

Development of a vocational college course on metro service telephone communication system maintenance based on work process

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ABSTRACT: In order to meet the rail transit industry's demands for skilled talent, vocational colleges are required to explore work-process-oriented course construction and implementation according to the rail transit industry's position demands. Based on the entry point of vocational colleges' course construction of *Metro Service Telephone Communication System Maintenance* of the Urban Rail Transit Control Specialty, this article outlines the simulation of the real-work environment and explores the unification of the learning process and the work process based on work-process-oriented course construction and the teaching implementation integrated with position demands for the rail transit industry's verification of occupational skills.

INTRODUCTION

Urban rail transit includes metro, light rail, magnetic levitation and other means of transportation, and it is one of the urban public transportation modes [1]. The rapid development of urban rail transit requires staff with appropriate skills. Investigation and statistics show that 81.8% of the rail transit workers graduated from vocational colleges. Therefore, it appears crucial to explore work-process-oriented course teaching according to the rail transit industry's position demands, the learning of knowledge and skills, the cultivation of occupational quality through practice, the unification of the learning process, and the work process and the strengthening of graduates' position adaptability. These are the key problems to be solved by vocational colleges.

Taking the vocational colleges' Metro Service Telephone Communication System Maintenance of the Urban Rail Transit Control Specialty course as an example, the vocational colleges' work-process-oriented course construction and implementation of this specialty are discussed in this article.

COURSE CONSTRUCTION OF WORK PROCESS ORIENTATION

Work process is a concept of profound connotation, and it not only refers to a series of work processes and tasks, but also includes the conditions, environment and situation, occupational skills and other relevant conditions required by the work implementation, and these factors are required to be understood and acquainted with, during the future real-work process [2]. As one of the specialised courses of urban rail transit, the work-process-oriented course teaching of Metro Service Telephone Communication System Maintenance firstly should build a certain learning situation focused on work tasks and, then, guide students to acquire relevant knowledge based on the implementation of these tasks. The course should combine the learning and work processes with the students' ability and personality development according to the analysis of the rail transit industry's relevant positions and based on the learning objectives and requirements of various careers. The five learning situations developed for the course are shown in Table 1 [3].

Table 1: Course construction of Metro Service Telephone Communication System Maintenance.

Design of learning situation topic unit	Carrier	Method of constructing work process orientation course
Learning situation 1: perception of the service telephone communication system	Function	Overall perception-centred construction

Learning situation 2: operation of branch exchange telephones of the service telephone communication system	Type of business	Situation-centred construction
Learning situation 3: operation of between exchanges telephone business of service communication system		
Learning situation 4: daily maintenance of the service telephone system	Phenomenon	Problem-centred construction
Learning situation 5: fault handling of the service telephone system		

COURSE IMPLEMENTATION OF WORK PROCESS ORIENTATION

Though the implementation plans of establishing work-process-oriented courses will vary with the establishing modes, each implementation plan can be realised in six steps: information, decision, plan, implementation, inspection and assessment. Taking learning situation 2, operation of branch exchange telephones of the service telephone communication system, as an example, the implementation process of the situation-centred course will be explained in details in this part of the article. According to the characteristics of learning situation 2, the course implementation will be divided into the following four steps:

Definition of Work Task of Branch Exchange Telephones Operation

1. Introduce the learning tasks through description of the learning situation:

Description of learning situation; the communication office in the signal area should have a telephone for the convenience of all personnel's fulfilment of the tasks of the branch exchange telephones operation.

2. Description of relevant occupational ability:

Teachers will introduce the process of the branch exchange telephones operation. During the communication with students, teachers will guide them towards drawing conclusions that the fulfilment of the tasks requires the cooperation from the central communication worker and the wire worker of the rail transit industry's signal workshop.

3. Introduction of working situation:

Teachers will introduce the equipment and tools (shown in Table 2) required by the working situation and briefly introduce the functions all equipment.

Table 2: Hardware conditions required by working environment.

Serial No.	Name of equipment	Unit	Quantity	Serial No.	Name of equipment	Unit	Quantity
1	Alcatel 4400 switch	Set	1	5	Routing knife	Pair	6
2	Main distribution frame	Set	1	6	Jumper wire	Pair	10
3	Maintenance terminal	Set	2	7	Electric cable	Pair	10
4	Cable distribution box	Piece	1	8	Multimeter	Piece	6

4. Student grouping and teachers' explanation of the task assessment requirement:

Students will be divided into groups with a group of five to six persons, and at the same time, teachers will explain the task assessment requirements. The assessment can be conducted based on learning tasks and requirements, knowledge required by relevant tasks, the rationality and operability of the plans, the normalisation of the operation, team awareness and many other indexes.

Task Preparation

1. Question-answer-oriented organisation of students' autonomous learning:

Teachers will set questions and provide learning materials that include the knowledge objectives and skill goals for students and students should try to solve the problems independently. Teachers are ready to answer the students' questions at any time.

2. Teachers' intensive answering to questions:

After autonomous thinking and exploration of the problems within the specified time, students may freely ask questions and teachers will intensively explain the difficult knowledge points.

