

Deep Integration of the First and Second Classrooms of Electronic Science and Technology Majors from the Perspective of Industry Education Integration

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Abstract: With the explosive development of information technology, the existing talent cultivation mode of electronic science and technology majors in local universities has been unprecedentedly impacted. For example, the lack of integration of industry and education practice has led to insufficient experience and ability of students to solve complex engineering problems, the asynchronous development of science and education, and the inability of traditional education models to meet students' individual needs. Based on the background of engineering education professional certification and new engineering construction, this article aims to cultivate students' abilities. It studies the main methods and strategies for the integration of the first classroom and the second classroom from three levels: integration goals, integration steps, and integration content. Multiple measures are taken to cleverly and organically integrate the two classrooms, in order to better serve the engineering education certification work of electronic science and technology majors and the needs of new engineering construction. Ultimately, high-quality engineering, high-quality, and innovative applied talents were cultivated.

Keywords: Electronic Science and Technology; The First Classroom; Second Classroom; Concentration Integration

1. Introduction

In order to meet the technological development and needs of the times in the context of the current Fourth Industrial Revolution, developed countries represented by the United States and Germany have made significant progress in engineering education reform and professional

construction, adjusting, transforming, upgrading, crossing and integrating traditional engineering majors [1-2]. The number and student size of local universities account for over 90% of the total number of universities in China, making them an important component of the higher education system. They shoulder the responsibility of cultivating high-quality talents for local economic and social development. However, most local universities are located in non-central cities and generally face the problems of 'regional differences, limited industrial resources, scarce talents, and low platforms', resulting in serious deficiencies in the development of engineering majors and inadequate talent cultivation in local universities [3].

The new round of technological revolution and industrial transformation is reshaping the global manufacturing landscape, and engineering education in universities should be closely linked and mutually supported with industrial development. The construction of new engineering disciplines [4,5] and the reform of engineering education [6] require engineering graduates to have the ability to adapt, support, and lead the development of new economy, new technology, new industry, new ecology, and new models. In order to meet the needs of industrial and social development, and better implement the talent cultivation goals of the new engineering construction and engineering education reform, universities have successively carried out research on the cultivation of engineering professionals for industries [7,8]. For talent cultivation in universities, the first classroom and the second classroom are equally important. The first classroom is a classroom learning that emphasizes theoretical knowledge and skills, with a focus on teacher lectures. It has the characteristics of standardization, abstraction,

concentration, and collectivism. The second classroom teaching aims to cultivate students' comprehensive practical abilities, with diverse content, rich forms, and flexible methods, which makes it easier to stimulate students' active participation in learning. Actively promoting the deep integration of the second classroom and the first classroom, maximizing their positive role, can better meet the requirements of engineering education professional certification and new engineering construction, and form a joint force for all-round education. The ultimate goal is to cultivate more high-quality engineering, high-quality, and innovative applied talents for society.

2. Definition and Relationship between the First Classroom and the Second Classroom

First classroom education is a teaching activity that develops corresponding teaching outlines and plans according to teaching laws, enabling students to master scientific knowledge. From the definition, it can be seen that the first classroom includes three elements: students, teachers, and teaching content, which are respectively the subject, leader, and carrier of first classroom education, and classroom teaching is its main channel. Compared to the first classroom, the second classroom focuses on cultivating students' practical skills, communication abilities, and humanistic literacy as its main teaching objectives.

When formulating the training plan and teaching system, the first classroom has planned and limited the teaching content of the second classroom, which is reflected in the form of elective courses or practical activities. Because the existence of the second classroom is dependent on the first classroom, it restricts the effective functioning of the second classroom education. In order for the second classroom to better carry the function of cultivating disciplinary professional competence, it should be elevated to a position on par with the first classroom.

3. Investigation and Analysis of the Current Situation of First Classroom and Second Classroom

In May 2025, a questionnaire survey on extracurricular activities was conducted among undergraduate students at Jingdezhen Ceramic

University. The survey was conducted anonymously, including information on extracurricular activities, extracurricular content, students' interests in participating in extracurricular activities, understanding of the relationship between first and second classrooms, factors affecting students' participation in extracurricular activities, existing problems, and suggestions. The questionnaire was conducted online using mobile phones, and the survey subjects selected engineering students from our university. A total of 1752 valid questionnaires were received. The analysis of the survey results is as follows.

