 Disconnection between teaching concept and post demand

The traditional teaching concept takes teachers as the center, and the "teaching" of teachers determines the "learning" of students. It only pays attention to the learning of theoretical knowledge, and fails to give full play to the students' subjective initiative. It has certain limitations in tapping students' potential and expanding their knowledge abilities. Students lack comprehensive abilities such as practice and innovation, and are not competent for core posts such as research and development, design, management, and application.

2.2 Old teaching content to be reconstructed

With the continuous development of cloud computing, big data, 5G and other emerging technologies, technology integration has become a trend. The Communication Principle course mainly involves the core technology of the physical layer in the communication direction, laying the foundation for the development and research of emerging technologies.^[4] In the face of the rapid development of emerging technology industries, the original curriculum content emphasizes theory over practice, and the innovative content is too little to meet the needs of technological development. In order to adapt to the new generation of scientific and technological revolution and industrial transformation and lay a solid foundation for information communication, it is necessary to reconstruct the teaching content of the Communication Principle course.^[5]

2.3 Teaching mode are not conducive to the cultivation of students' abilities

The Communication Principle course is highly theoretical and involves many contents. In the teaching process, a lot

*yulina@sdxiehe.edu.cn; **huhengji@sdxiehe.edu.cn

of tedious mathematical deduction is often carried out from the time domain and frequency domain, which makes many students with weak theoretical foundation and poor mathematical foundation flinch. A single classroom teaching can not achieve the teaching goal, so it is urgent to explore a teaching mode conducive to the cultivation of students' ability.

2.4 Poor process regulation of curriculum evaluation mechanism

The Communication Principle course is systematic and abstract in concept. Students are used to passively accepting knowledge rather than actively exploring. The concept of active learning is poor. The process of teaching and learning is lack of effective regulation and cannot achieve continuous improvement.

3 Reform measures

Taking the cultivation of students' ability as the starting point, relying on the training goal of applied talents of our school, we carried out innovative reform in the teaching of Communication Principle, explored and practiced from the perspectives of curriculum objectives, teaching contents, teaching methods, evaluation mechanisms, etc., to cultivate communication talents who can meet the needs of industry and have strong post competence.

3.1 Match the industrial demand and reconstruct the course content

It aims to meet the needs of the new generation of information technology industry and cultivate versatile and application-oriented talents with post competence. The integration of schools and enterprises, and the reconstruction of teaching content based on the real cases of enterprises. The teaching content would be divided into six learning modules, and provide related examples: basic concept module, analog modulation system module, digital transmission system module (baseband, frequency band), information coding module, digital synchronization technology module and emerging technology module. The teaching is organized with "point-to-point signal transmission", the signal transmission process of various transmission systems is established with the basic model of communication systems, and the analysis of the effectiveness and reliability of various communication systems is the main line. First introduce AM, then compare DSB, SSB and VSB with AM; In the digital communication system, the bit rate, band utilization and bit error rate of ASK, PSK and FSK are analyzed.

The establishment of new technology modules will help to integrate the curriculum teaching with the development of information technology, the introduction of the new generation of information technology, such as the Internet of Things, big data, mobile edge computing and cloud computing, is basically not involved in the traditional course teaching. Teachers timely add new and popular technical knowledge in the process of implementing

teaching: Internet of Things access technology, multi antenna transmission system and channel coding technology in 5G communication-low-density parity check code. Current mainstream wireless access technologies include WiFi, Bluetooth, Zigbee, RFID, NFC, WiMax and NB-IOT. The technologies involved in the Communication Principle are mostly based on the point-to-point single antenna communication model. Low channel capacity and data transmission rate are one of the main bottlenecks in the development of single antenna communication systems. Multi antenna systems can significantly improve the capacity and data transmission rate of single antenna systems. Through the study of channel coding technology in 5G communication, students can initially grasp the current development trend of channel coding in cellular mobile communication, understand the new requirements of the new generation of cellular mobile communication for channel coding methods, and it is of great significance to cultivate students to view technology development from a development perspective.

3.2 School enterprise integration and joint construction of experimental training base

According to the training target of application-oriented composite talents, the joint venture will jointly build a new generation of IT featured laboratory. By taking advantage of the enterprise's engineering conditions, technology and management level, we will build an integrated application and innovation base of production, teaching and research, which has multiple functions such as scientific research, teaching, training, identification, production and service, and promote the deep integration of production, teaching and research. To enable students to learn and study real problems in a real environment, and improve their practical ability and problem solving ability.

Most of the Communication Principle teaching experiments are confirmatory experiments, which use the experimental box to verify the transmission of the corresponding system.^[6] In order to cultivate students' innovative thinking ability, the experiment sets up three levels of experiments: verification experiment, simulation experiment and innovative design experiment. Validate the basic communication system with an experimental box, use Systemview or Matlab simulation software to draw and simulate the circuit schematic diagram, provide students with DSP and EDA platforms and creative development systems, and encourage students to carry out innovative experiments and designs. It will lay a solid foundation for students to participate in the Internet of Things design competition, hardware design competition and graduation thesis design.

