Construction of Teaching Quality Assurance System in the Context of Engineering Education Certification

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Abstract. The teaching quality assurance system involves all aspects of personnel training. It effectively monitors, analyzes and improves all the processes and factors that affect the quality of personnel training, which is the key to ensuring and continuously improving the teaching quality. Taking Computer Engineering College of Harbin Engineering University as an example, this paper summarizes a set of effective teaching quality assurance system through undergraduate teaching reform and practice. This article introduces the overall situation of the construction of college teaching quality assurance system, sorts out the main monitoring points in the teaching quality assurance system, and expounds the evaluation mechanism of teachers' teaching level. After a year of teaching practice, this teaching guarantee system has achieved good results.

Keywords: Engineering Education Certification · Quality control
Teaching evaluation · Monitoring point · Continuous improvement

Engineering Education Certification [1] is the qualified level of certification aiming at the engineering education to regulate engineering education specialty in higher education in China, construct higher vocational education quality control system and improve engineering teaching quality. In the process of teaching practice, quality assurance work of teaching is gradually normalized in accordance with the relevant norms of professional certification [2], following the OBE education concept. In all aspects of teaching, in accordance with professional quality certification standards, the formation of closed-loop feedback mechanism and continuous improvement to continuously improve the quality of education and teaching.

1 Education and Teaching Quality Assurance System Architecture

The teaching quality goal system includes a series of standards such as school orientation, training goal, quality standard; The quality assurance system of

teaching resources management includes the construction and management of teaching staff [3], management of teaching expenses, facilities construction and management, teaching infrastructure management, teaching reform and research management [4]; The quality assurance system of teaching process management includes the enrollment plan and quality of students, the formulation (revision) of personnel training plan and the implementation of talent training programs; The teaching quality monitoring system runs through all aspects to provide feedback and improvement measures for all aspects. The main monitoring points and quality standards involved are as Tables 1, 2, 3 and 4 shows:

2   Teaching Evaluation Mechanism

The teacher teaching evaluation [5] conduct on five dimensions, as shown in Table 5. The evaluation system from the three perspectives are the curriculum system, graduation requirements, training objectives. The system regularly evaluates whether teachers can achieve the goal of the curriculum, whether the construction of the curriculum supports the training objectives and whether the graduating students meet the competency requirements.

Applying this evaluation system as the core, a top-down professional construction as Fig. 1 and improvement has been achieved. From the in-depth study of social needs and the connotation of subject development, a reasonable training goal and a graduation requirement for supporting training objectives have been identified. According to the graduation requirements, the curriculum system are set up and the teaching objectives of the curriculum are clarified to build and maintain a faculty and supportive environment which can support to reach the goals. Then through the bottom-up assessment and feedback, whether the syllabus (curriculum objectives) test are reached from the most basic course teaching papers, curriculum analysis, the achievement of graduation requirements are tested from the achievement of the goal of the curriculum, whether the training goal is reached are tested from the graduation requirements, and finally whether the community is satisfied with the training of personnel are tested from the training objectives and the development of the work of students, which end up test and correct the personnel training objectives and the concept of running a school. Closed-loop process formed by top-down design and bottom-up feedback reflects the professional construction of continuous improvement mechanism connotation.

3   Implementation Effect of Teaching Quality Assurance System

Since 2016, the system of professional leaders, as well as teachers' self-evaluation mechanism, professional evaluation, student evaluation, external evaluation, joint evaluation of departments and departments has been implemented as "five dimensions", which lead college teaching into good condition by running more than a year.

Table 1. Monitoring points: training objectives

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Graduates recognize their own training objectives	Questionnaire for new graduates and 5 years graduates			Evaluation results are fed back to the teaching and advisory committee. If not appropriate, the organization will revise the training objectives. If the training objectives are not met, find out the reasons and improve the curriculum system setting and teaching
Admission of employers to graduates achieves the training objectives	Conduct a questionnaire to employers who hires new and 5 years graduates			
Training objectives in line with national and social needs	Investigate and analyze whether the national and social needs are consistent with the objectives of this major	Once a year	Training program revision team	
The employment rate is higher than the average school level	Figure up employment rate			

