Using Project-Driven Method to Improve the Comprehensive Ability of College Students

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Abstract: It is very important to cultivate their comprehensive quality, in addition to learning theoretical knowledge, for college students. Using project-driven method can improve the students' comprehensive Ability. The specific situation of "multi-functional solar LED lamp system" of national innovation training program for college students is introduced in this paper, which including the composition of project members, selection of project theme, scheme design, application process, project content, organization and implementation process and project achievements. It has been proved that the method of project-driven teaching can improve students' interest in learning and ability of autonomous learning. At the same time, this method can also consolidate and deepen students' understanding of theoretical knowledge, enable students to master the basic methods of scientific research, and cultivate students' leadership, team cooperation spirit, innovation awareness and practical ability.

1. Introduction

At present, the teaching in many colleges still takes the teacher as the absolute main body and lays particular stress on the imparting of theoretical knowledge. The teaching is somewhat divorced from the actual engineering demand. The students are more in a passive position, and their independent learning ability and innovation ability are weak.

The teaching method of "project driven" is student-centered. Introduce projects in the teaching process to make the project a platform for student learning [1-2]. In the process of completing the project, students' learning enthusiasm is fully mobilized, their independent thinking ability is stimulated and innovative thinking is formed, so that students' theoretical knowledge and comprehensive ability can be improved together [3].

The College Students' Innovation and Entrepreneurship Training Program include three types of innovation training projects, entrepreneurship training projects, and entrepreneurship practice projects, which are divided into three levels of national-provincial-school level, and the project construction cycle ranges from one to two years. [4-5] Students are free to organize teams, the project team is composed of 3-5 members, one of whom is the project moderator and the team needs to be equipped with 1-2 instructors. The research project must be completed independently under the guidance of the instructor. It must not occupy normal class time, and the project team must obtain relevant results and complete all tasks such as final acceptance within the research period [6-7].

2. Application and Implementation Process of the Program

The College Students' Innovation and Entrepreneurship Training Program provides a complete platform for students to cultivate their innovation ability. In the initial stage of the project, the students volunteer to form a team, choose the research direction based on their interests and their majors, and write project report after a large number of investigations. After the project is approved, the project team analyzes and solves the problems encountered by consulting the literature and combining the professional knowledge learned, and finally completes the project and writes the paper to submit the results [8-9].

The following is an example of "Multi-Functional Solar LED Lamp System", a national innovation training program for college students declared by students of measurement and control

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technology and instrument specialty of Xi'an Shiyou University.

2.1 Project Theme Selection

Students should be interested in it when they choose the topic of the project, and the research content of the project should have some new ideas and some prospects of popularization and application.

The College Students' Innovation and Entrepreneurship Training Program is promoted to students since they entered the University as freshmen in Xi'an Shiyou University. In the first semester of sophomore year, students can join in Training Program. The name of the project applied by the students of this project group is "multi functional solar LED lamp system", based on their interests and their majors.

With the continuous breakthrough of LED lighting technology and the continuous improvement of LED luminous efficiency and performance price ratio, the application market of LED lighting products in the lighting field is expanding. In the context of global warming, the deterioration of the human ecological environment, and the shortage of conventional energy, the solar photovoltaic industry has received widespread attention and support from governments of various countries. The students of the project team are very interested in LED lighting circuits powered by solar energy, and they have designed various interesting and practical functions for LED lights Such as counting people in and out, pest trapping, etc.

2.2 Project Implementation Process

The implementation of the project is mainly divided into the following stages.

First of all, students should consult the materials. Because the students don't know the characteristics and usage of many components and equipment needed in the project, such as solar cell, led, high-voltage package, relay, MCU, development board, etc., they need to use various resources to learn so as to select the components.

Secondly, students need to learn the professional knowledge required by the project. Because most of the professional courses for sophomores have not yet begun to learn, such as "Signal and System", "Digital Signal Processing", "Analog Electronic Technology" , "Digital Electronic Technology", "the principle of single-chip microcomputer", "interface technology of single-chip microcomputer", "sensor principle and application", "measurement and control circuit", etc. so some courses require students to study purposefully according to the school's teaching plan, and other courses must be self-learned in advance when they encounter problems by students.

