

Research on Gold Classroom Construction of Engineering Majors under the Background of Emerging Engineering

Yan Jing^{1,a}, Shuwang Chang^{2,b,*}

¹School of Information Science and Engineering, Harbin Institute of Technology, Weihai, 264209, Shandong, China

²School of Mechanical, Electronic and Information Engineering, Shandong University, Weihai, 264209, Shandong, China

^ajingyan@hitwh.edu.cn, ^bshwchang@sdu.edu.cn

*Corresponding author

Keywords: Emerging Engineering, New 40 Items of Higher Education, Reform of Classroom Teaching, Gold Classroom.

Abstract. Guided by the trilogy of emerging engineering construction and 40 items of higher education in new era, the novel concept of classroom teaching, namely student-centered, outcome-based and aimed at creating gold courses, has been updated and established. The reforms of classroom teaching of professional courses in engineering majors have been carried out from four aspects, namely introducing new knowledge in classroom, implementing problem-driven teaching, fusing multiple teaching forms and combing professional education with general education. The practice has proved that the proposed reforms have enhanced the interaction between teachers and students and improved students' learning ability, engineering awareness and innovative thinking, which laid a good foundation for the construction of gold courses.

1. Research Background

The year of 2017 is the first year of emerging engineering construction (EEC) in China. *Fudan University Consensus*, *Tianjin University Movement* and *Beijing Guidance* are the trilogy of EEC, which put forward new requirements for talent training from different angles. The *Fudan University Consensus* points out that comprehensive colleges and universities should promote the organic integration of science education and humanities education. The *Tianjin University Movement* points out that it is necessary to change educational patterns according to students' interests, to enhance the interaction between teachers and students for forming a learner-centered engineering education model. *Beijing Guidance* puts forward that it is important to implement fully the professional certification concept of international engineering education of student-centered, outcome-based and continuous improvement.

The initiative of regarding undergraduate education as the foundation and four regressions [1] were put forward on the work conference of undergraduate education for higher colleges and universities which was held by the Ministry of Education in June 2018. Minister Chen Baosheng stressed that it should be done to update classroom content and promote the revolution of classroom teaching, and to build the quality culture. A series of rectification measures are formulated in August 2018, namely rectifying comprehensively the order of education and teaching, strengthening the management of classroom teaching, intensifying the management of learning processes, eliminating water courses and creating gold courses [2]. It was proposed that the classroom teaching should be promoted based on student-centered and the learning revolution should be boosted by the teaching reform in the 40 items of higher education in new era [3] in September 2018.

At same time, we should soberly know that current college students, called digital native generation or network generation [4], are very different from the previous ones because they have strong dependence on the network. Although there are certain points of interest in professional

courses, many students' learning interests still cannot be stimulated. There are more and more low-headed students in the classroom, and the interaction between teachers and students is becoming more and more difficult. The classroom teaching quality of engineering courses is also very worrying.

Facing the new era, new background and new requirements, it is necessary and urgent to explore and research the reform of classroom teaching for creating the gold courses and cultivating engineering students with innovative consciousness and engineering practice ability.

2. Updating the concept of classroom teaching

Classroom is the main front of education and teaching. Only when the classroom revolution is carried out can education be truly innovated. In view of the current problems in students and teaching, colleges and universities should combine closely their respective talent orientation, school orientation and training objectives, as well as new requirements for EEC. The basic concepts should be established, which are student-centered, outcome-based, focusing on students' learning effectiveness, continuous feedback and continuous improvement.

Moreover, the concept also includes regarding the construction of gold courses as the goal, choosing suitable teaching methods of classroom teaching according to the course, designing scientifically assessment content and methods of courses, and grasping firmly the main battlefield of the classroom to eliminate water courses, create gold courses, which can improve the quality of classroom teaching. In order to stimulate students' desire for knowledge, improve student's learning efficiency and enhance their abilities of self-learning, the self-management and active learning of students should be guided actively by strengthening the interaction between teachers and students.