3.1 Ways for Students to Obtain Extracurricular Information

Obtaining relevant information for students is the first step in conducting extracurricular activities. Among the channels through which students obtain information about extracurricular activities, the proportion of 'school promotion', 'college promotion', and 'class notification' is relatively high, while the proportion of 'inter student notification' is only 18.54%. As is well known, the dissemination of biological relationships can effectively generate peer effects, enabling them to actively understand and participate in extracurricular activities. This indicates that it is necessary to strengthen word-of-mouth communication among classmates and students in the same major, so that students can obtain extracurricular information more accurately and comprehensively.

3.2 The content of Extracurricular Activities and the Purpose of Students

The second classroom not only includes professional subject activities such as science and technology innovation projects, science and technology competitions, lectures and reports, but also public welfare activities such as group activities, cultural performances, and sports competitions. There are also social welfare activities such as social internships, community services, and teaching support. Through investigation, it was found that students are more receptive to the content of extracurricular activities, with professional subjects and social welfare activities receiving a recognition rate of over 65%.

Engineering students have a heavy academic workload, and their participation in extracurricular activities has a clear purpose.

The survey found that 92.14% of students participated in extracurricular activities due to their 'interests and hobbies'. The proportion of students aiming to 'improve their communication skills', 'professional practical operation skills', and 'humanistic literacy' reached 73.28%, 66.45%, and 60.73% respectively, ranking 2-4, indicating that students attach great importance to their ability improvement in these areas.

3.3 Understanding the Relationship between Second Classroom and First Classroom

Everyone recognizes the importance of the second classroom and its complementary relationship with the first classroom. 1497 students, accounting for 85.45%, believe that 'the first classroom is the main focus, the second classroom is supplementary, and the two complement each other'. Secondly, in the survey on the relationship between extracurricular activities and professional knowledge, 62.36% of students believe that extracurricular content is a continuation and expansion of the first classroom teaching.

3.4 Factors Affecting Students' Participation in Extracurricular Activities

580 students have participated in and organized extracurricular activities multiple times, accounting for only 33.11%, which is basically the same as the proportion of students who have not participated in extracurricular activities (30.55%). Explain the factors that affect or restrict students' participation in extracurricular activities. The survey found that 'heavy learning tasks and lack of time' (22.55%), and fewer types of extracurricular activities that do not interest oneself (13.78%) are the two main factors.

In a survey on student performance, the proportion of students who scored 'good' (with an average score of 80 or above) participating in extracurricular activities (74.39%) was much higher than that of students who scored 'passing' (with an average score of around 60) (36.18%). Especially in terms of 'planned participation in extracurricular activities', students with good grades are 'selectively participating according to their own development plans', with a base proportion of 91.32%. And students who only achieved passing grades were more likely to 'participate in whatever is interesting without any plans', with a proportion of 51.33%.

3.5 Main Problems in the Implementation of Extracurricular Activities in Schools and Colleges

The survey results show that 45.54% of students believe that there is a lack of systematic organization of activities, 41.38% of students believe that the biggest problem is the lack of innovation in the form and lack of synchronization with the times in the second classroom, and 36.88% of students believe that the level of guidance teachers in the second classroom is insufficient, and that their ability to participate in organized activities has not been improved.

Therefore, when investigating suggestions for improving extracurricular activities, 74.6% of students believed that the content of extracurricular activities should be enriched, and activities should be carried out in multiple forms to promote the coordinated development of knowledge, abilities, and qualities. 62.53% of students believed that extracurricular activities should be planned and organized, and teachers' guidance on activities should be strengthened. 72.49% of students believed that extracurricular activities should strengthen practical teaching, highlight the cultivation of practical abilities, and expand students' participation. 58.96% of students believed that extracurricular activities should be "connected with reality, systematically plan the content of activities, and implement school enterprise cooperation".

The above survey results indicate that the problems in the second classroom can be divided into three categories: (1) the lack of clear common goals between the first and second classrooms, and the inability to achieve mutual integration effects. The traditional concept that 'the second classroom is an attachment to the first classroom, and the main battlefield for talent cultivation is still in the first classroom' is still firmly rooted. In addition, the second classroom includes various cultural and recreational activities such as club activities, research activities, and competitive competitions. The second classroom is often misunderstood as enriching students' extracurricular life and expanding their social skills. This inaccurate understanding of its functional positioning leads to a narrow positioning of related educational functions, making it impossible for the second classroom to have systematic and high-level guidance. The fragmented and unsystematic

nature of the second classroom has weakened its functional connotation and educational requirements. (2) The resource allocation and guarantee system of the second classroom is not sound. The second classroom has always served as a supplement to the first classroom education, with insufficient teaching staff and unreasonable resource allocation, resulting in the inability to systematically construct teaching content and evaluation. (3) The phenomenon of 'two skins' in the first classroom and the second classroom is serious. Some teachers forcefully separate the first classroom from the second classroom, with the first classroom operating independently and their teaching management departments being independent of each other. The teaching content is completely unrelated, and there is a lack of interaction and coordination between the two, making it difficult to effectively integrate and develop together.

