

DESIGN OF COURSE EVALUATION SYSTEM BASED ON OUTCOMES-ORIENTED APPROACH - TAKE MOBILE COMMUNICATION COURSE AS AN EXAMPLE

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Abstract: This paper takes the mobile communication course of communication engineering major of Pingdingshan University as an example, and explores the research and practice path of a course evaluation system according to the pain points in the implementation process of the current science and technology course evaluation system. Firstly, from the perspective of ability outcomes, the course objectives are optimized. Secondly, the outcome-oriented "234" evaluation system is constructed. Aiming at the formative and summarized evaluation, evaluation activities are carried out before, during and after class, so as to achieve students corresponding course objectives. Thirdly, the assessment and evaluation characteristics of discipline competition replacement are formed to promote learning through competition. Finally, continuous improvement measures are adopted to form a closed-loop system of teaching quality evaluation, so as to promote the achievement of curriculum objectives and improve the quality of talent training.

Keywords: Mobile communication; Evaluation system; Outcome-oriented; Competition replacement

1 INTRODUCTION

With the continuous promotion of the concept of engineering education certification, the core of teaching quality assurance is to adhere to the student-centered teaching concept, establish an outcome-oriented curriculum evaluation system, and effectively implement the teaching quality assurance. outcome-oriented education is an important concept and guiding ideology of engineering education certification[1]. It is organized and carries out teaching based on the level and achievement degree of students learning results. The goal of teaching design and teaching implementation is the final learning results of students through the educational process, that is, students can apply what they have learned in the course to practice and reach certain standards. Therefore, in the monitoring and evaluation of teaching quality, it should not be carried out in accordance with the traditional classroom listening, teaching inspection, student evaluation and other ways, but to focus on the achievement of the course objectives and the support of the corresponding graduation requirements[2].

The outcome-oriented curriculum assessment and evaluation design is a structural mode of organizing, implementing and evaluating education with the learning achievements achieved by students through the educational process as the core. It is to put the teaching objectives (i. e., students expected learning outcome) in the central position of teaching activity design, develop the selection of teaching content, the setting of teaching links and the organization of teaching process around this goal, and finally verify the achievement of teaching objectives through reasonable assessment and evaluation methods[3]. In the current engineering of professional courses, most of the professional course evaluation content does not gather students ability outcome, single evaluation way, evaluation results lack of effective feedback mechanism of pain points, lead to students should have insufficient comprehensive ability, course objectives to achieve evaluation situation is poor, not forming teaching effect phenomenon such as continuous ascension[4].

In this paper, communication engineering core mobile communication courses, for example, by optimizing the course objectives, and around the course target using a variety of teaching methods, build based on outcome-oriented curriculum evaluation system, curriculum evaluation standard, pay attention to the combination of process assessment and final assessment, through diversified assessment way of comprehensive evaluation of students learning results. So as to ensure that students learning results can meet the expected curriculum objectives.

2 DESIGN OF THE OUTCOME-ORIENTED CURRICULUM EVALUATION SYSTEM

The mobile communication course emphasizes the combination of theory and practice, covering complex theories such as wireless communication model, modulation and demodulation technology, and integrating multidisciplinary knowledge such as electromagnetic wave propagation, digital signal processing and communication principles[5]. With the rapid development of mobile communication technology, the courses need to follow the forefront of the industry and cover the latest technological advances. The course focuses on application orientation and focuses on cultivating students ability to solve complex communication system problems around practical application scenarios. Therefore, the assessment and evaluation design of mobile communication courses should comprehensively and systematically evaluate students learning effect, including both the mastery of theoretical knowledge and the application of practical skills. This summary will design the assessment and evaluation scheme of mobile communication from three aspects: course objective optimization, evaluation scheme design, and assessment characteristics.

2.1 Optimize the Course Objectives

According to the graduation requirements supported by the course and the needs of personalized development, the course objectives of mobile communication are optimized and the supporting ability corresponding to each course objective is determined. Clarify the assessment standards of course objectives, and take them as the basis for the implementation of the teaching process and the evaluation of learning results. In accordance with the requirements of training communication engineering professionals and following the guiding ideology of ability training oriented, this course forms four course objectives in accordance with the index points of the supported graduation requirements:

(1) To understand and express the processing, networking and transmission process of communication signals by combining the application scenarios of mobile communication systems in different times, and solve the problems such as channel loss, environmental interference, multi-path fading and multiple access in the mobile communication system by selecting appropriate technologies and methods, so as to realize the design and optimization of the system scheme.

(2) To select the appropriate communication module, design, debug and realize the comprehensive communication system, and explain and analyze the experimental effect.

(3) To combine the background of the industry and the scientific principles of the mobile communication technology to explain the influence of the new technologies in the mobile communication system in society, health, safety, law and culture.

(4) To carry out effective group communication and communication in the process of experimental system design, and effectively express the experimental design problems through explanation and defense.

