

Exploration and Practice of Curriculum Assessment Reform under the Background of Engineering Education Certification

Qing Pan^{1,a*}, Yaliang Che¹, Deqiang Ding¹

¹ Basic communication network department, College of Information and Communication, National University of Defense Technology, Wuhan, China

^a panqingddl@163.com

ABSTRACT

Curriculum assessment is the key link of curriculum construction. It is not only the test of students' knowledge mastery, but also the propeller to implement teaching reform and improve teaching efficiency. This paper focuses on the core concept of engineering education certification, and carries out reform and practice for the curriculum assessment of "Organization and Maintenance Management of Optical Network". It can realize the ability output orientation, student center, continuous improvement by means of multi-dimensional formative assessment, diversified scoring rules and the analysis of curriculum assessment.

Keywords: curriculum assessment, engineering education certification, formative assessment, summative assessment

1. INTRODUCTION

Engineering education certification originated in the United States. Its dominant "Washington Agreement" is the most influential international mutual recognition system of four-year undergraduate engineering education degrees in the world. Foreign engineering education certification has been carried out earlier, it is relatively mature in academic thought and educational concept, and the whole certification system is relatively complete and perfect. A series of engineering education training modes have been formed, mainly including: ability oriented education mode which pay attention to the cultivation of core competence has been widely used in Europe, America and other countries; The result oriented education model has adopted by the United States, Britain, Australia and the European Union; The mode of industry university cooperative education has been used, such as the "dual system" mode in Germany, the "sandwich" mode in Britain and the "TAFE" mode in Australia^[1].

China started the pilot work of engineering education certification in 2006. In June 2016, China officially joined the "Washington Agreement", it marks the beginning of the engineering education certification which has international substantive equivalence in China. In 2017, "Tianda action" proposed to cultivate new engineering talents by "enhancing teacher-student interaction, reforming teaching methods and assessment methods, and

forming a learner centered engineering education model". With the continuous promotion of engineering education certification in China, many universities and scholars have actively explored in combination with their core ideas, and carried out a series of teaching practice activities, and accumulated rich research results. For example, Shantou University has carried out relevant teaching practice for CDIO mode^[2], and Long Fenjie has explored the reform of engineering education mode under the guidance of OBE concept^[3].

Engineering education certification emphasizes the cultivation of student's practical ability, innovative consciousness and professional quality, and curriculum assessment is an important link to test the teaching effect and cultivate qualified talents. A reasonable and effective curriculum assessment can truly and objectively reflect the effectiveness of curriculum teaching and students' learning results and some problems existing in teaching, it will directly affect the quality of talent training. "The higher education law of the people's Republic of China" clearly points out that the purpose of examination management in Colleges and universities is through the reform of assessment mode to guide teachers to teach reasonably, to guide students to study actively and creatively, to guide students to learn how to behave and do things while learning professional knowledge, to improve their ability to integrate into society, and to cultivate students into talents with humanistic quality,

practical ability and innovative spirit^[4]. Article 1.3 of the "general standard for engineering education certification" also clearly points out that "We should track and evaluate students' performance in the whole learning process, and ensure through formative evaluation that students meet the graduation requirements when they graduate".

As a professional core course, "Organization and Maintenance Management of Optical Network" gives full play to the positive role of curriculum assessment. By analyzing the current situation of curriculum assessment and gathering the core concept of engineering education certification, we reform and practice the curriculum assessment, which not only meets the needs of course construction and teaching reform, but also reflects the development and trend of current engineering education certification.

2. ANALYSIS OF CURRENT SITUATION OF CURRICULUM ASSESSMENT

2.1. The curriculum assessment dimension is single, which is difficult to reflect the real level of students.

At present, many curriculum assessment mainly take the final examination, supplemented by the usual examination. The final examination mainly examines students' memory of knowledge and mastery of calculation methods by the means of the closed-book examination. The usual examination includes classroom performance and assignments. In this assessment and evaluation method, before the exam the students adopt the method of making a concentrated effort to review quickly and memorizing mechanically to successfully pass the exam in the final examination, while the usual examination mainly plays the role of "using the usual grades to make up for the final score". It is unknown as for whether students can use knowledge to solve practical problems. The consequence of this immediate and coping learning method is that students are "loose in the front and tight in the back" in the learning process, and their knowledge and skills are not solid. Due to the lack of deep understanding, they will quickly forget in a short time after the examination, which cannot fully reflect students' understanding and application of knowledge, but also contrary to the training goal of applied undergraduate talents.