3.3 Innovate Teaching mode with the goal of ability training

With the goal of cultivating students' post competence, the teaching mode of combining online and offline is innovatively adopted to improve the teaching effect of the course. Build rich online resources before class,^[7] the learning of the course of Communication Principle requires a strong

knowledge base of science and engineering, and many leading courses are difficult. In view of this problem, Computer College and Engineering College Cooperate to Build Online Teaching Platform, record micro classes, short videos, etc., and use the video software of our school's Super Star Learning APP, WeChat official account etc. to push learning videos. Before class, students can independently learn the pushed video resources and complete the online questionnaire evaluation, which is helpful to grasp students' learning situation and provide support for classroom teaching design.

Based on project teaching in class, cultivate innovative ability, and improve teaching effect with the help of flipped classroom. [8] Communication Principle courses have strong practicality. The course teaching is project driven and guides students to learn independently. Each information transmission system learns from knowledge background, system principle, system information transmission and other aspects to guide students to find and solve problems and improve their practical ability.

After class, students are guided to carry out project practice and assign high-level tasks. Through group discussion and cooperation, students can jointly complete project practice, promote students' application of theoretical knowledge, and cultivate students' team spirit and innovative practice ability. [9]

3.4 Attach importance to process assessment and improve the course evaluation system

Establish a continuous improvement mechanism for process assessment, and strengthen the process control to track the effectiveness in a timely manner. According to the modular setting assessment of the course content, the learning effect and teaching effect evaluation will be carried out after each module is completed. According to the evaluation results, problems in teaching and learning will be found, which will reverse the improvement of the course objectives, teaching content, teaching methods, etc.

Improve the traditional unitary curriculum evaluation system. The reformed Communication Principle curriculum evaluation includes teacher evaluation (50%), self-evaluation (25%) and peer evaluation (25%). Teacher evaluation focuses on process and development, and individual differences of students. The evaluation should pay attention to the two-way comparison, the horizontal comparison should be used to compare students, the vertical comparison should focus on the comparison of students' previous and current situations, and the evaluation of students' process and development. We should not only pay attention to the students' mastery of knowledge and skills, but also pay attention to the changes in students' feelings and attitudes, and pay attention to the changes in the learning process. Students' self-evaluation is helpful to cultivate their sense and ability of self-evaluation, self-reflection ability, and improve their self-development and self-improvement ability. Peer evaluation is helpful to improve students' teamwork spirit. [10]

4 Conclusions

Through the study of the original content of the course and the addition of new content, students can master the relevant knowledge of communication technology, understand the development trend of the communication industry, and point out the direction for future study and research. The setting of the three-level experiment is helpful to cultivate students' innovative thinking ability and practical ability, cultivate practical ability and innovation ability that can be competent for the post, and meet the requirements of industrial development for high-quality composite application-oriented talents.

References

1. Notice of the General Office of Shandong Provincial People's Government on Printing and Distributing the 2022 Action Plan of "Ten Innovations", "Ten Strong Industries" and "Ten Demand Expansion" [J]. Bulletin of Shandong Provincial People's Government, 2022 (14): 1-185.
2. Zhu Wenqi's project team. Strategic emerging industry series - new generation information technology industry from the perspective of the "Fourteenth Five Year Plan" [J]. Food industry, 2022(02):72-78.
3. Notice of the General Office of Jinan Municipal People's Government on Printing and Distributing Jinan's "Fourteenth Five Year Plan" to Accelerate Digital High quality Development [J]. Bulletin of Jinan Municipal People's Government, 2022 (03): 16-32.
4. Yu Lina, Chen Chong. Research on the Innovation of the Teaching Mode of Communication Principle under the Background of New Engineering [J]. China New Communication, 2020, 22 (09): 177.
5. Lu Lijin, Zheng Xin, Course Reform of Mobile Communication Principles in the Background of 5G [J]. Science and Technology Horizon, 2022, (05): 59-61.
6. Cui Yanling, Pan Jinjin, Wen Wenkai. "LTDE" teaching design and implementation based on flipped classroom -- taking "communication principle experiment" as an example [J]. Science and Education Guide, 2022 (24): 124-127.
7. Liu Li, Li Lijun, Zheng Xiuping. Research on the mixed teaching reform of Communication Principles based on SPOC [J]. Digital Communication World, 2022 (10): 146-148.
8. Lu Yi, Wang Shen. Teaching Reform of Communication Courses Based on the Background of "New Engineering" [J]. Journal of Xi'an University of Electronic Science and Technology (Social Science Edition), 2019, 29 (02): 136-140.
9. Cui Yanling, Pan Jinjin. Research and discussion on "chain" teaching of communication practice courses based on SPOC flipped classroom [J]. Education Observation, 2021,10 (30): 104-106+112.

10. Wang Guan, Wang Junmin. The mixed teaching reform and research of "student-centered" communication principle course [J]. *Science and Technology Perspectives*, 2022 (16): 88-90.