Political Practice and Exploration of the Principle and Application of Single-chip Microcomputer

-Take the design of LED works as an example

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Abstract. This paper expounds the ideological and political elements contained in the design of LED works, introduces how to use the design of LED works to carry out innovative practice exploration, the teaching method of innovative practical education, the reform of curriculum assessment mode and the effectiveness of innovative practical education. This course integrates the relevant content of ideological and political education into classroom knowledge teaching, and educates students to love the party, country, science, and socialism, so as to achieve the goal of cultivating students' scientific literacy and innovative spirit in an all-round way.

Keywords: course ideology and politics; online and offline mixed teaching; project-based; case teaching

1 Introduction

General Secretary Xi Jinping emphasized at the National Conference on Ideological and Political Work in Colleges and Universities that to make good use of the main channel of classroom teaching, all kinds of courses must go in the same direction as ideological and political theory courses to form a synergistic effect [1]. With the advent of the new technological revolution and industrial transformation, New Engineering has proposed cross-integrated technologies and disciplines such as "Internet +" and "Intelligence +", which all require the cultivation of students' skills and comprehensive qualities, not only requiring students to have the ability to program, but also to Students are also required to have innovative skills, emphasizing technical implementation. As an important branch of computer development, single-chip microcomputer is widely used in various fields and has become one of the most basic and core courses in engineering education [2].

Many domestic scholars have done research on the principle and application of single-chip microcomputers and how to implement curriculum ideological and political. Zheng Zihan and others put forward the teaching mode of "task-driven + combination of reality and reality + learning by doing, learning by doing", expounding the teaching

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content and curriculum ideological and political teaching cases that integrate the elements of ideological and political education [3]. Relying on practical teaching and combining teachers' precepts and deeds, Li Xiuying implemented the ideological and political reform of the single-chip course [4]. Yan Manjun listed three practical teaching cases, and summarized the integration of ideological and political elements and single-chip course teaching [5]. To sum up, the ideological and political elements of the single-chip course are to dig deep into the ideological and political elements, and naturally integrate them into the course teaching. The ability and hands-on practical ability, professional qualities such as honesty and trustworthiness, hard work, teamwork and communication skills required by the industry, and communication skills to stimulate patriotism, national self-confidence, road self-confidence and national awareness in the development of China's manufacturing industry.

2 The Ideological and Political Elements of LED Works Design

(1) Introduce Industry 4.0 and Made in China 2025, and promote the policy of strengthening the country. In the teaching profession to publicize the policy of strengthening the country. Let students understand China through the "three steps", and when the founding of New China is 100 years old, its comprehensive strength will enter the forefront of the world's manufacturing powers, and it will inspire students' passion to study hard for the dream of building a strong socialist country.

(2) Expand the content of professional courses and explore values. Educate students to be down-to-earth, start with technology, rejuvenate the country with science and technology, enhance patriotic sentiment, cultivate students' patriotic thoughts, and take the development goal of rejuvenating the country with science and technology.

(3) Through the complementarity of theoretical teaching and practical teaching, successful practical projects can enhance students' sense of professional pride and self-identity, cultivate students' down-to-earth sense of responsibility, and take science and technology to rejuvenate the country as their own responsibility.

(4) Complete LED design practice projects in the form of group cooperation, cultivate students' teamwork awareness, and guide students to explore and innovate.

3 Exploration of LED Works Design Innovation Practice

The team works together to complete the LED work design, which is mainly divided into four stages: modeling design; Proteus simulation implementation; programming and debugging; video production. Students express their patriotism and love for the party through the design of LED works. The following is the student's LED work design.

(1) Arrange the shape of a heart with light-emitting diodes. Some boards have the words "I love China" printed on them, and some light-emitting diodes flash in different colors and have different lighting effects. The physical picture of the "I Love China" LED work is shown in Figure 1. The physical picture of the LED works is shown in Figure 2.

Fig. 1. "I love China" LED works physical map

Fig. 2. Love display LED works physical map

(2) Students use the 51 development board to display "New China" and "I LOVE u China" etc. The physical diagram of the development board in the 8 * 8 dot matrix is shown in Figure 3.

