Integration of craftsman spirit of great powers into the practical classroom teaching of computer network foundation

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Abstract: It is a trend in curriculum construction to extend ideological and political education from specialized ideological and political courses to curriculum ideological and political courses. Based on the characteristics of private applied undergraduate courses, this article takes the practice of "RJ-45 interface twisted pair" in computer network courses as an example to explore the spiritual power of ideological elements, and integrates curriculum education into teaching case design and teaching process to cultivate students' spiritual power and achieve the goal of comprehensive education.

Key words: course category; craftsman spirit; computer network

1 Introduction

In 2016, Premier Li pointed out in his government work report, "We will encourage enterprises to carry out customized and flexible production, foster a craftsman spirit of striving for excellence, and create more varieties, better quality, and better brands." This is the first time that the "craftsman spirit" has been included in the government work report. In his report on the work of the Government in 2017, the Premier once again said, "We will promote the spirit of craftsmanship and foster a culture of craftsmen who have a strong commitment to work and strive for excellence. We will nurture Chinese artisans to create more Chinese brands that are renowned around the world, and usher in an era of quality in China's economic development." In the same year, Li Hongwu and Zhao Yan published a paper "On the Craftsman Spirit of a Great Country", which discussed that the craftsman spirit of a great country is the professional concept and working attitude of loving one's job and striving for perfection formed through the "mentoring system" in a certain industry or occupation. It is not only very influential in China, but also widely studied and praised around the world. Its essence is to pay attention to details, pursue the ultimate, be sincere and honest, specialize in art, have a great vision for a country, and possess the character of a craftsman [1].

In recent years, most of the literature has discussed the spirit of "craftsman of great powers" in vocational education, and some research results have been achieved. In 2017, Suxi discussed that the transformation of China from a manufacturing power to an intelligent manufacturing power requires not only the improvement of scientific and

technological research and development capacity, but also a very important supporting factor -- "craftsman spirit" [2]. In 2019, Guo Na discussed ways and strategies to cultivate "craftsman spirit" in vocational education [3]. In 2020, Ruan Lei et al. discussed the organic integration of ideological and political education and craftsman spirit cultivation in vocational colleges [4]. In the same year, Yang Fengling proposed ways and measures to effectively carry out craftsman spirit education in higher vocational colleges from the two aspects of effective use of new media platforms and clever design of classroom contents [5].

In the applied undergraduate education, the spirit of "craftsman in a big country" is also worthy of research and application. In 2019, Jin Shuangling and Jin Minglin et al. optimized the institutional path for cultivating talents with the spirit of "craftsman from a great country" by integrating ideological and political education into professional theoretical teaching and experimental and practical teaching in combination with the school's own characteristics and training model, emphasizing the cultivation of craftsman spirit for applied undergraduates [6]. In 2020, Wei Zixuan and Liang Qing et al. published an article discussing the value of integrating craftsman spirit into the talent training of application-oriented undergraduate universities and the path of integrating craftsman spirit into the talent training of application-oriented undergraduate universities, thus implementing the fundamental task of "building virtue and cultivating people" in application-oriented undergraduate universities [7]. In 2021, Wei Zhang started from the existing problems in the cultivation of craftsman spirit of design talents in application-oriented undergraduate colleges, and comprehensively carried out a practical exploration on the cultivation of craftsman spirit of design talents in application-oriented undergraduate colleges [8]. In the same year, Jing Ru et al. discussed the purpose of realizing the craftsman spirit of computer skilled personnel in the field of information industry from three aspects: vocational ability, professional ability and technical skill ability [9]. In 2022, Zhang Yanyan took Jilin University of Agricultural Science and Technology as an example to study the cultivation path of artisan spirit among students in application-oriented undergraduate colleges [10].

To sum up, domestic experts and scholars have conducted in-depth research on the theoretical basis and application promotion of the spirit of "craftsman of great powers" and contributed a large amount of literature and research results. This paper, based on computer application-oriented undergraduates, discusses the combination and operation of the spirit of "craftsman of great powers" in the practical course of "Computer Network Fundamentals".