4. Countermeasures and Suggestions

In order to meet the requirements of new engineering construction and engineering certification, universities have launched teaching reforms one after another. The first classroom mainly focuses on teaching reform of course content, teaching methods, evaluation system, etc., and has achieved good results in cultivating knowledge ability, innovation ability, and practical ability. However, there are still obvious shortcomings in professional ethics, team communication, and other aspects. In order to meet the requirements of engineering education professional certification, only carrying out the first classroom reform is not enough to meet the ability cultivation requirements of work education certification. Based on the background of engineering education professional certification, this article proposes a reform idea for the integration of the first classroom and the second classroom from three levels: integration goals, integration pace, and integration content, with ability cultivation as the core. The work is carried out from the following aspects:

4.1 Establish the Educational Concept of Combining the First Classroom with the Second Classroom

The first classroom teaching and the second classroom education jointly undertake the educational function of higher education, and the two complement each other. In the context of the construction of new engineering disciplines and

the certification of engineering education majors, the talent cultivation goals and graduation requirements of universities need to be combined with the educational factors of both, optimize their educational and teaching resources, improve students' theoretical knowledge, professional practice ability and quality ability, enhance the comprehensive competitiveness of graduates, and meet the basic requirements of the construction of new engineering disciplines and the certification of engineering education majors.

4.2 Establish an Integrated Teaching System with Two-Way Interaction between the First Classroom and the Second Classroom

The first classroom teaching focuses on the learning of theoretical knowledge and the cultivation of professional skills. The teaching content is fixed, systematic, and continuous, but students cannot choose the learning content according to their own situation, which limits their personalized development and cannot meet the comprehensive ability requirements of employers for talents. The second classroom has advantages in exploring and developing students' interests, cultivating their personalities and comprehensive qualities, but lacks systematic theoretical knowledge. The theoretical teaching in the first classroom effectively solves this problem. Therefore, integrated teaching activities that involve interaction between the first and second classrooms can enhance students' knowledge, skills, and more.

4.3 Establish an Integrated Curriculum System for the First and Second Classrooms

From the perspective of engineering education professional certification, it is necessary to effectively construct a curriculum system that integrates the first and second classrooms. The curriculum system of the first classroom has good systematicity and modularity, but there is a serious lag in the course content, which affects students' interest in learning this major. The second classroom combines social needs and professional characteristics to carry out corresponding course teaching, but there is a serious problem of fragmented courses in the second classroom. As long as the two are effectively integrated, the second classroom curriculum is integrated with the first classroom curriculum, and the second classroom activities are perfectly incorporated into the first

classroom teaching system, forming an integrated curriculum that connects the inside and outside of the classroom.

4.4 Establish a Systematic First Classroom and Second Classroom Management System

Establishing a systematic management system for the first and second classrooms is a institutional guarantee for effectively integrating the two. Firstly, establishing a management model in which the second classroom teaching supervisory department and other departments coordinate and promote can break the situation of departmental fragmentation. Secondly, it is necessary to establish a sound guarantee system to ensure the teaching venue, funding, and faculty of the second classroom. Finally, it is necessary to increase the number of academic projects such as special lectures, academic reports, and subject competitions, provide students with more practical opportunities, allow them to explore problems and raise questions in practice, and bring them to the first classroom to enhance their interest in learning theoretical knowledge.

5. Conclusion

This article is based on the background of new engineering construction and engineering education professional certification, with ability cultivation as the core, studying the main methods and strategies for the integration of the first classroom and the second classroom from three levels: integration goals, integration pace, and integration content. Multiple measures are taken to cleverly and organically integrate the first classroom and the second classroom. On the premise of maintaining the existing first classroom unchanged, it is possible to strengthen the construction of technology and practical projects in the second classroom, providing students with more opportunities for practice and hands-on experience. Vigorously developing social practice activities such as volunteer service and innovation and entrepreneurship can enrich and improve the types of extracurricular activities. Focusing on students' personal interests and promoting their strengths has increased their participation. Integrating the second classroom with the first classroom organically can comprehensively cultivate the knowledge, professional skills, and team communication abilities of students majoring in electronic science and technology. This can

better serve the needs of their engineering education certification work and the construction of new engineering disciplines, and cultivate high-quality engineering, high-quality, and innovative applied talents.

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