2.2. The curriculum assessment is too focused on theoretical knowledge or practical operation, so it is difficult to comprehensively investigate the comprehensive quality of students.

The traditional curriculum assessment pays too much attention to the mastery of theoretical knowledge or practical operation, and lacks the investigation of comprehensive application ability and innovation ability. This knowledge oriented assessment method restricts students' enthusiasm for independent learning and

innovative learning, and it is difficult to adapt to the goal of cultivating innovative talents. However, the assessment of ability is difficult to be quantified into examination questions. Therefore, the assessment of this aspect is often ignored, it results in students' passive listening in class, lacking of in-depth thinking and critical spirit, the students are difficult to develop high-level thinking, hindering the improvement of students' comprehensive quality and ability, it does not meet the training needs of high-quality compound talents.

2.3. Curriculum assessment analysis and summary are mere formality, which is difficult to form timely teaching feedback.

At present, curriculum assessment analysis and summary are required after the completion of all courses. However, because the examinations are often close to the end of the term, many teachers only count scores and register result. Few teacher really make a systematic analysis of a major and a course to comprehensively evaluate the students' mastery of knowledge and the formation of ability, Especially for the problems in the teaching process, there is a lack of positive analysis and effective feedback. For students, they often get only one score and they don't know what aspects they need to improve. For teachers, they did not find out the problems existing in their own teaching process through analysis and summary, so as to they achieve the purpose of improving teaching, it results in curriculum assessment analysis and summary becoming a mere formality, and going through the motions.

3. REFORM AND EXPLORATION OF CURRICULUM ASSESSMENT

The core concept of engineering education certification is "student-centered, achievement-oriented and continuous improvement", that is, taking students as the main body of teaching activities, taking the cultivation of core competence as the output and the continuous improvement of teaching quality as the purpose. These concepts not only convey distinct value orientation, but also contain rich model connotation [5]. In order to solve the problems existing in the curriculum assessment, the course "Organization and Maintenance Management of Optical Network" follows the core concept of engineering education certification, and adopts multidimensional assessment methods : summative assessment such as equipment operation and formative assessment such as scheme formulation and displaying, to achieve the results of ability training. The course develops a variety of grading rules, reflecting "student-centered"; We also pay attention to curriculum assessment analysis and summary, and we continue to improve the course through curriculum assessment feedback.

3.1. Pay attention to multi-dimensional formative assessment

Because the incentive effect of summative assessment on students' learning is limited, it is difficult to achieve a comprehensive evaluation of students' learning quality in one assessment. For the cultivation of innovative and applied undergraduate talents, we should not only pay attention to students' learning results, but also pay attention to students' learning process. The course "Organization and Maintenance Management of Optical Network" adopts a combination of summative assessment and formative assessment, as shown in Figure 1. The formative assessment evaluates the results according to students' scheme formulation, display and report, accounting for 70%. The summative assessment adopts the way of equipment operation, accounting for 30%. By increasing the proportion of formative assessment, we encourage students to increase the intensity and time of their usual study, and urge students to more deeply understand and apply knowledge after class by consulting materials, group discussion, making plans, etc.