In the third stage, students are required to design circuits, purchase components, program, make PCB boards, install systems and debug systems.

In the final stage, the project team summarizes, writes thesis, submits the final report, and participates in the defense.

3. Multi-Functional Solar LED Lamp System

The system is an LED lighting device which uses solar cells as a power source. In addition to the lighting function, it also has insect killing and counting functions on different occasions.

Many insects have phototaxis, and it is an important research field for pest control to eliminate pests by using the color tropism of pests. Recent studies have shown that different pests have different sensitivity to light. The phototaxis of most existing pests to the monochromatic spectrum is concentrated at 320-590 nm [10].

LED is a light-emitting diode, which is a kind of semiconductor solid-state light-emitting device. It can emit red, orange, yellow, green, blue, white and purple light. Its spectrum is suitable for the phototaxis of most pests, so it is very suitable to use LED as a light source for trapping pests. Therefore, LED lighting technology and insecticidal technology can be organically combined, which is suitable for parks, orchards, farms and other places.

In order to ensure the real-time and accuracy of statistical data such as the number of personnel, it is necessary to install the automatic detection and counting devices to monitor the entry and exit of

personnel in real time, etc. At the same time, it also needs to transfer real-time data to the computer management system to provide basis for security management. The system combines lighting circuit and counting circuit, and can be applied to park entrance and other places.

3.1 The Composition of the System

The system consists of the following parts: power module, high-voltage power grid module, counting module, keyboard module, clock module, display module, environmental parameter acquisition module, LED array and drive module, etc. System diagram is shown in Fig.1.

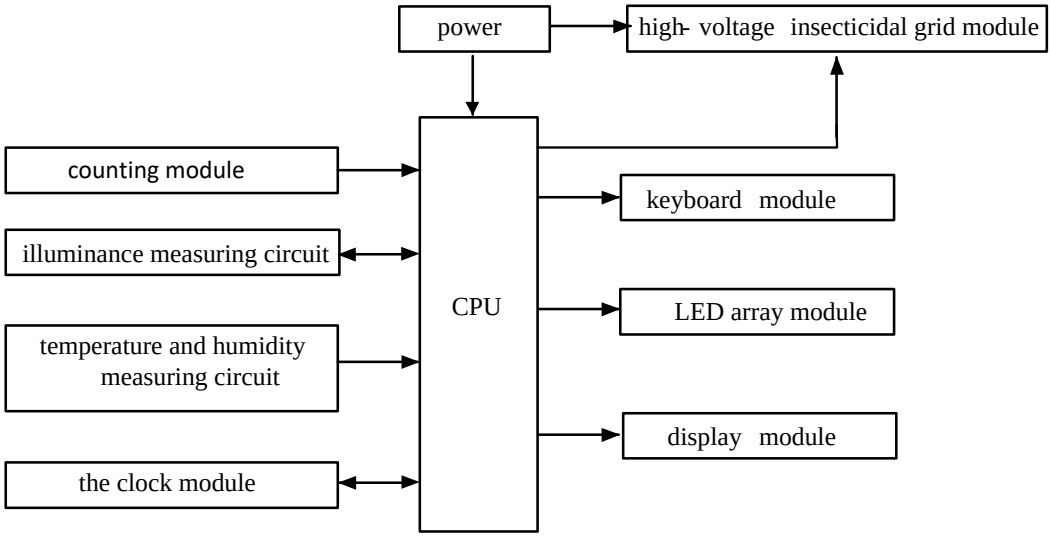

Figure 1 System diagram.

3.2 Counting Function

The sensor used for counting adopts infrared diffuse reflection photoelectric switch and infrared human body sensor to calculate the number of people passing through the sensor in real time. When someone passes through two sensors in the forward direction, the counter adds one and decreases one in the reverse direction。 Fig. 2 is the counting module debugging picture.

