

Study and Practice on Course Assessment Mode with Ability Training as the Core

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Abstract. Traditional assessment mode is suitable for evaluating knowledge, and is not suitable for evaluating ability. Focusing on ability training, the assessment mode combining formativeness and finality is proposed. Analyzing problem and solving problem ability, autonomous learning ability, information acquisition and expression ability, engineering practice ability and innovative thinking ability are evaluated through classroom interaction, homework, unit test, self-learning, experiment and final exam. Various questions suitable for ability assessment are drawn up, such as thinking questions, discussion questions, investigation questions, analysis questions, application questions, design questions, etc.

Ability is practical skill and personalized psychological characteristics for successfully completing a certain activity. Higher education is changing from teacher-centered to student-centered, is changing from knowledge learning to comprehensive training of knowledge, ability and quality[1]. The training objectives, graduation requirements and curriculum system have been revised, the teaching objectives and methods of the course have also been revised accordingly. The assessment mode, assessment standard and test questions of the course should also be modified[2]. Both knowledge and ability should be examined. Based on the course of data communication and network technology, the assessment mode and content suitable for ability training are discussed in this paper.

Ability Training

Data communication and network technology is a professional course of electronic information engineering, is an interdisciplinary of electronics, communication and computer. This course extends to network architecture and standards, data communication, TCP/IP architecture, LAN architecture, WAN technology, internet application protocol, computer network security, etc. Knowledge updates quickly. New standard, new technology emerges endlessly. Teachers should not only teach knowledge, but also train self-learning ability, information acquisition and expression ability, engineering practice ability and innovation ability.

Self-learning Ability

Self-learning ability is the ability to acquire new knowledge and new skill proactively under the teachers' guide[3], is the important foundation of independent working ability, research ability, etc. Students can improve their learning efficiency with strong self-learning ability, can constantly expand their knowledge. Technologies and standards involved in data communication and network technology are various, cannot be introduced completely in class. For example, teachers will focus on HDLC standard, and guide students to study PPP standard independently. Technologies and standards involved in data communication and network technology update rapidly, cannot be wholly involved in any text book. After teaching NAT protocol, teachers arrange students to look up information and learn PAT protocol.

Information Acquisition and Expression Ability

One person expresses his thoughts, feelings and intentions by language, text, graphics, expressions and actions clearly, and lets others understand and master well. Information acquisition and expression ability not only affects the students' growth and success, but also affects their future life, social interaction, even their future accomplishments. Teachers can take the opportunity of self-learning show to let students to arrange their self-learning content, to make PPT using various multimedia resources, to express their thoughts clearly.

Engineering Practice Ability

Engineering practice ability is the actual work ability which is formed through a lot of practice under the engineering background[4,5]. Generally, it involves planning scheme, organizing and implementing, experimental and debugging, submitting project documents. In the process of theory teaching, premises distribution system, campus network planning and designing can be introduced to train students' engineering consciousness. In the process of experiment teaching, students are required to plan network topology, choice network equipment, and verify the correctness and practicability of the network.

Innovation Ability

Innovation is the soul of a nation's progress, is inexhaustible power of a country's development. Innovation ability training is indispensable responsibility of higher education. In the field of science, art, technology and all kinds of practical activities, innovation ability is the creative ability which brings new thought, new theory, new method and new invention using existing knowledge and theory[6]. Teachers should guide students to think, arouse students' interest, improve students' innovative consciousness, and encourage students to question the existing methods, technology and means.

Assessment Mode

Single summative evaluation is easy to evaluate students' knowledge, is not easy to evaluate students' ability of analyzing and solving complex network engineering problems. The course of data communication and network technology combines the examination of theoretical knowledge with the examination of practice, combines knowledge assessment with ability assessment, adopts the assessment mode which combines formative assessment and summative assessment, integrates teaching process and assessment process. Formative assessment includes homework, unit test, self-learning and experiment, etc. Summative assessment adopts the final examination of the course.

Daily Performance

It mainly assesses the understanding and mastery of knowledge in each class or unit. The assessment methods include classroom interaction, homework, unit test, etc. According to the accuracy of technology and specification, the correctness of calculation communication system performance, and the feasibility of network scheme design, the comprehensive score is made. Attendance and classroom interaction act as auxiliary means of assessment, where absence reduces their score and answering questions correctly increases score.

Self-learning Show

In the main chapters, a self-learning topic is arranged. Students form a self-learning group and choose one self-learning topic. Through the Internet, library and other ways, students look up and learn the technical background, working principle, implementation method and application field of related technologies. Students prepare self-learning report and PPT before class, show learning achievements in class. In this teaching procedure, the ability of using information retrieval tools and the ability of information processing are assessed. The comprehensive score is made from self-learning report and

PPT according to the accuracy, completeness and normalization. Teachers evaluate the average score of the self-learning group, and the team leader assigns the scores to the members.

