

Research on CDIO Teaching Model Based on Electrical Science and Technology Competitions

Qiyue Li^{1*}, Xiaobing Xu¹, Lixin Zhao¹, Wei Sun¹, Jie Li²

School of Electrical Engineering and Automation, HeFei University of Technology, Heifei 230009, China

*Corresponding author

E-mail: liqiyue@mail.ustc.edu.cn

Abstract

The science and technology competition of college students is an important way to cultivate college students' innovative ability by cultivating their innovative consciousness and spirit, while improving their practical and innovative abilities. In the student Science and Technology competition training, adopting the CDIO model to train science and technology innovation ability of students, will train the university students to have outstanding engineering ability and avoid the blind study. This paper proposes the construction method of CDIO cultivation scheme for the electric science and technology competition, the evaluation model of CDIO students' learning achievement based on the electric science and technology competition, and discusses the construction of the training scheme and evaluation of learning achievement under the new competition teaching model.

Keywords: Science and Technology Competition, Innovative Ability, CDIO Teaching Model, Evaluation of Learning Achievement

1. Introduction

Building an innovative country is our future goals, colleges and universities shoulder the important task of training personnel for the country, cultivating innovative talents has become one of the main tasks of universities. The college students' science and technology competition is carried out by cultivating college students' innovative consciousness and innovative spirit, and improving their practical ability and innovative ability. Students can apply knowledge to practice by participating in various science and technology competitions, and constantly discover in practice. Problems, analysis of problems, and problem solving. Therefore, to strengthen the cultivation and improvement of college students' practical and innovative abilities, we must firmly grasp the science and technology competition!

At present, there are many college students' science and technology competitions. Among them, the related competitions of engineering and electrical students are: National Undergraduate Electronic Design Contest, "Challenge Cup" National (Provincial) College Students Extracurricular Academic Science and Technology Competition, National College Student Smart Car Competition, Chinese University Bio Network Innovation and Entrepreneurship Competition and "Internet +" College Students Innovation and Entrepreneurship Competition. The common features of these competitions are to cultivate college students' sense of practice and innovation, to advocate scientific and technological innovation, to serve the society with science and technology, to guide and encourage college students to be brave in innovation, to cultivate students' practical and innovative consciousness, to improve the engineering practice quality of college students, and to emphasize the novelty and uniqueness of works. The

award-winning works of the annual competition fully demonstrate the infinite creativity and innovative ability of college students. Some of the winners later became the winners of the “National Science and Technology Progress Award”, “China Outstanding Youth Science and Technology Innovation Award” and the “China Youth May Fourth Medal”. It proves that science and technology competition plays an important role in cultivating innovative talents.

Science and technology competitions require students to take the initiative to learn, broaden their knowledge, and grasp all aspects of knowledge in a comprehensive and solid way; they need to be brave in exploration, be brave in practice, and constantly use the knowledge they have learned to solve practical problems. Its exploratory, practical and scientific performance stimulates students to explore the unknown areas, so that they can experience the fun of creation in innovative activities, guide them to continuously learn new knowledge, master new technologies, and constantly solve various practical problems. Cultivate their spirit of scientific and technological innovation and improve their ability to innovate. Therefore, science and technology competition is an important way to cultivate college students' innovative ability.

CDIO, Conceive, Design, Implement, and Operate are internationally popular advanced engineering education ideas [1], emphasizing the concept of “concept-design-implement-run” in the form of completed projects. A product life cycle process to cultivate the ability and quality of college students. It advocates “learning by doing” and trains students' engineering abilities through the whole process of conception, design, implementation and operation, including subject knowledge, students' lifelong learning ability, team communication ability and comprehensive ability in business and social environment. The science and technology competition is characterized by comprehensiveness, system and flexibility. It does not have the only correct answer. Students need to make full use of their innovative ability, propose different solutions, and comprehensively apply various aspects of knowledge to creatively solve practical problems [2]. In the student science and technology competition training, using CDIO mode to train college students' scientific and technological innovation ability can avoid blind learning and train university students into high-quality compound and applied talents with excellent engineering ability.