2 Case course content

The "course category" of "Computer Network Foundation" is the basic course of computer science and technology. It is an introductory course in the computer network course group, and provides support for subsequent courses such as network engineering, network protocol programming, mobile Internet technology, network security and network integration. With this course, students can master the computer network involved in all aspects of the theoretical basis and technical basic knowledge. The basic concepts and working principles involved in computer network technology are expounded comprehensively. Through learning of this course, students can master the basic concepts of computer network and data communication, understand the basic principles of LAN, master networking method, be familiar with Internet access methods and network interconnection methods, be familiar with the basic functions of network operating system, grasp operation and configuration of the network operating system, understand TCP/IP protocol; be familiar with network security technology and application, and understand the forefront of computer development technology. "Computer Network Fundamentals" is a course that cultivates students' basic and specialized skills in networking and maintenance. It is the foundation of a network course group and a course that cultivates the abilities of network administrators and engineers. It will lay a necessary professional foundation for the subsequent study of professional core courses and the

future work related to computer network, and cultivate students' ability to analyze and solve problems independently. At the same time, it integrates ideological and political elements to cultivate students' craftsman spirit of the great country.

3 The connotation of "craftsman spirit"

"Craftsman spirit" is a kind of professional spirit. At the same time, it is the embodiment of professional ethics and professional skills, and it is a kind of professional value orientation and behavior of practitioners. The "craftsman spirit" is implemented at the individual level in four aspects:

(1) Dedicated. Recognize the profession and take your work seriously;

(2) Professional. Study this major course carefully in school, after entering the society with professional technology and knowledge. Focus on doing the best job you can;

(3) Rigorous. Be meticulous in your work, not opportunistic, to ensure workmanship and quality;

(4) Strive for excellence. Pay attention to detail, practice and improve. The project in the classroom requires strict industry standards, improves the production process, and performs the assessment according to the highest standards.

4 Ideological and political teaching design

4.1 Selection of teaching content

"Making twisted pair of RJ-45 interface" in the course of "Computer Network Foundation" is the practical teaching content, testing students' practical ability, and the technology and quality of the experimental products can be inspected on the spot. It is a good integration point in the course teaching to cultivate students' "craftsman spirit" of love, dedication and excellence.

4.2 Formulation of teaching standards

It is necessary to establish strict experimental procedures and acceptance standards in accordance with the industry standards for twisted pair, guide students to pay attention to details in the process, compare inferior products with high-quality products, guide students not to be opportunistic, and standardize operations.

4.2.1 Experimental purpose

(1) Learn to make two types of RJ-45 connector: straight line and cross line;

(2) Master the network connection method of using twisted pair as transmission medium;

(3) Master the use of wire gauge.

4.2.2 Experimental environment

Computer with RJ-45 interface network adapter, Type 5 twisted pair, crystal head, crimping clamp, line tester.

4.2.3 Key points and difficulties of the experiment

Key points: to learn twisted-pair identification, manufacture and use of tester.

Difficulty: Master the method of making twisted pair correctly.

4.2.4 Experimental instruction

The RJ-45 connector includes a plug and a jack (or socket). The jack is mounted on the machine, and the plug is connected to the connecting wire (Type 5 wire with unshielded twisted pair is now most commonly used). The wiring standard set by EIA/TIA specifies the numbering of eight pins.

If you look at the jack and make the pin contact point on the top, then the leftmost is ①, and the rightmost is ⑧ (as shown in Fig. 1(a)).

If you look at the plug and place the end of the plug facing your eye, and the contact point of the pin is below the plug, then the furthest left is ① and the furthest right is ⑧ (as shown in Fig. 1(b)).
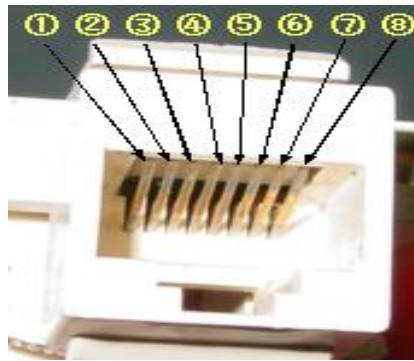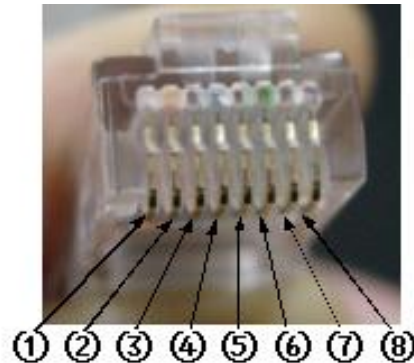
(a) By the jack   (b) By the plug

Fig. 1. This is a figure that two methods of identifying the number of eight pins by the jack and plug. (a) By the jack; (b) By the plug.

Only two pairs of wires are used in 10Mbps and 100Mbps Ethernet. In other words, only four pins are used. So to which four pins should we attach the wire?

Make twisted pairs according to the T568B (T568A) standard. T568B and T568A are EIA/TIA twisted-pair manufacturing standards. T568B standard is widely used in Ethernet (as shown in Table 1 & 2).