1. Professional system leader is implemented, and the professional leaders which hold a concurrent post by grassroots academic leaders is the first person in charge of professional construction. Responsible teachers for each course is set, who is responsible for the specific implementation of the curriculum and curriculum construction. Since the autumn semester of 2016, the system

Table 2. Monitoring point: training requirements

| Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Meet the training requirements of knowledge, ability and quality	Check the student comprehensive evaluation file	Once prior to each student's graduation	Training program revision team	The evaluation results are fed back to the teaching and advisory committee, and adjust to the problem or regulate the corresponding teaching activities
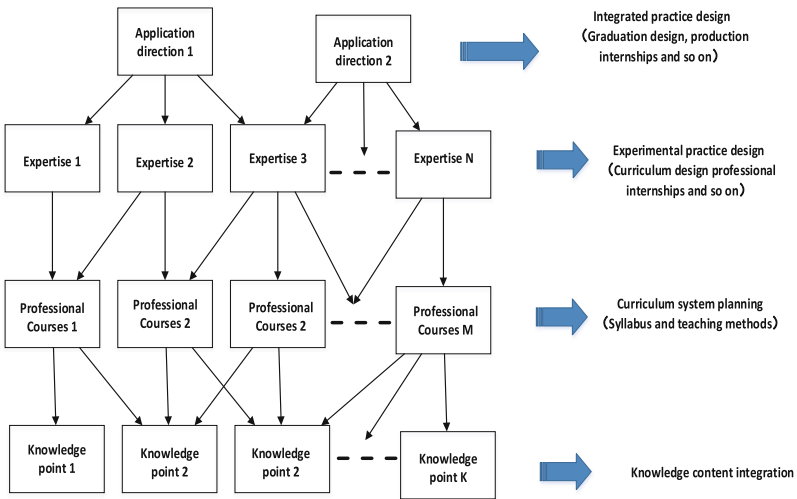
Fig. 1. Top-down professional construction

of talking between professional principals and responsible teachers has been implemented. The outline is as follows:

– Understand the professional training objectives and graduation requirements, and timely explain to students;
– Understand and know the supporting role of this course in training objectives and graduation requirements, and explain to students the teaching contents and objectives of this course;
– Problems in the Course Implementation and Improvement Measures (Syllabus, Course Assessment, Teaching Methods, Feedback from Students, etc.);

Table 3. Monitoring point: courses teaching

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
The teaching content covers the relevant knowledge areas and knowledge points which is consistent with the curriculum syllabus	See if the lesson plans meet the course requirements	One semester ahead of schedule	Course responsibilities teachers, inspectors	The evaluation results are fed back to the person in charge of the course, and the teaching content, teaching methods and examination methods are adjusted according to the result
Course assessment requirements and content can support areas of expertise	Whether courses meet the request of the training objectives	Held once a semester for each course	Specialty in-charge	
Theoretical and experimental teaching can complete the teaching work according to teaching plan	See if teacher teaching meets the curriculum goal	No fixed term	Students, inspectors, faculty leaders	
The distribution of test scores, as well as the status of the review, proposition	Check the papers, laboratory reports, papers, check whether students meet the curriculum requirements	Once a semester	Specialty in-charge	

- Course leaders need to organize teachers for teaching preparation, fill in the meeting records and report to the college for the record;
- Curriculum construction (including IMOOC class construction, textbook construction, teaching and research, etc.) and the problems to be solved.

Since the implementation of this system, teachers have made clearer view of the training objectives for this course who can timely grasp the feedback from students, supervisors and other parties to adjust timely in the course of teaching and pay more attention to the teaching mode, teaching construction

Table 4. Monitoring point: conditions guarantee

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Training programs can be recognized by more than 90% of students and most of teachers and supervisors	Analyze the feedback of students and teachers from different grades of various curriculum, supervisors and college leader	Once a semester	Specialty in-charge	Form a semester research report, leaving the personnel training revision to reference
According to year and teaching links and processes, clearly define standards and accurate access to relevant documents	For all aspects of teaching, teaching and operating order file was established	Long term	Talent development office	Standardize the teaching operation process
Experimental teaching environment and platform support the smooth opening of experimental courses which meet the needs of students in class and extracurricular innovation	Whether teaching experiment environment and software and hardware platform meet the needs of course teaching and students' scientific and technological innovation	Once a semester	Specialty in-charge	Form a teaching condition construction plan as well as add and update hardware and software equipment to meet the practical and theoretical teaching needs
Meet the company's skills requirements for junior staff and basic standards of corporate employees	Whether school-enterprise joint training meet the training objectives and requirements	Once a year	Student counselor and business mentor	Formed a school-enterprise training annual report, and conduct focused analysis for students in and out of enterprises