2. Construction of CDIO Training Program for Electric Science and Technology Competition

According to the methods described in the CDIO standard and reference [3], the training program for college students' electrical science and technology competition should be related to the requirements of the electronics industry for students' knowledge, skills and quality, and include the students' professional knowledge system and personal qualities. , teamwork ability, design and construction of the competition project system, and use this as a training goal. Therefore, it is especially important to establish a diversified training program, and it should be student-centered, combining theory with practice, developing ability and quality, and attaching importance to the spirit of unity and cooperation. Therefore, the CDIO diversified training program for the electric science and technology competition should specifically include the following aspects:

(1) A combination of multiple learning methods. In this training program, teachers should promote a variety of learning methods such as self-directed learning, collaborative research and research-based learning. Collaborative seminar learning is an effective way to improve students' self-directed learning. Research-based learning, also known as exploratory learning, is a process-oriented learning approach that enables students to discover and solve problems independently in the learning process, avoiding the

tedium of traditional passive learning, and research-based learning can effectively promote the progress of collaborative seminars and learning, suitable for teaching for science and technology competitions. Without Conceive, there is no design. So independent research, in fact, CDIO is self-conceived and designed.

(2) The combination of learning ability and communication ability. The competition training course provides students with a learning experience that not only allows students to understand the multi-disciplinary knowledge they support and how they are used in the competition, but also has a clear plan for students to gain interpersonal relationships during the learning process. Skills and the ability to build products and systems. When there is a clear correlation between the content of each subject and the learning effect, interdisciplinary content learning can achieve complementary goals. The clear competition teaching plan refers to the method of combining these abilities and multidisciplinary knowledge, and integrates the IO capabilities of the CDIO standard into the content of competition teaching. This is because students' interpersonal skills and professional skills should not be excluded from the professional development program, but should be considered as part of the entire CDIO curriculum. Therefore, the course teaching for the electric science and technology competition should not only cultivate students' learning ability, but also pay attention to the students' communication and cooperation ability.

(3) Teaching and learning based on active learning methods. Active learning methods enable students to focus on thinking and solving problems rather than passing on course content. It will allow students to be more involved in the concepts of operation, use, analysis and judgment. In the teaching of electrical science and technology competition, active learning can include learning and group discussions, speeches, debates, concept questions and student feedback on learning, which also reflects the CD concept in the CDIO standard. This is because when students are asked to participate in an electrical science and technology competition, they must make a clear analysis of the content so that students can not only learn more, but also better understand what to learn and how to learn. This cognitive process helps to improve the learning motivation of students to obtain the corresponding learning outcomes, and to develop the habit of lifelong learning. Through active learning methods, teachers can help students understand the relevance of some important concepts and apply this knowledge flexibly to other conditions.

3. Establishment of CDIO Student Learning Evaluation Model Based on Electrical Science and Technology Competition

The main goal of the CDIO teaching method is to train students to solve complex engineering problems in real life, create new products and systems, effectively communicate with the society and run complex systems and programs. This goal happens to compete with various types of electrical technology. The implementation is consistent. According to the above CDIO training program and the standard CDIO syllabus [3], schools and teachers can effectively develop students' ability to solve and analyze problems, but how to effectively and reliably measure teaching results has been an unresolved issue, so this paper proposes The CDIO Student Learning Assessment Model, which is based on the electrical science and technology competition, is used to guide the development of CDIO teaching methods, as shown in the following figure:

