

The Influence of Cultivating Professional Learning Interests on Educational Mode in the Construction of New Engineering

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Abstract—In order to promote the development of the "new engineering" of the major of measurement and control technology and instrumentation in Changchun University of Science and Technology, the "student-centered" education concept is implemented, and the teaching reform based on the "interest group" teaching model is also carried out. In the implementation process of the teaching reform, the specific implementation method of the "interest group" teaching mode is clarified, and some attempts on new teaching mode have made in class 2018 of the major of measurement and control technology and instrument according to the implementation rules. According to the feedback from teachers and students, the results of the reform are comprehensively evaluated. The evaluation results show that the overall satisfaction of the method is 92.3%. Some of the shortcomings also clarify the ways for the next improvement.

Keywords—new engineering construction; professional learning interest; education model

I. INTRODUCTION

There is an important relationship between learning interest and the learning effect and achievements of undergraduates in four years. The study with interest is of great significance for undergraduates to master professional knowledge in a more comprehensive and stable way [1]. Undergraduates' interest in their majors will directly affect their future career intention and development direction [2]. However, for undergraduates, the establishment of their learning interests is often more complicated, because they are no longer students in primary and secondary schools who are easy to develop interests under the guidance of teachers, but it requires them to think independently to have more spontaneous interests [3]. Thus, interest guidance in undergraduate education is a more complex issue. Institutions for undergraduate education and their superior institutions have also seen the importance and difficulty, so the state and schools have been supporting all kinds of reforms on educational mode to promote interest and its guidance.

Generally, the methods adopted by foreign educational research institutions are to cultivate children from very young, improve their interests in a gradual manner and to make corresponding adjustments according to the changes of age and environment [4]. Therefore, many scholars have conducted in-

depth research on the "interest cultivation" of undergraduates in higher education [5], such as the construction of learning interest and the cultivation of special interests [6]. In China, there is an endless research on students' learning interest, all of which aim to improve the quality of undergraduate education [7]. And each college also improves their educational mode according to their own colleges' situation.

Since the "new engineering" was proposed in 2016, the Department of Higher Education has clearly proposed to promote the construction and development of "new engineering" and formulated relevant measures for education reform and industrial upgrading according to the different characteristics of each major [4]. According to its guiding spirit, teaching instruction committee of instrument also puts forward corresponding teaching reform attempts in accordance with the actual situation of each college. For the major of measurement and control technology and instrument in Changchun University of Science and Technology, an attempt to adopt the "interest group" teaching mode has been made among undergraduates of class 2018.

II. THE INTRODUCTION OF THE MAJOR AND DEMAND ANALYSIS

"Measurement and control technology and instrument" major in the School of Optoelectronic Engineering, Changchun University of Science and Technology is an undergraduate major with three sub-directions: "precision instrument", "photoelectric instrument" and "testing instrument", which is finally formed in 1998 after several adjustment based on the department of optical precision mechanical instrument in 1958. In 2009, it was rated as a major for key construction with national characteristics. In 2011, it was awarded as a provincial characteristic major during the "twelfth five-year plan" in Jilin province and became a provincial brand major. Additionally, it is also the first undergraduate major of Changchun University of Science and Technology that has been certified as an engineering education major and has been examined by the university.

In order to adapt to the construction of new engineering, the certification system of engineering education and the "student-centered" educational concept, the education reform based on the guidance of "professional interest" are explored under such

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a demand for constantly development of the major. Since this major relies on the first-level discipline authorized by the doctor's degree of "instrument science and technology", both the college and academic workers hope that the undergraduate teaching can rely on the strong scientific research background and take the relevant technical knowledge involved in the main research fields as the support, so as to mobilize students' interest in professional study. The main research topics of this major include: spacecraft simulation test and calibration technology, photoelectric precision measurement and flexible assembly, photoelectric detection technology and quality control, overall design and simulation of precision instruments, intelligent testing technology and system, visual detection and image processing technology. In the construction of new engineering, the intersection and integration of both inside and outside the disciplines is the key point. The integration of knowledge system within disciplines based on the interest of professional study is the main demand of teaching reform of this major.