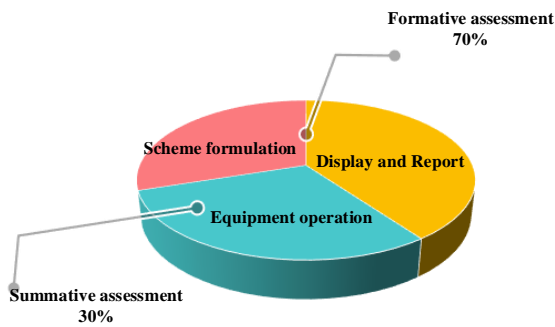


Figure 1 Curriculum assessment combining summative assessment and formative assessment

During the teaching process, two or three training tasks are arranged according to the course progress. Students make plans, display and report in groups. The

scheme formulation adopt the way of "group discussion--scheme deduction--equipment verification--submission of training report", Each group will transfer the knowledge and skills learned in the pre-course and this course to the training tasks through discussion, and present the scheme in the form of training report; Display and report adopt the way of "checking reflection--scheme report--questioning and debate" to evaluate students' ability of solving practical problems by using knowledge and skills comprehensively from the aspects of teamwork, expression ability, innovation ability and logical thinking ability. The summative assessment mainly examines the practical operation ability of individual students, the students and teachers jointly participate in the formulation of practical assessment contents.

3.2. Formulate diversified scoring rules

Comprehensive assessment of achievement is an important part of curriculum assessment, and it is also an important means to measure the quality of curriculum teaching and students' learning level. For multi-dimensional assessment forms, the course "Organization and Maintenance Management of Optical Network" has formulated diversified assessment and scoring rules, which organically combines scheme formulation, display and reporting and equipment operation. Curriculum assessment gives corresponding weights respectively (scheme formulation accounts for 30%, display and report accounts for 40%, and equipment operation accounts for 30%), and the final score of the course is obtained after weighted average. At the same time, in addition to the conventional teacher score, curriculum assessment adapts the scores of multiple evaluation subjects such as students' inter group mutual evaluation and intra group mutual evaluation. Through diversified score evaluation, the observations from various angles are converged and finally made a comprehensive evaluation both quantitative and qualitative. Diversified assessment is shown in Table 1.

Table 1. Diversified Assessment

Formative assessment			Summative assessment		
Assessment content	Evaluation method	Score	Assessment content	Evaluation method	Score
Scheme formulation	teacher evaluation	20	Equipment operation	teacher evaluation	30
	inter group mutual evaluation	10			
Display and Report	teacher evaluation	30			
	intra group mutual evaluation	10			

The course "Organization and Maintenance Management of Optical Network" integrates the "replay and deduction" teaching mode into the process assessment. The result of examination is obtained by the teacher's score, intra group mutual evaluation and inter group mutual evaluation, which not only emphasizes the team cooperation of the group, but also affirms the individual performance of the students.

Among them, the scheme formulation is jointly obtained by the teacher's score and the intra group mutual evaluation. The teacher scores from the perspective of rationality and innovation according to the submitted training report, and judges the students' analysis and problem-solving ability with the scheme reasoning and plan's analysis as the key points. The intra group mutual evaluation is evaluated by the group leader according to the contribution of the group members. As members of the same group, due to their practical cooperation, they feel more direct and real about each other.

Display and report is jointly obtained by the teacher's score and inter group mutual evaluation. The teacher judges the students' expression ability with the logic and attraction of each group in the presentation process as the key points, and judges the students' innovation and communication ability with the high-quality problems raised by each group for other groups as the key points. The inter group mutual evaluation is composed of the evaluation team sent by each group, they score the display and report links according to the scoring rules.

The comprehensive evaluation system improves the students' comprehensive thinking ability to a certain extent, and makes the assessment really become an important means to guide teaching and guide the improvement of students' professional quality. By means

of teacher evaluation, intra group evaluation and inter group evaluation, the phenomenon of "free riding" is reduced as much as possible, and the students who study hard and perform well are affirmed. At the same time, allowing students to participate in the assessment and evaluation also reflects the respect for students' dominant position in the curriculum, which is conducive to stimulating students' learning initiative and exercising the responsibility of students who dare to act, cultivate leadership.

3.3. Strengthen the analysis of curriculum assessment

The analysis of curriculum assessment is not only an important step in the assessment process, but also a necessary measure to promote the scientization of curriculum construction. The course "Organization and Maintenance Management of Optical Network" uses spss2.0 for data processing and analysis, and uses the variance analysis to analyze in detail whether there are differences and correlations between students' formative assessment, summative assessment and comprehensive scores.