3. Teachers' provision of construction list:

Teachers will dispatch the construction lists to the groups according to the task requirements. Table 3 is the central communication workers' construction list and Table 4 is the wire workers' construction list.

4. Make plans in groups:

Teachers distribute the planning assignment forms required by the task fulfilment to students, and students should discuss their perception of the work tasks in groups to make implementation plans for the central communication workers and wire workers to fulfil the tasks. The implementation plans are required to include the specific work tasks and position requirements for each step [4]. Each group leader should be responsible for requesting everyone to actively take part in it.

Table 3: Central communication workers' construction list.

Phone number	User name	Group of customers				Type of business			Service authority			
		Simulation user	Digital user	Audio user	Other	New assembly	Disassemble	Telephone relocation	Emergency call	Group calling	General calling	Other
664528	Office in the signal area		√			√			√	√	√	
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Table 4: Wire workers' construction list.

User name: Office in the signal area
Address: Room 201, second floor of building complex
Phone numbers: 664528
Number of sets: one set
Completion date:

5. Groups' communication and discussion to perfect the plans:

After the completion of the implementation plans, all groups should check each other's plans to perfect the implementation plans and, then, take advice from teachers, who will compare all the plans and point out any irrationality. Students should, then, repeatedly discuss and modify the plans and, finally, submit a task implementation plan (as shown in Table 5) with rationality and operability.

Table 5: Implementation plan of branch exchange telephones operation.

Workplace	Object	Specific completed work tasks	Position requirements
Central communication machine room	Central communication workers	1. Confirmation of users' phone numbers and equipment numbers	1. Machine room workers' maintenance must strictly comply with the operation specifications to guarantee operation safety. 2. Machine room workers should not leave their working posts without permission and should timely handle the equipment faults according to relevant procedures. Responsibility system of first asking will be carried out for the telephone answering.
		2. Setting of user parameter and service authority: complete the data allocation according to the construction list.	
		3. Operation of main distribution frame's jumper wire: connect the interior wiring module with the exterior wiring module of the main distribution frame by using a jumper wire.	
Wire workers' construction site	Wire workers	1. Roll up the wires into bundles according to the distribution boxes.	1. Strictly carry out the watch and shift relief system and machine room management registration system, and the shift relief should be clear and definite.
		2. Calibrate the ends of the bundled wires with a multimeter.	

Wire workers' construction site	Wire workers	3. Connect the well-calibrated sub-wire onto the distribution box.	2. Any fault should be timely processed or reported to relevant persons for handling, and the fault handling must be serious and careful. All faults shall be reported and no concealment is allowed.
		4. Talk to the central communication machine room with testing phones to guarantee correct wire connection.	

6. Students will discuss with teachers to confirm the following implementation solutions:

- Role play: five to six persons in a group should arrange their own specific roles, such as wire workers and central communication workers.
- Data search: each role should actively search relevant data and get familiar with its role knowledge, skills and position specifications. For example, students may actively ask teachers for help or conduct a demonstration.
- Situation creating: central machine room communication worker and wire workers' workplaces can be the school service telephone system training room.

Task Implementation

1. Teachers' demonstration:

Teachers demonstrate standard operations for the communication worker, and wire worker and place emphasis on safe and standard operation.

2. Group implementation:

Students should share out the work and cooperate with each other in groups to fulfil the tasks of the office telephone operation and record the problems that may happen during the implementation process.

3. Group's experience exchange:

Groups should communicate with each other to ensure that each group member is acquainted with the workflow and the knowledge and skills related to each process.

4. Teachers' guidance:

Teachers will supervise, guide and evaluate the whole implementation process to guide and assist students through multimedia and real teaching aids to help them solve problems to improve the students' ability of putting theoretical knowledge into practice.

Task Summary and Feedback

1. Teachers' assessment:

Teachers will randomly assess the students' mastery of knowledge points and skills according to their roles and give them scores based on the assessment results. Each group is required to restore the equipments and clear the sites after the assessment [5].

2. Teachers' overall assessment:

Teachers will give students overall scores according to the assessment standards and their performance during the teaching activities and make suggestions [6].

CONCLUSIONS

Based on careful analysis of the rail transit training programme, the work-process-oriented teaching contents for the technical course Metro Service Telephone Communication System Maintenance, according to position demands, are presented and discussed in this article. The whole course implementation has been designed and organised strictly according to the actual demands for the work process, thus there has been good teaching effectiveness.

The questionnaire survey after the course implementation showed that 79% of the students thought that their ability to apply theoretical knowledge had improved during the work process; 87% of the students thought that awareness of safety and responsibility had been strengthened; 66% of the students thought that their autonomous learning abilities had been improved; and 90% of the students thought that their awareness of teamwork and collective spirit had been strengthened.

The development of work-process-oriented vocational education curriculum requires a suitable training base, facilities and instruments, qualified teachers and cooperative enterprises, etc. Vocational colleges vary with their locations, teachers, college funding, teaching attachments, socio-physical environment, spiritual and cultural environment, and other factors. In order to improve the success rate of course development, each vocational college's development of work-process-oriented courses should highlight its advantages according to its own characteristics by adhering to the principle of suitability.

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