The Research on Integrated Teaching of Theory and Practice in Switching Technology

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Abstract. According to the ZXJ10 SPC exchange in the Institute laboratory equipment, theoretical practice all-in-one teaching method application in switching technology is proposed for the students’ comprehensive ability improvement. In the paper, the precondition of integration, the integration process, the time allocation and assessment methods of integration and so on are shown in detail. Through the modularized teaching and group teaching, the theoretical knowledge and practical skills of students can be promoted and exercised a lot, which can give a better foundation for engaged in the communication related industries.

1. Introduction

Exchange technology course is the Professional course of the communication engineering in the school of electronic engineering of our university. It is the deepening and promotion of the course of digital SPC exchange in previous study. The course pays more attention to practice which is a course combining theoretical knowledge with practical operation\textsuperscript{[1]}. The course is supported by ZTE ZXJ10 large digital SPC exchange and SDH E300 equipment in our mobile communication laboratory for the theoretical knowledge study and practice training. By learning the course, a more complete knowledge of the large ZXJ10 digital SPC exchange can obtained. Besides, the basic theory, hardware structure and configuration and maintenance of the ZXJ10 equipment can be grasp ed, the local exchange telephone calls and long-distance communication with SDH can be complemented at the same time. All the knowledge can give certain technical support for students to be engaged in communication related work.

Due to the characteristics of the course itself, the course is not easy to learn. So the problem what kind of teaching method can be used to make students study knowledge better and understand knowledge in-depth should be thought a lot. Document [2] pointed out that integration teaching is the integration of theory teaching and skill training, in which the professional knowledge is studied and understood in the real scene perception and in the process of operation for students. In the meantime, the professional skills training and the practical technology of the first line can be mastered. With a coherent, comprehensive and complete teaching system formed, the students' professional knowledge and professional skills are mutually accepted and mutually coordinated, so as to improve the learning efficiency. Document [3] gives us that integration of theory and practice integrates all the theoretical teaching, practice teaching and production and technical for an organic whole which break boundaries between the traditional theory course and experimental lesson. In the integration of theory and practice, the teaching place is directly arranged to complete a teaching goal and the teaching task in the laboratory or training workshop. teaching with studying, learning with teaching and doing with studying can be applied, that is theory with practice alternation, which realize the integration of teaching and teaching materials, teachers site integration and teacher integration. It emphasizes on the training of students' practical ability and professional skills, and the teaching method can fully arouse and stimulate students' interest in learning. In addition, Chinese people's educator and thinker Mr. Tao Xingzhi had put forward "Teach-Learn-Do amalgamation", in which "doing" is the core proposition.
and doing with teaching, doing with learning\textsuperscript{[4]}. With the lab conditions of our school, "Teach-Learn-Do amalgamation" can be used for exchange technology teaching. With the help of phenomena in life, the theoretical knowledge related to exchange technology is derived, and then the explanation of theoretical knowledge is explained. With the help of practical experiment projects, the phenomenon of life can be solved and restored, a good integration of theoretical knowledge and practical experiment is achieved at the same time. In the later part, the equipment condition, the students and teachers, the teaching content and the teaching design of integration, the class hour assignment and the assessment method are all discussed.

2. The Premise Condition of Integration Teaching

2.1 Hardware conditions of the college [5].

In order to improve the practical operation ability of students, the 3G mobile communication laboratory had been established by our institute and ZTE Company. In the laboratory, there are TD-SCDMA wireless side equipments, TD-SCDMA core side equipments, SDH transmission equipments, ZXJ10 program-controlled equipments, data communication equipments. Among them, the user unit of ZXJ10 SPC exchange contains two analog user boards, which can realize forty-eight telephone one on one access. The four cables of the main and standby MP of the ZXJ10 SPC exchange are connected to one port of the top two-layer switch via the HUB. The other three two-layer switches are connected to the forty-eight computers and the top two-layer switch. The top two-layers switch connect to the server computer which has a ccs2000 queue. Through the queuing of ccs2000, the forty-eight computers are connected with the ZXJ10 SPC exchange in time slots, so that the operation and maintenance of the front and back can be realized. The structure of the integrated platform for laboratory switching technology is shown in Fig. 1 below.

![Figure 1. The structure of the integrated platform for laboratory switching technology.](image)

2.2 Analysis of the students.

The switching technology course is a specialized course of communication engineering in our college, which is usually offered in the next semester of third grade in University. The students learning the course is the communication engineering specialty, they have opened preliminary communication related professional basic courses, such as communication principle, signal and system, the high frequency electronic circuit, also they have learn some professional courses, such as digital program-controlled exchange principle, optical fiber communication, data communication and so on. With the certain basic knowledge and professional literacy, they can better learn other professional courses. Moreover, as an integrated teaching curriculum, switching technology course
can better integrate the theoretical knowledge and skills training together. Through their contact with the real equipment and the process of data configuration, the professional theoretical knowledge can be better understood with the training of professional skills, which is more comprehensive and complete grasp of the course.

2.3 Analysis of the teachers.

In the integration of teaching, teachers should not only teach knowledge, but also practice the operation of the device, and can real-time solve students' practice problems, timely find out the faults and troubleshooting, therefore the level of teachers determines the quality of teaching integration to a certain extent. In support of the school, I and several colleagues had accepted the theory and practice training of ZTE Company and obtained the certification of ZTE program-controlled exchange and data communication and so on. So we have certain ability for theoretical and practical knowledge teaching. At the same time, as a teacher of communication, our knowledge are constantly expanded by actively concerned about the latest subject and according to the latest development of technology, using the typical cases in production practice to the theory teaching, the enthusiasm of the students can be better mobilized and the knowledge of the students is enriched.