III. THE CONSTRUCTION OF "INTEREST GROUP" TEACHING MODE

The definition of "interest group" is completed by the project leader and his/her relevant course team. The division of "interest group" is realized through the decomposition of the course contents from the knowledge and the technical level in order to meet specific requirements of "the design of student-oriented teaching activities for the cultivation of cognitive ability at different levels" in the construction of new engineering. On this basis, each "interest group" is divided in a hierarchical way. The basic principle is to divide it in accordance with the steps of solution and logical relations of specific engineering problems. Teachers who are the most relevant to the "interest group" in the course team is responsible for the construction of "interest group", who provides course guidance, organization and communication, summary and induction and other tasks. According to the characteristics of knowledge structure and curriculum setting of students majoring in measurement and control technology and instrument in the School of Optoelectronic Engineering, Changchun University of Science and Technology, the "interest group" education mode is preliminarily constructed. The specific procedures are as follows:

(1) The project leader organizes the course teaching team to deeply discuss the curriculum hierarchy, the distribution of knowledge points, engineering technology and other contents, and gives a clear detailed classification. Based on the research orientation of each teacher, the "interest group" is constructed, and at the same time the main instructors of each "interest group" are determined.

(2) The leaders of each "interest group" will draw up the specific professional or engineering questions to be studied in their groups and set the hierarchy on these questions so that they can be applied to students with different cognitive levels. In addition, they will provide the detailed evaluation criteria on the solution of questions.

(3) Relevant teachers are in charge of collecting and classifying students' interest and research preference. Students'

groups are determined after the full explanation of research orientation of "interest group" to students. In addition, they introduce the tasks in "interest group" and its division in order to let students be clear about course contents and the duration for each discussion between teachers and students.

(4) The course learning mode is changed into "student-centered" one through their discussion in-class, after-class and in laboratory. The established course contents are completed through self-study, mutual discussion, communication with teachers and other forms. The results of course learning are summarized as well.

(5) Teachers collect the learning summary of each student, and then the person in charge of the "interest group" gives a comprehensive evaluation on the students in the group. Then, the person in charge of each "interest group" shall summarize the course summary and results of all students participating in this teaching mode, and in the meantime they shall give a comprehensive evaluation summary on the students' learning effect and then report it to the department and college for assessment, thus giving the final evaluation and suggestions for continuous improvement in the next step.

IV. THE OBJECTIVES OF "INTEREST GROUP" TEACHING MODE

The "interest group" teaching mode aims to improve the teaching quality, serve students and keep students remaining curiosity in their study in university and even in their whole lives. The objectives of the "interest group" teaching mode are as follows

(1) The basic goal of this model is to improve students' interest in learning, to develop their independent learning ability based on specific professional or engineering problems and to exercise their communication and coordination ability and problem-solving ability. In addition, it enables students to have the ability to solve specific professional problems. It also trains and cultivates innovative, compound and applied talents with communication ability, cooperative consciousness and independent learning.

(2) This mode can also arouse the interest of every teacher in the cross-integration of his or her research orientation. As the contents of "interest group" still needs to be divided in a detailed and hierarchical way, teachers will have a better understanding on the composition details, hierarchical relations and difficulty degree of the courses they teach, so as to facilitate the quantitative assessment and teaching improvement of students' knowledge and ability.

(3) The construction of this mode needs to sort out the curriculum system in an effective manner and lay a foundation for interdisciplinary and information interaction. In order to sort out the curriculum knowledge and professional technology based on "interest group", it is necessary to carry out discussion and research within the curriculum project system, which makes mutual communication among teachers of different courses and will optimize the whole curriculum system by teachers' course team.

V. PRACTICE OF TALENTS CULTIVATION UNDER THE PROFESSIONAL LEARNING INTEREST

A. Specific approaches for implementation

The original intention of the "interest group" teaching mode is to take students as the center. Grouping is completed according to students' interests and then the learning mode is carried out according to the relevant knowledge contents of the major. Therefore, the influence of professional learning interest on the teaching mode is very obvious. Therefore, under the guidance of learning interest, the core contents of this teaching reform center on cultivating innovative, compound and applied talents that meet the needs of society. Its specific practice will be carried out from the following aspects.