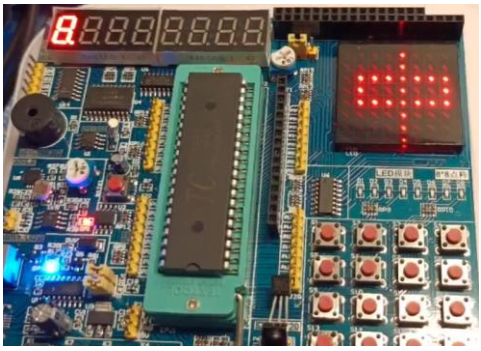

Fig. 3. The physical picture of the development board in the 8 *8 dot matrix "中"

(3) Students use Proteus simulation design to realize 1 6*16 dot matrix cycle displaying 16 words of socialist core values " prosperity, democracy, civilization, harmony, freedom, equality, justice, rule of law, patriotism, dedication, integrity, friendliness ". 16 * 16 The dot matrix "rich" Proteus simulation diagram is shown in Figure 4.

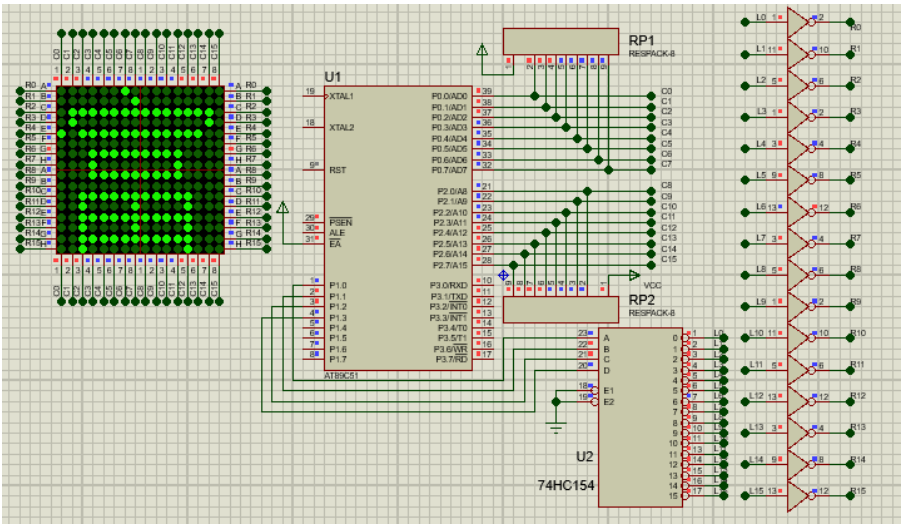

Fig. 4. 1 6*16 dot matrix "rich" Proteus simulation diagram

(4) Students use Proteus simulation design to realize OLED scrolling display meaning of" National Prosperity and National Rejuvenation" and time. The effect is shown in Figure 5.

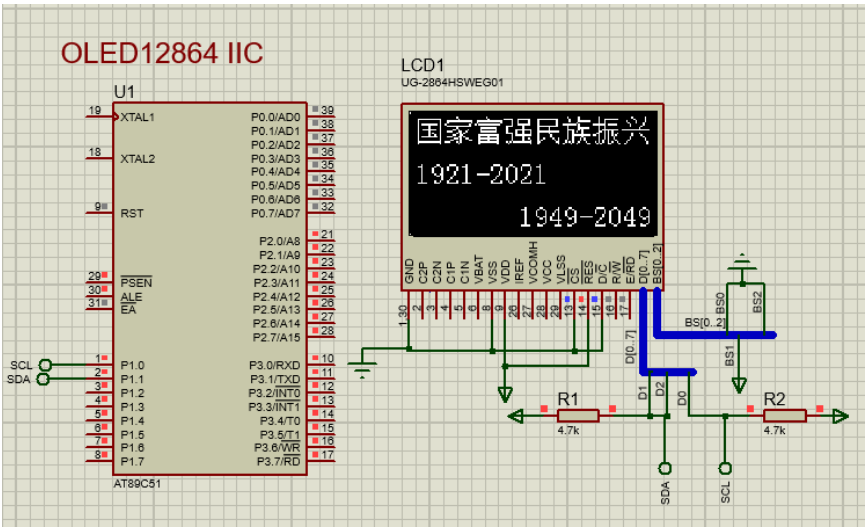

Fig. 5. Proteus simulation diagram of LCD displaying " national prosperity and national revitalization " and time

(5) Students use Proteus simulation design to realize the arrangement of light-emitting diodes in the shape of a heart, and the 8-digit digital tube displays "China 520 ", which means " China I love you". The effect is shown in Figure 6.