3. Reforms of teaching design of gold classroom

Classroom teaching is a commonly method used in education and teaching. It is not only the important process to cultivate students, but also the main approaches to guide students to master learning methods and cultivate students' learning abilities. The traditional classroom teaching is orderly and regular, which cannot arouse the enthusiasm of students' study. Therefore, the reform of classroom teaching is imperative. Based on the new requirements of EEC and the standard requirements of the gold courses, a series of reforms have been implemented to design classroom teaching and guided by updating concept of classroom teaching.

3.1 Doing a good job for introducing new knowledge

A good start is half done. Introduction of new knowledge is the first key step in teaching new knowledge, which relates directly to students' interests in learning and teaching effect. Breaking through the limitation of single course and starting from the big curriculum consisting of multiple related courses, a group of teaching cases and projects are distilled, which are combined with the achievements of teaching and scientific research and will be a starting point to introduce new knowledges of one course. It can stimulate students' interests, reduce the distance between theory and practice, strengthen students' engineering awareness, and enhance the ability of the original theoretical level to solve practice problems. The model of doing in learning and learning in doing is achieved, and the transformation from *learning* to *using* and to *learning* is realized.

3.2 Carrying out problem-driven teaching actively

The student-centered concept is implemented actively and the interaction between teachers and students are strengthened, which is one of the important characteristics of gold courses [2]. The problem-driven teaching [5] is carried out in order to overcome the growing difficulties of interaction between teachers and students in classroom teaching. On the one hand, a good job of problem design is done fully. On the other hand, the scene is designed by combining the teaching content.

A good question is like a bond, which will not only closely link the understanding and feelings between teachers and students, but also can enliven the classroom atmosphere and promote the

harmonious development of teaching and learning in the classroom. On the basis of cognitive and reasoning problems, the proportion of creative, methodological and exploratory issues is constantly increased. New forms of teaching such as heuristics and seminars are carried out by taking the problem as the drive and guidance. In terms of teaching scenes, we focus on introducing some engineering projects that are conducive to cultivate students' practical ability, and closely integrate students' theoretical study with production practice and scientific research.

Practice has proved that problem-driven teaching can effectively focus students' attention on the classroom, enlighten students' thinking, open the minds of students, and make students change from passive acceptance to active acquisition.

With the reforming of classroom teaching, the interaction between teachers and students has risen from the previous occasional question-and-answer to the deep-level exchanges of teaching, study, and even research, and elevated to the level that students can ask questions and conduct divergent thinking. It has gradually become a dialogue classroom [6] from the traditional infusion classroom, which is the necessary for the gold courses.

3.3 Fusing multiple teaching forms

Guided by the new learner-centered education pattern, followed the principles to improve teaching quality, the complementary and effective combination of multiple teaching forms are explored actively, which contain blackboard, multimedia, micro-course, Massive Open Online Courses (MOOC) and flipping classroom. The diversified teaching forms create space and resources for students, so that they can learn whenever and wherever possible.

The blackboard writing still plays an irreplaceable role in the current teaching. The proportion of blackboard writing is increased to avoid the knowledge discontinuity brought by the skip of the multimedia courseware. Moreover, the design and planning of the blackboard writing are considered thoroughly, which include the layout, the hierarchy of the knowledge framework, and so on.

Multimedia teaching can help students acquire more and up-to-date information. The multimedia courseware should be a combination of page design, animation effect, sound effect, new technology application, etc., rather than some simple and plaintext PPT courseware.

Micro-course is a useful supplement to regular teaching. Some valuable resources, including important knowledge points, typical cases, teaching summaries and reflections, problem-solving skills, and simulation applications of Matlab or LabView, can be made into video for a few minutes. The rational utilization of micro-courses can not only overcome the shortcomings of hardware facilities in many classroom, but also facilitate students to study in class and review after class.