1) It should optimize and upgrade training program

It should strengthen the combination of students' curriculum and scientific research contents, and offer cutting-edge courses with stronger combination of theory and application. It should integrate the scientific research advantages and abundant qualified teachers in the research fields of instrument science and technology into the undergraduate teaching. In order to broaden students' horizon, the training program is comprehensively improved by relying on the scientific research forces in key laboratories, engineering centers, and measurement and control technology research institutes of Ministry of Education. It should integrate the leading edge of science and technology and team achievements into undergraduate teaching and impart students with relevant knowledge and research methods.

Academicians, Chang Jiang Scholars, outstanding scholars and other excellent talents can be invited to help undergraduates expand their horizons from the discipline level and introduce the importance and application of research fields to them.

2) It should carry out plans to supervise teaching quality

Specially-appointed professors, winners of national fund, famous professors and other talents can be employed to undertake teaching tasks for undergraduates. Students can be encouraged, guided and enlightened by their learning experience. It can give full play to the role of all kinds of outstanding teachers in undergraduate teaching. It should establish the supervision and evaluation mechanism for undergraduate teaching. And supervision group and specially-appointed teachers are to examine the teaching quality. Especially for the new teachers, it should arrange experienced teachers to listen to their teaching and give evaluation opinions to improve their teaching ability.

3) It should improve students' practical ability

It should optimize and adjust practical teaching task and its time allocation. It should integrate the latest scientific research results and demands into experimental teaching, reduce the proportion of confirmatory experiments, increase the proportion of comprehensive design experiments, develop innovative experimental contents and stimulate students' interest in independent experiments.

4) It should broaden students' international horizon

It should broaden student's international vision by using the method of "going out" and "bringing in". First of all, we should increase the opportunities for undergraduate students to study in the form of academic exchanges at home and abroad. We can increase the opportunities for undergraduates to study abroad through exchange programs with many famous foreign universities, and introduce foreign students to study in our university. Among them, the "2+1" project between China and Russia has been successfully implemented for many years and achieved good response.

With the deepening of teaching reform on instrument science and technology under the construction of new engineering, we will continue to explore new teaching methods and reform plans in order to cultivate innovative, compound and applied talents that meet the needs of the society.

B. Analysis on practical result

The above practical methods are adopted for the promotion on some students majoring in measurement and control technology and instrument of class 2018 for a semester. The research group of "interest group" has drawn up 6 different interest topics and divided them into groups according to the direction of students' interest and their independent choice. In the end, 12 students select the topic of hardware device on the basis of programming, which is the largest number. Only 3 students select optical testing topic. The remaining 4 groups have 5 to 7 students each. To achieve a relatively balanced distribution, the research team divides the group with the largest number of people into two categories to form a total of seven interest groups. From the reports submitted by students at the end of the semester, it can be seen that the division of labor in each group is relatively clear, and the writing quality of production internship reports has been greatly improved compared with the past. In the final presentation of the "interest group", there are many students with good creative designs and high experimental results. It is found in the questionnaire of students' satisfaction that most students are satisfied with this form, and the students' satisfaction rate reaches 87.5%. In terms of teacher evaluation, students' enthusiasm to ask questions under the model of "interest group" has obviously changed. Because there will be many practical problems when we finish this project. In addition to consulting relevant literature, a more direct way is to communicate with relevant teachers to improve the frequency and quality of communication between teachers and students. Teacher evaluation satisfaction reaches 95.1%. After summarizing the satisfaction of students and teachers, the overall evaluation satisfaction reaches 91.3%.

In the process of implementation, some deficiencies are also found. For example, some students thought that they are overloaded with completing the project and the arrangement of some students' groups is not reasonable, which leads to the large workload of some students and the low participation of some students. After in-depth analysis and discussion, the research group on "interest group" decides to adopt segmented arrangement in the next teaching reform, that is, to further refine the topic, so as to allocate according to the learning ability of different students and make the workload and participation of all students similar.

VI. CONCLUSION

This paper introduces a teaching mode based on "interest group" and designs the specific method of "interest group" teaching mode oriented by cultivating learning interest on majors. It has been promoted and implemented in the major of measurement and control technology and instrument in School of Optoelectronic Engineering, Changchun University of Science and Technology in order to cultivate innovative, compound and applied talents that meet the needs of society.

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