3. The Teaching Content and the Teaching Design of Integration

3.1 Knowledge architecture and modular explanation.

Switching technology course uses "digital program-controlled exchange technology" teaching material by ZTE NC Education College. According to the arrangement and the learning situation premised of students, the course is divided into 4 modules for learning the knowledge, which is switching principle, hardware structure, local exchange calls, and different exchange calls.

Module one is a basic section of the switching technology, which mainly tells about the basic components, classification and development of the telephone network, including the corresponding key technology, such as A/D, multiplexing, PCM frame structure, switching technology and so on. Because a lot of knowledge in this part had studied in detail in communication principle, digital program-controlled exchange principle, so the course will is review and practice to deepen knowledge and understanding through the way of some animation and examples.

Module two is mainly about the hardware structure of ZXJ10 SPC switch, including the architecture and the single board two parts. This section has both theoretical knowledge and practical training, so speaking with practicing is used. After talking about the features and networking organization of ZXJ10, the students can actually observe the ZXJ10 device and record the actual hardware structure of the ZXJ10 device, thus they can form the basic framework of the actual equipment. About the 8KPSM network organization, the boards of laboratory equipment are be contrasted for explanations. With the task oriented and driven teaching method, each one unit is explained with the observation and recordation of each single board. In explaining the backplane connection, let students actually observe the backplane connection of the laboratory. To better understand how each of the ZXJ10 modules becomes an organism of collaborative division of labor, an analogy teaching approach is used to knowledge elaboration. Through the analogy of "people", the DSN of the switch is analogous to "heart", the MP is analogous to "brain", the COMM board analogy is analogous to "neck", each functional unit is compared to "limbs". DSNI-C is compared to "senior secretary", DSNI-S is compared to "low Secretary", so each board can be correct understood as well as their role. Maintain data configuration is supported in the process of the theoretical knowledge explanation, which is the capacity of local switching exchange, the capacity of adjacent switching exchange, physical configuration, using the practice training, every board and module can be better understood.

Module three is mainly to achieve the local exchange calls, in which interpretation of theoretical knowledge is been integrated into the practice training[6]. For example, in the number management section, through the actual office-number, the hundred-number, the telephone number distribution, the way and significance of the number division in the telephone network can be better understood;
the data configuration of the number analysis can better understand the characteristics of the called number and the adding methods of some new services; data configuration of user attributes helps to understand the characteristics of calling numbers, such as pulse dialing, audio dialing, caller number display and so on.

The module four is mainly to achieve different exchange calls which are in practice oriented. Through the data configuration, the characteristics, significance and principle of channel associated signaling and common channel signaling can be better understood.

3.2 Group Discussion and Teaching.

In order to give full play to the functions of teaching and stimulate students' interest in learning, the integrated course adopts the teaching method of grouping students into groups. Based on the students' marks of the two front years, according to the comprehensive performance of the students, the students will be grouped reasonably, that is each groups have four students with a good student, two better students and a poor student. Each study group is free to get a characteristic group name, and the class name is called in class to answer questions, thus the interest of classroom teaching is increased. Class assignments are divided into individual questions and team questions, individual questions can increase individual class scores, and team questions can increase team scores. So, through the group division and group discussion, the pleasure of learning can be increased, the enthusiasm of students can be fully mobilized, and students' team spirit is increased. At the same time, by the good students helping the poor students, the knowledge can be better grasped in the class, and the efficiency of the class is improved.

3.3 The setting of faults and troubleshooting.

In order to make students more in-depth understanding knowledge, this course also specially set up some regular data configuration faults, such as physical breakdown, ASIG soundboard faults, the called number faults, the calling number faults. By observing the faults, the students find out the cause of the trouble and find out the problem of data configuration. In addition, students discuss the causes of failures through groups; students can understand the knowledge more deeply and master the method of troubleshooting.

4. The Class Hour Assignment and the Assessment Method of Integration Teaching

4.1 The class hour assignment.

The course has 48 class hours, because it is integrated teaching, practical practice and theoretical teaching are as a whole. From the point of view of class hours, the teacher teaching accounts for half of the time, students thinking and training accounts for half of the time. From the knowledge structure, the switching principle module accounts for 6 class hours for mainly summarization and knowledge review; hardware structure part accounts for 16 class hours with mainly theoretical knowledge and subsidiary physical configuration practice; local exchange calls module accounts for 14 class hours with data configuration practice as the major and theoretical knowledge as the auxiliary; different exchange calls part accounts for a total of 12 hours with signaling knowledge and data configuration for relay.

4.2 The assessment method.

The course is a test course, assessment at ordinary times combines with assessment at the final time are all used for assessment with each accounting for 50%. The usual assessment has the team scores and the individual scores. The team scores can be obtained by every team member, but the individual scores can be obtained by everyone form daily performance; the final paper testes the students for the course at the end. Taking into account the characteristics of the course itself, the content of assessment is the combination of theoretical knowledge and practical operation, accounting for 50% of each. For example, the final paper for theoretical knowledge has 50 scores; computer data configuration practice has 50 scores. This kind of assessment enables students to pay more attention to practice, not just theoretical knowledge.
5. Conclusion

Switching technology integration teaching mode with module teaching and group teaching integrated the "teaching, learning and doing" together, so that students can be taught with studied, learn with taught and done with studied which greatly stimulates students' learning enthusiasm and increases the joy of learning. At the same time, the active learning replace the traditional passive learning, through the practice of training greatly deepened the study of theoretical knowledge. The integrated teaching method of "hand, brain and use" can better cultivate students' ability of self-study, finding problems and solving problems, and improve their ability to cooperate and innovate.

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7. References