Table 1. Standard pin numbers order table of T568A and T568B

Standard	1	2	3	4	5	6	7	8
T568A	white/green	green	white/orange	blue	white/blue	orange	white/brown	brown
T568B	white/blue	orange	white/green	blue	white/blue	green	white/brown	brown
Pair		pair	Same pair with pin 6		pair	Same pair with pin 3		pair

Table 2. T568B cabling

Pin#	Pair#	Function	Wire color	Used with 10/100BASE-T Ethernet?	Used with 100BASE-T4 and 1000BASE-T Ethernet?
1	2	Transmit	white/orange	Yes	Yes
2	2	Transmit	orange	Yes	Yes
3	3	Receive	white/green	Yes	Yes
4	1	Not used	blue	No	Yes
5	1	Not used	white/blue	No	Yes
6	3	Receive	green	Yes	Yes
7	4	Not used	white/brown	No	Yes
8	4	Not used	brown	No	Yes

Straight-through cable: Both ends of a twisted-pair cable use the same standard, that is, T568B or T568A. Only 4 cores of 8 cores are used in 10M/100M Ethernet, and all 8 cores are used in 1000M Ethernet.

The twisted-pair cable adopts T568B standard at one end and T568A standard at the other end.

DTE devices: PC, router, switch uplink, and HUB expansion port.

DCE devices: switch common port, HUB common port.

Similar equipment is connected with the use of cross line mode; Different devices are connected through a straight-through cable.

Description: Data Terminal Equipment (DTE) is a data terminal device that has certain data processing capabilities and the ability to send and receive data. As you know, most digital data processing equipment has very limited data transmission capacity. You cannot communicate by directly connecting two data processing devices that are far apart. An intermediate device must be added between the data processing equipment and the transmission line. This intermediate device is the Data Circuit-terminating Equipment (DCE). The role of the DCE is to provide signal conversion and coding functions between the DTE and transmission lines, and to establish, maintain, and release data link connections. A DTE can be a computer or a terminal, or a variety of I/O devices. A typical DCE is a modem connected to an analog telephone line. For example: PC crossover cable; PC HUB straight-through cable; HUB common port cross line; HUB expansion port straight-through cable; Router crossover cable; PC switch straight-through cable; Router switch straight-through cable; Switch common port; Switch straight-through cable, Switch common port crossover cable; Switch Uplink, Switch uplink crossover cable.

4.2.5 Experimental contents

Step 1: Get type 5 wire, RJ-45 plug and a special pair of crimping pliers.

Step 2: Use the wire cutter edge of the wire crimping pliers to cut off the outer protective sleeve of the type 5 cables (be careful not to cut the insulation layer of the twisted pair cables inside), and keep the knife edge at least 2 cm away from the end of the type 5 cables.

Step 3: Peel off the outer protective sleeve (rotate and pull out).

Step 4: Expose four pairs of twisted pairs of cables (as shown in Fig.1).
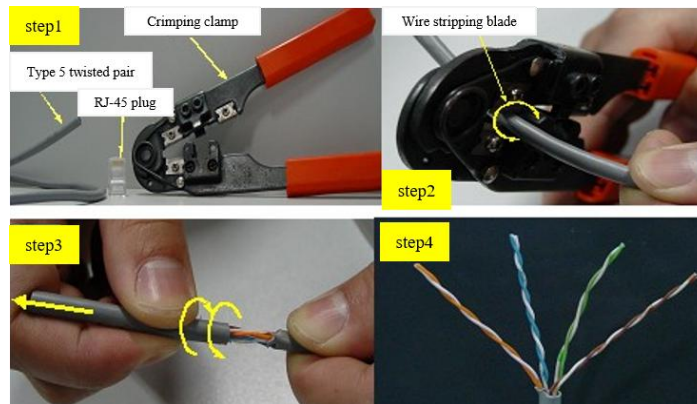

Fig. 1. The use of crimping pliers

Step 5: Arrange the wires according to EIA/TIA-568B standard and wire color.

Step 6: Arrange the 8 wires in a flat and neat parallel arrangement, leaving no space between the wires.

Step 7: Prepare to cut off the eight wires using the wire cutter edge of the crimping pliers.

Step 8: Cut the cable. Please note: Make sure it is neatly cut. Do not strip the length of wire too short. You can leave it out a little bit. Do not peel off the insulation of each wire.

Step 9: Put the cut cable into the RJ-45 plug and push it to the bottom to test its length, the outer protective layer of cable should finally be able to be compressed in the depression in the RJ-45 plug. Make necessary adjustments repeatedly.