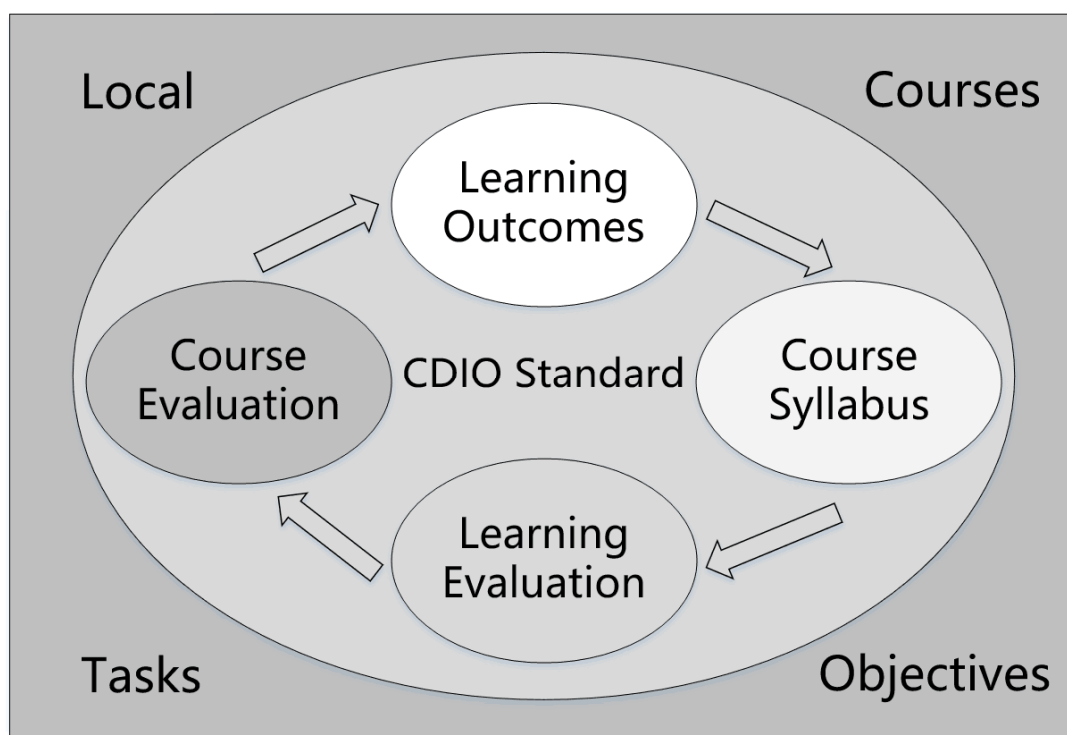


Figure 1 Student learning assessment model

As shown, the model provides CDIO-based student learning assessment method standards and can be used at multiple levels, such as courses, projects, and competition systems. This model describes the four elements of student learning assessment: learning objectives, curriculum and teaching, learning assessment methods, and the use of assessment results. It emphasizes adherence to CDIO standards for teacher teaching, student learning, electrical science and technology competition project implementation, and outcome assessment. And continue to improve the process.

This CDIO assessment model begins with the student's learning outcomes in a course based on the CDIO syllabus. The model then aggregates the results into other course content or related electrical science and technology competitions. Secondly, the student's learning evaluation results are also embedded in the course content and related. In order to ensure the authenticity of the competition, the teacher needs to use the assessment results to propose improvements to the course or project.

Student learning evaluation begins with the normative documents of the course learning or electrical science and technology competition goals, such as knowledge and skills needs, competition project indicators. Once the learning objectives are clearly established, the instructor can design a guiding CDIO syllabus and determine the appropriate teaching and learning methods accordingly. Obviously, different kinds of teaching objectives require different teaching methods and learning experiences. Different evaluation methods are also needed to ensure the reliability of the evaluation data and adapt to the wide learning style of different students. Therefore, the student learning evaluation method should include direct and indirect evaluation methods for students' learning effects, in order to correspond to different types of learning methods and different learning processes, to help students achieve the expected learning outcomes.

In a course or electrical competition, teachers can use a range of different assessment methods to determine whether the student has the required knowledge, skills, and goals specified in the CDIO syllabus. These different assessment methods include written or oral tests with scoring criteria, student performance assessment forms, student combinations at different times, effort in the student design process, and quantifiable student self and mutual evaluation. For example, learning objectives related to course knowledge can be tested in verbal and written tests, and those related to the competition can use a set of evaluation criteria to record student performance to better measure student learning outcomes.

Based on this model, teachers can easily evaluate teaching results according to CDIO standards for electrical science and technology competitions, and improve the teaching, learning and evaluation process in a closed loop, modify teaching plans and goals according to students' learning effects and competition projects, plan follow-up courses, and refine Course outline, improved assessment methods.

4. Conclusion

In the various electrical science and technology competitions, the introduction of CDIO standards and the construction of corresponding training programs and student learning assessment models can effectively promote and improve the teaching practice of science and technology competition activities, improve the practical ability, innovation ability and team spirit of college students, and cultivate The excellent engineering ability and comprehensive quality of college students.

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