

The Cultivated Ability of Innovative Practice of College Students

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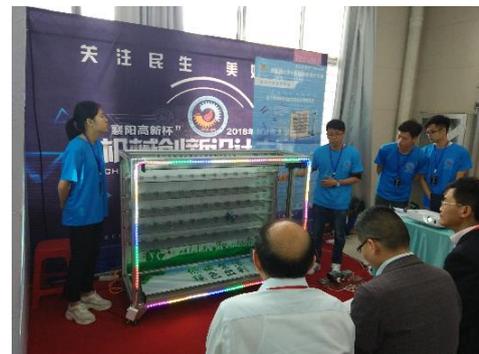
Abstract-This article takes the second classroom student project led by the author as an example to explore the method of university innovation training. This paper introduces the project process of the students in the second class to complete, The completion of the project requires students to have the ability to conduct preliminary research, data statistics, mechanical design, 3D modeling, finite element analysis, PLC control, industrial design and practical operation explores the methods for teachers to guide students to cultivate innovative practice ability, guide students to access materials, search for documents to determine technical solutions and related knowledge points, master design analysis methods, and learn software to solve various problems, inspire students' self-learning ability, and ensure the individualization of students while cultivating students' teamwork spirit, independent work ability, communication ability, language expression ability, and self-management skills. In the process of solving problems and brainstorming with classmates, students need to find the interests and responsibilities that are constantly explored, independently learn relevant professional knowledge points, list ways to solve problems, and make continuous progress.

Keywords: the second classroom; innovative practice; independent learning

I INTRODUCTION

Taking the students who was led by the author in the "Automatic Stereo Bicycle Parking Lot Based on Walls", and participate in the "Competition of Hubei Machinery Innovation Design" as an example, to study that how to use the second classroom to better enable students to use the knowledge that learned in the classroom, and to improve the ability of innovation and practice. This project designed a simple, practical, safe and reliable automatic three-dimensional bicycle parking device for the management difficulties and space occupation caused by the excessive number of bicycles in the urban residents' community [1]. The device uses a linear transmission mechanism composed of high-precision and high-efficiency ball screw, combined with the ability of flexible and precise control of the stepping motor, and designs a self-contained stereo bicycle parking garage based on the wall. It solves the problems of bicycle parking disorder, disordered traffic caused by the large number of bicycles in urban residents in China, etc. At the same time, it makes full use of the empty wall to maximize the utilization of parking space [2]. The completion of the project requires students to have the ability to conduct

preliminary research, data statistics, mechanical design, 3D modeling, finite element analysis, PLC control, industrial design and practical operation [3].



(a) Competition scene



(b) Group photo

Fig. 1 Mechanical Innovation Design Competition scene

II The establishment of the second class and the completion of the project

In term of the study of how to cultivate the ability of university innovation and practice, we will use the second classroom as a carrier to further explore and introduce the team of the research project led by the author as an example [4]. The project involves a lot of work, and the project team consists of five undergraduate students, and the entire project is only half a year from the start to the completion of the overall production, which requires the leadership teachers to clear the division of labor for students and to determine reasonable schedules of working hours [5]. Each student must

have several positions, and some of the work needs two or more students to cooperate, especially in the physical production process, it needs much more requirement for students to trust, encourage, adjust, and cooperate with each other.

After the establishment of the project team, the teachers will arrange an inner-group meeting once a week to coordinate the various problems generated each week and next week's work according to the schedule; the group will be organized by the team leader, summed up daily, and finalized details; in case of emergency special circumstances The teacher organizes students to hold temporary meetings, guide students to access materials, search for documents to determine technical solutions and related knowledge points, master design analysis methods, and learn software to solve various problems [6].

In the process of completing the project, students can achieve the purpose of cultivating innovation ability and practical ability through bit by bit learning and progress. In the program determination stage, students can learn about the existing bicycle parking programs by participating in the materials and watching videos [7]. Based on the existing programs, each student's innovative ideas are proposed to propose five new programs. The teachers guide the students to discuss the five programs and finalize a plan. In the model establishment stage, students clearly divide the work, determine the size of the equipment according to the knowledge learned in the classroom, perform key part check, 3D modeling, finite element analysis, and make animation [8]. The physical manufacturing stage, parts procurement, aluminum cutting and transformation, equipment installation, are all completed by the students rather than factory OEM, although the physical completion is slightly unsatisfactory, but the student's improvement in hands-on ability is very significant. During the stage of controlling and debugging, program preparation, PLC installation, repeated debugging of the program, each time the equipment is modified, and the program needs to be re-commissioned.



(a) PLC debugging



(b) Device installation

Fig. 2 Equipment commissioning

During the process of repeated installation and debugging, students not only improve their innovative practice ability, teamwork ability and resistance. Both pressure capacity and self-regulation ability can be improved [9].

In the process of the establishment of the second classroom, the completion of the project, and ability cultivation of the students' innovative practice, the teacher has a purposeful method to train the students, and the author will summarize the experience that the students in the process of continuous contact with the students as follows.

III TEACHER GUIDANCE

Teachers who develop students' ability to innovate based on competition projects mainly play a guiding role and do not need to participate in every detail of the entire project. The main task of the teacher is to help the students understand the content of the project and help the students to break down the task in the general direction (and do not need to be refined). Students are prone to slack in the process of project implementation. They are easy to give up when encountering setbacks. Teachers need to find their interest points through their own abilities and methods to encourage students to adjust their emotions, continue to work, and constantly improve [10].