Step 10: After confirming that everything is correct (taking special care not to arrange the wires in the wrong order), place the RJ-45 plug into the indenter slot of the crimper and prepare for final compaction.

Step 11: Hold the handle of the wire crimper with both hands and press it firmly. Note that after this step, the eight pin contacts of the plug pass through the insulating outer layer of the wire and are tightly crimped to each of the eight wires.
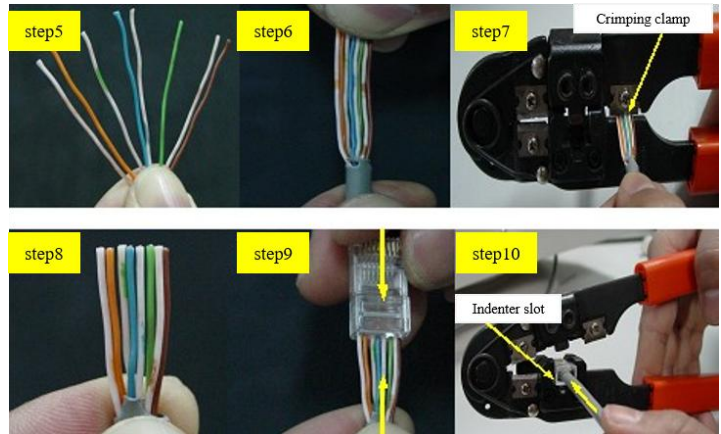
Step 12: Done (as shown in Figure 2 & 3).
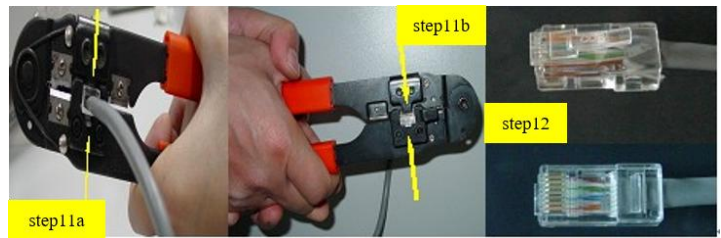

Fig. 2. Cut the cable in sequence

Fig. 3. Press the wire crimping pliers firmly

4.2.6 Use the network cable tester

Step 1: Power on the network cable tester and check whether the device is powered on.

Step 2: Switch off the power switch of the network cable detector. Connect one end of a network cable to the network cable port on the main engine of the tester and the other end to the network cable port on the auxiliary engine of the tester. Then, turn on the power supply on the host and watch the display status of the test light.

Step 3: Carefully observe the numbers on the two rows of display lights of the main engine and auxiliary machine to see whether they are displayed symmetrically at the same time. If they are symmetrically displayed, it means that the network cable is good; if they are asymmetrically displayed or some lights are not bright, it means that the network cable is disconnected or the core arrangement is wrong when making the network cable head.
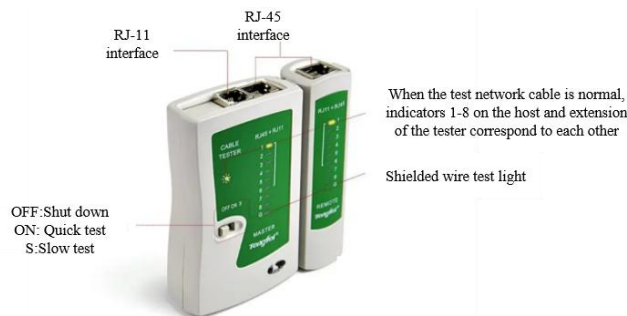

Fig. 4. Network line finder

Before inserting the network cable into the detector, clean the dirt and rust on the metal contact of the RJ-45 connector before inserting it into the connector. It can test twisted pair 1, 2, 3, 4, 5, 6, 7, 8 and G wire one by one, and can distinguish which (right) wrong wire, short circuits and open circuits.

According to the demand of network post ability of computer majors, the reform of teaching design is carried out, focusing on the process and technology, and the cultivation mode of "craftsman spirit" is improved from the aspects of teaching design, teaching links and evaluation methods.

5 Ideological and political conclusion

Through the computer network basic practice course "Making a twisted pair of RJ45" case, students have mastered the basic theory and method of computer network, as well as the classification of twisted pairs of computer network, 568A and 568B standards, and the method of making RJ45 network cable. The integration of ideological and political elements of the "great country craftsmanship spirit" aims to encourage students to become more professional, rigorous, and refined, thereby cultivating their "craftsmanship spirit", improving learning effectiveness, and enhancing employment skills.

Acknowledgments

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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