The massive open online courses (MOOC) are a new form of teaching that has been developed rapidly in recent years. Students are encouraged actively to use MOOC resources for breaking through the constraints of learning place and equipment and absorbing the essence of online courses to achieve the sharing and exchange of high-end knowledge. Furthermore, some contents are enriched and improved based on the existing excellent curriculum resources to provide suitable network resources for students to learn.

In addition, the educational ideas and concepts contained in the flipping classroom are absorbed. A suitable number of teaching links of flipping classroom are arranged so that students can participate in some interesting teaching activities, which not only can effectively mobilize students' learning enthusiasm, but also do not bring them too much burden for preview and learning.

3.4 Combining professional education with general education

As Mr. Li Zhengdao said, achieving the perfect combination of science and art, technology and humanity is an important success symbol of modern universities and the hope of cultivating talents who can adapt to the development needs of the new century in education [7]. It is necessary to continuously guide students to summarize and reconsider, explore the general knowledge and humanistic connotation in engineering education, find the enlightenment brought by teaching content

and sublimate teaching contents in classroom. The perfect combination of professional education and general education not only imparts knowledge, but also achieves the purpose of educating people.

General education for students has been conducted from three aspects in the teaching of engineering majors. The first aspect is to excavate the general contents contained in various courses and share them with students. The second aspect is to discover the interdisciplinary general knowledge of epistemology, methodology and system theory by taking the big curriculum composed of many related courses as the starting point, which will help to penetrate the interdisciplinary teaching and social responsibility into the process of cultivating people. And the third aspect is to explore humanities and social sciences related to the major. Students' creative thinking, including divergent thinking, intuitive thinking, inspirational thinking, etc., is cultivated and simulated besides the learning of basic knowledge of mathematics, engineering ethics and moral quality education, all of which can lay a solid foundation for cultivating students into high quality and innovative talents.

4. Conclusion

As a new thing, emerging engineering construction is a complex system engineering, and it is necessary to innovate continuously in all aspects of education and teaching. Classroom teaching is the main battlefield of education and teaching. It is impossible to create gold courses or to achieve real education reform without high-quality classroom teaching. Combining the college-level key project, tacking the new era and new requirements as the background, aiming to creating gold courses and regarding classroom teaching as a breakthrough, the authors update the concept of classroom teaching and carry out a series of reform around classroom teaching to create gold classroom from four aspects. Practice has proved that the proposed reforms have attracted students' attention and learning hotspots, have improved their learning interests, enthusiasm and initiative to engineering courses and have strengthened their systematic understanding and grasp of course so that students' engineering consciousness and innovation consciousness have been enhanced greatly.

References

- [1] Ministry of Education, Insisting on Undergraduate Education as The Foundation Promoting Four Regressions Building A First-Class Undergraduate Education with Chinese Characteristics and World Level, *China University Teaching*, vol. 6, pp. 5-6, 2018.
- [2] LU Guodong, Governing Water Course and Creating Gold Course, *China University Teaching*, vol. 9, pp. 23-25, 2018.
- [3] Ministry of Education, The Significance of Accelerating the High-level Undergraduate Education Construction and Improving the Talent Cultivation Ability from the Ministry of Education. http://www.moe.gov.cn/srcsite/A08/s7056/201810/t20181017_351887.html.
- [4] ZHOU Kaifa, ZENG Yuzhen, Exploration on the core competence and teaching mode of new engineering education, *Chongqing education research*, Vol. 5(3), pp.22-35, 2017.
- [5] Li Huichun, Knowledge Centeredness of Current General Education and A New General Education Approach, *Fudan Education Forum*, vol. 9(6), pp. 30-35, 2011.
- [6] LI Zhiyi, My Opinion on Water Course and Gold Course, *China University Teaching*, vol. 12, pp. 24-29, 2018.
- [7] LI Zhengdao, The Combination of Science and Technology and Humanity Is The Symbol of Success in Modern Universities, *China University Teaching*, vol. 6, pp. 10, 2002.