Fig. 3 practical teaching

The premise that teachers can guide students through the project is that they have sufficient knowledge reserves and the ability to continuously enrich themselves. Before the teacher guides the students, they need to have a full understanding of the project [11]. They can decompose the project tasks in stages, identify the main problems, list the difficulties that the students may encounter, and guide the students to find

problems in the process of completing the project. Solve problems and develop students' ability to learn and think independently. Teacher guidance can't be done in any way. Instead of students thinking about each problem, teachers only need to give general directions, let students break down their detailed tasks, formulate small goals, and learn how to solve difficult problems.

IV INDEPENDENT LEARNING ABILITY FOR STUDENTS

After entering the university from high school, students face a more relaxed environment, they often easily missing goals, relax their minds, and gradually become weak. The supervision system in the university is more free and open than senior high school, which makes it easy for students to develop self-control. Over time, in the face of more in-depth teaching, it is unable to adapt to the ways and methods of teaching, resulting in inertia, fear of learning, and gradually become irritated learning [12]. The problem of students' involuntary learning is also caused by the combination of school and social factors. The school's education and teaching methods are improper, the professional setting and teaching content are lagging behind, which lacks effective construction of study style, the distance between teachers and students, etc. will make students produce "tired of learning". The establishment of the second class in the course of the competition, the teacher's active guidance to students' interest development can continuously strengthen students' independent learning.

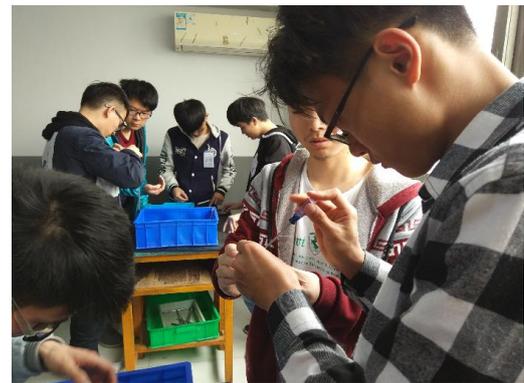
Under the first contact with science and technology competitions, undergraduate students are generally in a state of no way to get started. They do not even know how to obtain information. Teachers need to provide students with a way to learn, so that students can clearly access resources and improve structural design methods, such as using the school database, research status at home and abroad, the latest research methods, consult design specifications, non-professional books, expand ideas and broaden your horizons, are all available [13]. Students' knowledge is no longer limited to textbooks, and the richer the information, the more they can find points of interest.

The motivation for students to learn independently is how to solve the problems students encounter in the project and the inspiration that continues to collide during the group discussion. In the process of solving problems and brainstorming with classmates, students need to find the interests and responsibilities that are constantly explored, independently learn relevant professional knowledge points, list ways to solve problems, and make continuous progress.

V STUDENTS' INDIVIDUALIZED TRAINING

Every student in each project team has its own characteristics and cannot be treated each other in the same training mode. In the same team, students have different grades, different depths of knowledge, and different ways of dealing with problems. Students in upper grades should be encouraged to take on more tasks in design. They must be ambitious in innovation and should be more motivated [14].

Grade students master the methods of acquiring knowledge and pay attention to the basic knowledge and encourage students in lower grades to try more. In the same team, the students have different personalities. Teachers in the face of different personality students should actively explore each side of the students, find the shining points of the students, give different ways to guide students of different personalities, and let the students have more contact and discussion. Let students learn tolerance and understanding. In the same team, students have different professional specialties and different development directions. Students need to be rationalized. A team needs different roles. Each student can take up multiple roles and develop themselves. In the second class, they will play professional expertise, and master much more skills at the same time.



(a) Group discussion



(b) Group experiment

Fig. 4 Group discussion and experiment

At the same time of individualized training of students, students should also cultivate team awareness, encourage students to exchange and discuss, understand different knowledge points and technologies in the process of communication, and understand the overall progress of the project and the connection status of each link, and promote successful implementation of the whole project. In the process of teamwork, students' teamwork spirit, independent work ability, communication ability, language expression ability and self-management ability are cultivated simultaneously.

VI Training of practical ability for students

In the process of participating in the competition to complete the project, the students in the second class cannot simply be limited to theoretical knowledge or simulation analysis. The innovative ability without physical support is like a castle in the air, it easy to go wrong, and has no practical value [15]. Students should be encouraged to constantly correct and improve the program through practice while exploring the theory. For example, conduct field research and questionnaire survey in the early stage of the project, determine the real needs to determine the research direction; try to make a physical model in the research process to correct the research plan; and finally, be able to produce the physical object that can reach the final goal.

VII Conclusion

In the process of the establishment of the second classroom, the completion of the project, and ability cultivation of the students' innovative practice, the teacher has a purposeful method to train the students, and the author will summarize the experience that the students in the process of continuous contact with the students .The cultivation of college students' innovative practical ability is inevitably a subject that needs long-term exploration. The author has studied some training methods based on his own experience. Teachers must guide students instead of students, inspire students to learn independently, and ensure students' individualization while cultivating students' spirit of team cooperation, independent work ability, communication ability, language expression ability and self-management ability. In the process of solving problems and brainstorming with classmates, students need to find the interests and responsibilities that are constantly explored, independently learn relevant professional knowledge points, list ways to solve problems, and make continuous progress. Let students learn to innovate and practice in the second class.

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