2.2 Formulate the "234" Course Evaluation System

The course has formulated a "234" evaluation system, which adopts the evaluation methods combining formative evaluation and summarized evaluation to achieve the four curriculum objectives in three evaluation dimensions before class, during class and after class. The evaluation system design is shown in Figure 1.

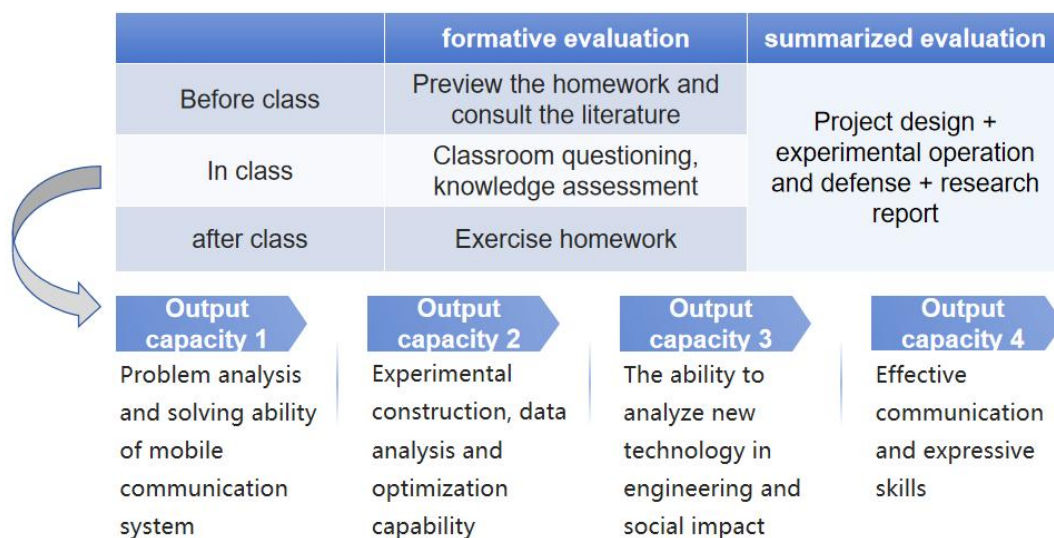


Figure 1 "234" Evaluation System

Through formative evaluation, the learning network course platform is used to track students learning status in real time, and a formative evaluation scheme with "preview task-classroom assessment-exercise-homework" as the core achievement is constructed, so as to timely capture students specific performance in knowledge mastery, skill application and problem solving. Through the summary evaluation, the summary assessment and evaluation scheme with "project design-experiment operation and defense-research report" as the core results is constructed. The specific summary evaluation and assessment design is as follows:

2.2.1 Project design

The project design scheme of the mobile communication course takes the actual engineering case as the entry point, and the base station construction and optimization project in the campus of Pingdingshan College is selected as the core practice content. Through the application of real scenes, students can personally experience the transformation process from theory to practice, and deepen the understanding of mobile communication principles, network planning, base station layout and optimization technology. The main assessment contents are as follows:

(1) The project design shall cover the project design background, network architecture, scheme analysis, scheme design, effect analysis and summary; the project design can fully reflect the design idea and design process, and design and realize the project solution.

(2) Follow the scheme design, fully consider the functional requirements of the scenario; leave sufficient allowance and upgrade space in structure and performance; follow advanced industry standards; follow the principle of reasonable structure, high efficiency and low cost; have flexible user use and management.

(3) Through project demand analysis, the project makes detailed planning and design, can reasonably select technology, design and optimize mobile communication network, and complete network planning with engineering management methods in a multi-disciplinary environment.

(4) According to the scheme planning and design requirements, select the corresponding technologies (networking, channel loss, modulation and demodulation, environmental interference, multi-path fading and multiple access, etc., select no less than 6 technologies) to complete the network design and optimization, and analyze whether the project has achieved the expected results through the results.

(5) Complete the writing of the project design, including: project overview, planning and design, program implementation, summary, references, etc.

(6) The report structure is reasonable, standard format and accurate expression of professional terms.

2.2.2 Experimental operation and defense

The experimental content not only involves the application of theoretical knowledge, but also emphasizes the problem-solving ability in practical operation. By practicing the experimental tasks of the complex mobile communication system, students can deeply understand the working principle of the mobile communication system and the complexity in its actual operation. Experimental assessment requirements:

Experimental report: Write the experimental report according to the requirements, design, analysis, effect and other requirements, methods and specific process of mobile communication application scenarios.

Group task: In the comprehensive experimental learning, select appropriate tools, complete the experimental content, complete the mobile communication application scenario with effective conclusions, and make group summary and defense.