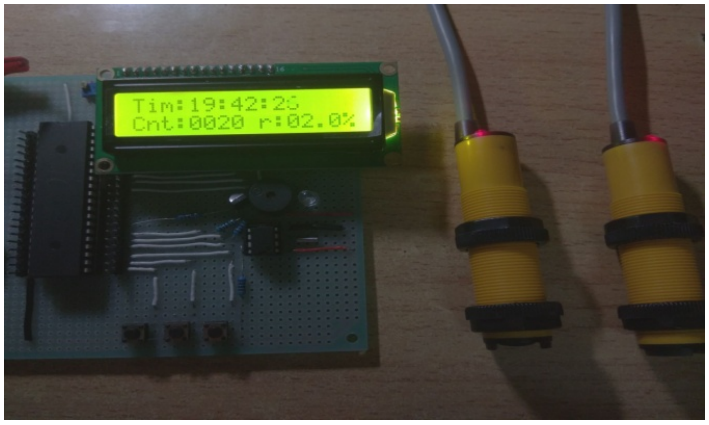

Figure 2 Counting module debugging picture.

3.3 Pest Killing Function

LED lighting technology and light induced pest killing technology are combined organically. A multi-color LED array is used to form a lighting source. According to the characteristics of insect phototaxis (the sensitivity of different insects to different wavelengths of light sources), the specific wavelengths of light sources are used to induce pests, and the high-voltage power grid is used to kill them.

4. Summary

After two years of hard work, the project team completed the "multi-functional solar LED light system" with a lot of extra-curricular time. Students' academic performance is not affected, but greatly improved. At the same time, students' practical ability, innovation ability, organizational skills and team cooperation ability are also improved greatly. All three teams, participating in the 2019 National Undergraduate Electronic Design Competition, won the provincial second prize under guiding by three members of the project team. System debugging picture is shown in Fig. 3.

Figure 3 System debugging picture.

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References

[1] Qingyu Zou, Baisheng Liu, Yan Liu, Liyun Xing, “Research and practice of project-driven teaching model in Visual C ++ Programming Design ”, Journal of Education and Praxis Research , pp. 11-15, January 2016.

[2] Liu Youyao, Jiang Lin ,Du Huimin, Zhang Liguo, Gong Jiamin, Liu Jihong, “Research and Practice on Nurturing Innovative Talents in Engineering Application”, Journal of Higher Education,pp. 76-81, May 2017.

[3] CHEN Hong-bing, ZHAO Li-ya, LU Jin-deng, “Reflections on the Cultivation Mode of College Students' Innovation and Start-up Training Program under the New Situation”, Education Modernization, vol. 15, pp. 7-9, April 2017. (In Chinese)

[4] LIU Fu-juan, “A Brief Analysis on the Importance of Innovation and Entrepreneurship Program to the Cultivation of College Students' Comprehensive Ability—Taking college students majoring in textile engineering as an example”, Science & Technology Vision, vol. 30, pp. 37-39, October 2019. (In Chinese)

[5] XIONG Li, WU Ting-ting, LING Yu-ting, “Research on Case Teaching Design of Innovative Entrepreneurship Course Based on Cultivation of Practical Ability”, Education Teaching Forum, pp. 149-150, April 2017. (In Chinese)

[6] WU Zhiwei, LIU Xin, CHEN Qi, LIU Zhiyong, LIU Guoguang, CHENG Guoyong, “Application of pavement detection methods based on buried sensor on training programs of innovation and entrepreneurship for undergraduates”, Journal of Architectural Education in Institutions of Higher Learning, vol. 24, pp. 116-119, August2015. (In Chinese)

[7] Zhou Jing, Long Xing-Ming, Luo Hai-Jun,“Spectrum optimization of light-emitting diode insecticide lamp based on partial discharge evaluation”, Journal of the International Measurement Confederation, vol.124, pp.72-80 , August 2018.

[8] Liu, Chenggang, Bruner Jr., “Homer L.The optimization of temperature and relative humidity control in cushing library”, Advanced Materials Research, vol.250-253, pp 3139-3143, October 2011.

[9] Wang Y Q,Chong N,Wang S Y,Zhang L,Xiong J F,“Design of diseases and pests therapeutic instrument of solar in greenhouse”, Applied Mechanics and Materials,vol.130-134, pp.442-445, April 2012 .

[10] YANG H Z, WEN L Z, “Effects of light on the phototaxis of several important agricultural pests”, Journal of Agricultural Engineering, vol.30, pp.279-285, July2014.