Experiment

In this teaching procedure, the ability of network planning and construction and the ability of network equipment configuration and network protocol analysis are assessed. The assessment methods include preview, operation and experimental report. Students emphasis on the adequacy of preview, the appropriateness of design experimental parameters, the rationality of comprehensive experimental scheme before class, emphasis on the accuracy of experimental results, the standardization and independence of experimental operation in class, emphasis on the correctness and comprehensiveness of experimental summary and analysis, the integrity and standardization of experimental report assessment after class.

Final Exam

Students' basic knowledge is assessed as well as their ability using knowledge to solve practical problems. The examination is carried out in the form of open papers. The examination questions of basic knowledge account for about 30%, such as multiple choice questions and short answer questions, while examination questions of comprehensive application ability of knowledge account for about 70%, such as calculation questions, analysis questions, application questions and design questions.

The composition of total scores: homework (10%), unit test (5%), self-learning (15%), experiment (20%) and final exam (50%).

Test Questions

Generally, multiple choice questions, judgment questions, blank filling questions and short answer questions are suitable for assessment knowledge, while calculation questions, analysis questions, application questions and engineering design questions are suitable for assessment comprehensive application of knowledge. Different knowledge requires different questions. For example, in the LAN architecture unit, it is required to understand the LAN architecture and traditional Ethernet, which can be assessed by multiple choice questions, judgment questions, blank filling questions and short answer questions. It is required to master the exchange LAN, fast Ethernet, Gigabit Ethernet and WLAN, which can be assessed by analysis questions and application questions. It is required to set up local area network using layer-II and layer-III Ethernet switch expertly, which can be assessed by engineering design questions. In order to assess analyzing and solving problems ability, information acquisition and expression ability, innovating ability better, various test questions suitable for ability assessment should be designed.

Thinking Questions and Discussion Questions in Class

Ability training is accumulating constantly, and ability assessment also runs through the process of classroom teaching. Combining with the teaching content, teachers should set up thinking questions in time to assess the information acquisition and expression ability of students. For example, there are problems such as uneven distribution and serious waste of IPv4 addresses. Students can find out how many Internet users are there in China and how many addresses do China have using their mobile phones? Another example, there is ARP spoofing in the Internet address resolution protocol. Students retrieve in which industry that ARP spoofing has extremely harmful and how to prevent?

Teachers can also extend and expand teaching content, set up discussion questions, and assess students' innovative thinking ability through analysis and discussion[7]. For example, the OSI/RM model is perfect, why it has not become the practical standard of the Internet? Another example, according to the different services provided by TCP and UDP, which applications must use TCP to transmit and which applications can use UDP to transmit?

Survey Questions after Class

Theory teaching should be combined with practice. Case-teaching method can be used to explain the practical application of technical standards. Students can also be arranged to carry out investigation and research, which not only consolidates the knowledge learned, but also improves their investigation and research ability. For example, after learning the composition of LAN, students are required to investigate the composition of software and hardware in a computer room of their school, draw the network topology, and calculate the number of network cables required. Another example, private address can effectively solve the problem of IP address shortage. Students can be arranged to investigate how IP address is configured in the dormitory area of their school?

Analysis, Application and Design Questions in Test Paper

Most of test papers include a large proportion of multiple choice questions, blank filling questions, short answer questions and other questions to assess knowledge, which is more suitable for assessing knowledge, and not suitable for assessing analyzing and solving problems ability using knowledge comprehensively. Therefore, we should reduce the type of questions above and increase the analysis questions, application questions and design questions. Most of the contents can be compiled into different types of questions according to the assessment requirements. For example, in data-link layer unit, the test can simply answer "what is the basic function of the data-link layer", can simply answer "the working process of the HDLC protocol", can also analyze "how the HDLC protocol realizes the function of the data-link layer combining with the data frame structure", can also compare and analyze "the HDLC protocol and the TCP protocol are connection oriented, and what are the differences between the connection establishment and release process". Another example, in network layer, the test can simply be choice questions, can be the difference and connection with MAC address of data-link layer and domain name of application layer, can be the actual application and engineering design by combining IP address, subnet division and route selection.

Conclusion

Establishment of diversified assessment mode and preparation test questions suitable for ability assessment can effectively assess students' abilities in many aspects, promote students to learn independent, guide students to apply what they have learned, stimulate students to be diligent in thinking, and truly achieve a comprehensive, objective, fair and just performance assessment.

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