2.2.3 Research report

Homework requires students to consult the latest 5G communication technology related literature, research reports, industry standards and patent information, etc., the content should cover the core technology characteristics of 5G, such as high speed, large capacity connection, low latency, communication, and these technologies in practical application, such as wisdom city, autopilot, 5G application in the field of remote medical exploration. By summarizing the key progress and innovation points of 5G communication technology, the advantages and disadvantages of different technical solutions are compared and analyzed, and the challenges and possible solutions are discussed. The report encourages the integration of personal insights to predict the future direction of 5G communication technology or make suggestions for improvement, so as to exercise students critical thinking and innovation ability. The assessment requirements of this operation are as follows:

(1) To explain the basic concepts and characteristics of 5G mobile communication;

(2) Familiar with key technologies and application scenarios in 5G technology, able to combine examples to analyze 5G scenarios;

(3) To explain the future development and influence of new 5G communication technologies in terms of society, health, safety, law and culture.

2.3 Form the Assessment Characteristics of Discipline Competition Replacement

This course insists on the principle of "promoting learning, teaching and innovation" through the whole process of talent training. By integrating the knowledge learned in class, students are actively encouraged to participate in the discipline competition in mobile communication to broaden students knowledge and exercise their practical ability, teamwork ability and innovation ability. Through the innovative implementation of the mechanism of "discipline competition replacement of usual work", the reform aims to break the limitation of emphasizing theory rather than practice in the traditional assessment and evaluation. By clarifying the replacement standards and procedures, students are encouraged to put the knowledge into the discipline competition, and replace the competition results as part of the usual work. This move not only stimulates the students learning motivation, but also promotes the practical application of knowledge, and comprehensively improves the students comprehensive quality.

Through discussion, the course team has formulated detailed and standard performance identification standards, and defined the replacement proportion and specific requirements of different competition awards. At the same time, the course team teachers will strictly review the submitted competition results to ensure the accuracy and fairness of the results. Students who have won prizes in mobile communication competitions are allowed to use their certificates to replace the results in the course assessment method. This measure can not only greatly broaden students knowledge, but also exercise their practical ability, teamwork ability and innovation ability. Table 1 below shows the performance criteria of the first semester of 2023-2024, and the winning level of mobile communication discipline competition.

Table 1 Replacement Results of the Winning Grades

Award level of mobile communication discipline competition	Replacement research report results
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National first prize	A++
National second prize	A+
National third prize	A
Provincial first prize	A
Provincial second prize	B++
Provincial third prize	B+
Provincial excellence d prize	B

The course team will dynamically adjust and optimize all aspects of the competition replacement according to the students learning situation and feedback, as well as the changes and development trends of the competition environment. This dynamic adjustment and optimization mechanism helps to ensure that the competition replacement assessment mechanism always conforms to the development of The Times, and provides students with a more scientific and reasonable evaluation system.

3 FORM A CONTINUOUS IMPROVEMENT CLOSED-LOOP SYSTEM

3.1 Actively Carry out Feedback and Continuous Improvement Work

Every semester, according to the evaluation results of the course objectives, actively feedback and continuous improvement are carried out to ensure the continuous optimization and improvement of the evaluation mechanism and form a benign closed-loop system of course evaluation. Specifically, according to the evaluation results, the school teachers are organized to carry out systematic lesson preparation, teaching research and grinding activities, so as to improve the scientific and rationality of teaching design. At the same time, it provides accurate assistance and guidance for new teachers and teachers with insufficient teaching experience to help them improve their teaching ability and classroom management level. Through collective lesson preparation and repeated grinding, to ensure the depth and breadth of teaching content and the effectiveness of teaching methods, to ensure that students can achieve the expected learning goals both inside and outside the classroom.

3.2 Continue to Strengthen the Curriculum Construction

In addition, outside the school, further strengthen the cooperation with the internship base, especially in the construction of curriculum resources. Through the communication and cooperation with the internship base, it can not only help students to better combine theoretical knowledge with practical application, but also optimize the course content and teaching methods according to the feedback in the internship. Combined with the achievement of the course objective evaluation, the teaching case resources should be expanded and updated to ensure the frontier and practicability of the teaching content. In addition, students should actively explore and adopt diversified teaching methods, such as project-based learning, case analysis, situational simulation, etc., to enhance students ability to analyze and solve problems in complex environments. Through the close combination of theory and practice, to promote the comprehensive improvement of students professional ability, comprehensive quality and innovation ability.

4 CONCLUSION

By adopting an outcome-oriented approach to designing the mobile communication curriculum evaluation system, this paper introduces the "234" evaluation system. This system fosters a profound integration of theory and practice, empowering students with flexibility in project design, experimental execution, and research report compilation. Consequently, their professional skills undergo marked improvement. The introduction of competitive assessment mechanisms effectively sparks students' interest in learning, motivating them to actively participate in national competitions such as the National College Students Mobile Communication 5G Technology Competition and the National College Students Huawei ICT Competition. As a result, students have secured ten national awards and over thirty provincial accolades in 5G mobile communication technology and related fields, significantly bolstering their employability and laying a solid foundation for their future careers.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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