Table 5. Five dimensions of the evaluation method

Evaluation measures	Executive body	Measures	Frequency of execution
Teacher self-assessment	The teacher	Qualification evaluation, benchmarking evaluation, papers analysis	Every term
Student assessment	Students at school	Questionnaire	Every term
Professional evaluation	Specialties in-charge	Talk system at the beginning of the course, teaching files	Every term
External evaluation	External enterprises, teaching supervision and so on	Governor attend class, enterprise research X and so on	Every term
College joint evaluation	College leaders, personnel training offices, teaching and so on	Check basic teaching information, ethics, education advisory committees and teaching level, teaching rules and so on	Every term

and assessment methods or other teaching reform. 19 courses including artificial intelligence, introduction to internet of things engineering, emperor new brain, system design and analysis, software engineering project practice conducted a teaching reform, the use of research-based, seminar-based teaching mode has been praised by students. At the same time, pay more attention to the process of assessment methods teachers get more and more recognition, and widely used in the teaching process. Assessment methods which focus on the process get the recognition from teachers.

2. The implementation of teaching information system. Each class in college set up a teaching information officer, who is responsible for the timely feedback of teaching information. Since the implementation of this system, the college has collected and summarized nearly one hundred feedback on the teaching, feedbacking by professional person in-charge to teachers, and teachers' targeted rectification has greatly improved the teaching effectiveness.

3. Regular inspection of teaching files system. Every semester, the college organizes a comprehensive examination of the curriculum papers, the experiment report, the internship summary and the graduation project, and focuses on the rectification of the test paper analysis so that the teachers can find out the shortcomings in teaching and put forward the improvement measures which is of great importance to the continuous improvement of teaching effectiveness significance.

4. Improve the teaching evaluation mechanism. College teachers teaching evaluation adhere to basic requirements of the ethics first, scientific research as the basis, the development of foundation to develop a teaching status assessment program. Assessment content:
   - education and teaching level (leadership listen to lectures, Grassroots academic leaders listen to lectures, supervision lectures, evaluation of professional leaders, check scores through teaching files);
   - ethics evaluation of teachers (academic misconduct, student evaluation of teachers, evaluation of academic instructors, graduation design and experimental practice teaching);
   - education and teaching ability (contribution to the construction of professional, curriculum construction contribution, commitment to the core curriculum, contribution to college teaching specialized work);
   - rules of education and teaching (teaching performance, consummation of assigned tasks from college and grass-roots academic organizations, situation of the participation in the education and teaching activities, course transfer, proctoring and proposition).

   In addition, through the continuous introduction of high-level teachers, the strict implementation of mechanism for Professor annual teaching undergraduates, teaching level and enhancement of students' understanding of professional knowledge has been continuously improved.

5. Add the Students' learning status to Teacher Teaching Evaluation System.
   - After the examination of the curriculum, according to the students' evaluation results, the degree of the course is analyzed, and the lower level of the curriculum shows the lack of support for training goals and graduation requirements. Analysis of the existing problems, targeted courses teaching content, teaching methods, assessment methods, or replacement of teachers and other aspects of the adjustment.
   - The student's classroom learning status is added to the classroom teaching evaluation link, which is reflected in the lecture of the school leadership, supervision, teaching and advisory committee.
   - Comprehensive implementation of undergraduate students' academic guidance system. Each semester is evaluated by the student working office to the student's academic achievement and participate in various competitions and so on, and according to this data to the academic teacher to evaluate.

4   Conclusion

By implementing the teaching quality guarantee system, the college teaching is further standardized, and the students' degree of satisfaction has improved significantly, and the development of connotation construction and extension construction. To improve the overall teaching level of the college, it has laid a good foundation for further innovative talent training mode, improving the quality of education teaching, and carrying out the professional certification of engineering education.

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