In the difference analysis, the comprehensive score is taken as a factor, and the formative assessment and summative assessment are taken as dependent variables for one-way ANOVA. The results are shown in Table 2. The F value of formative assessment is 2.494, the significance is 0.246, and the F value of summative assessment is 3.763, the significance is 0.151. Therefore, the analysis results show that there is no significant difference between the comprehensive score and formative assessment and summative assessment.

Table 2. Difference analysis

		Sum of squares	freedom	mean square	F	Significance
Formative assessment	Between groups	192.040	21	9.145	2.494	.246
	Within group	11.000	3	3.667		
	total	203.040	79			
summative assessment	Between groups	289.735	21	13.797	3.763	.151
	Within group	11.000	3	3.667		
	total	300.735	79			

In the correlation analysis, bivariate correlation analysis is carried out for formative assessment, summative assessment and comprehensive scores. The results are shown in Table 3. The analysis results show

that the correlation coefficients are > 0.3, indicating that there is a positive correlation between the three and the correlation is significant.

Table 3. Correlation test results

		Formative assessment	summative assessment	comprehensive scores
Formative assessment	Pearson correlation	1	.520**	.897**
	Significance (Two tailed)		.008	.000
	Number of cases	79	79	79
summative assessment	Pearson correlation	.520**	1	.844**
	Significance (Two tailed)	.008		.000
	Number of cases	79	79	79
comprehensive scores	Pearson correlation	.897**	.844**	1
	Significance (Two tailed)	.000	.000	
	Number of cases	79	79	79

** . At the level of 0.01 (two tailed), the correlation is significant.

The significance of curriculum assessment is to diagnose and feedback the teaching quality and students' learning effect, and to find the problems existing in teaching and improve them through assessment. In the process of curriculum construction, we give full play to the feedback role of curriculum assessment, we find the problems existing in curriculum assessment through analysis, and analyze the causes of the problems, and then find reasonable solutions to the problems, so as to improve teaching efficiency. We optimize and adjust the curriculum assessment through reflection, and make the whole course perfect day by day in the continuous reflection and improvement. In addition, after-school questionnaire survey shall be conducted for students after the examination, we pay attention to students' teaching participation, experience and acquisition, and enable students to participate in teaching as teaching subjects. By investigating and diagnosing whether the teaching methods and assessment methods used in the teaching process are suitable for students, and whether students' ability can be effectively brought into play in the assessment process, students should also be encouraged to put forward their own opinions on the assessment, and we integrate the good suggestions put forward by students into the future assessment system.

4. CONCLUSION

Curriculum assessment is the key link of curriculum construction. It is not only the test of students' knowledge mastery, but also the propeller to implement teaching reform and improve teaching efficiency. The course "Organization and Maintenance Management of Optical Network" had carried out reform and exploration in terms of assessment and evaluation methods, evaluation subjects and evaluation feedback. It can not only improve the course assessment methods of traditional teaching,

but also promote the coordinated development of students' ability and quality. Through the implementation of curriculum assessment reform, students' innovation and creativity and learning enthusiasm have been improved, and their ability to analyze and solve problems has also been significantly improved. However, teaching reform is a long-term, complex and systematic work. How to further improve the quality of engineering education still needs continuous practical exploration.

REFERENCES

- [1] Hu Hong, Exploratin on the demonstration of Engineering Education Certification of safety engineering specialty under the backgroud of new engineering[J] , Journal of Higher Education , 2019,(20):71-73.
- [2] Gu Peihua, OBE Engineering Education Model in Shantou University[J], Research in Higher Education of Engineering, 2014,(01):27-37.
- [3] Long Fenjie, Study on the Exploration and Practice of OBE Engineering Education Model in Newly-built Undergraduate Colleges[J] , Research in Higher Education of Engineering, 2017,(06):76-80.
- [4] Dai Shiyang, Research on the Reform of the Training and Examination Mode of Application-oriented Talents in Colleges and Universities[J], Journal of Shenyang Institute of Engineering, 2019,15(04):540-544.
- [5] Song Wei, Reform and Practice of the Software Course Assessment Methods for the Engineering Education Accreditation[J], Microcomputer Applications, 2020,36(11):13-15.