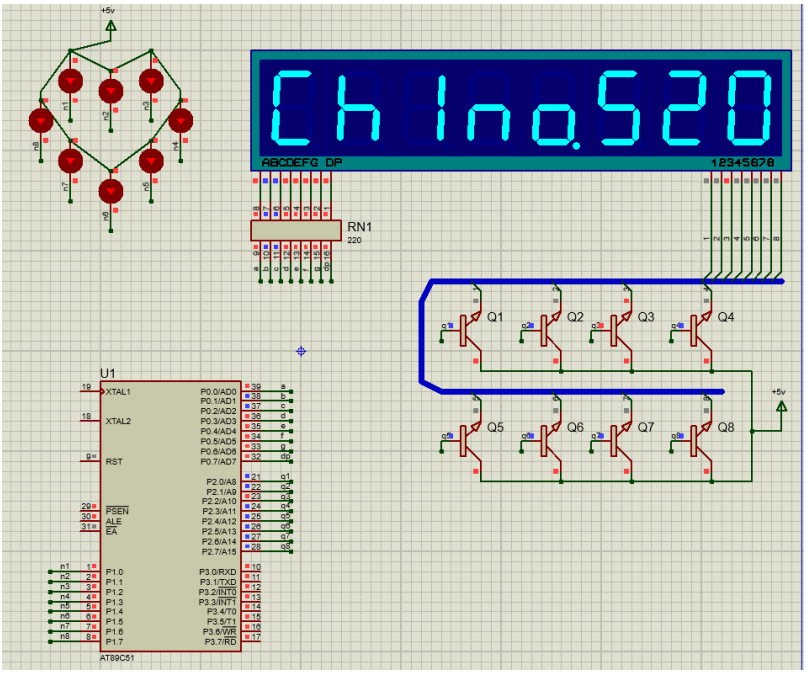

Fig. 6. Proteus simulation diagram of " China 520 " displayed on 8-bit digital tube

(6) Students use two 51 chips to realize the effect of LED shape display and 16 *16 dot matrix cycle display "Love my China" respectively. The effect is shown in Figure 7.

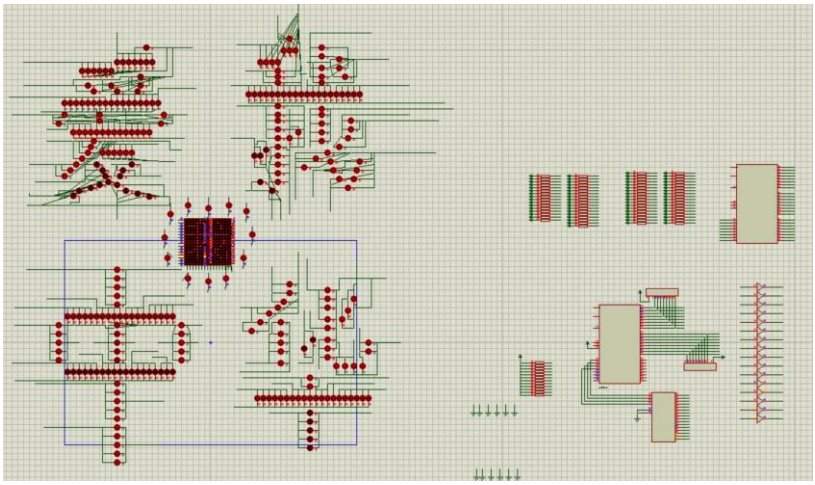

Fig. 7. 8 LED modeling display and 1 6*16 dot matrix display "Love My China" simulation picture

(7) Students use the buttons to realize 16 *16 dot matrix cycle display "one country, two systems, peaceful reunification", with control functions of pause, left and right switching, acceleration and deceleration display. The key control 16 * 16 dot array cycle shows the simulation diagram of "one country, two systems, peaceful unity" as shown in Figure 8.

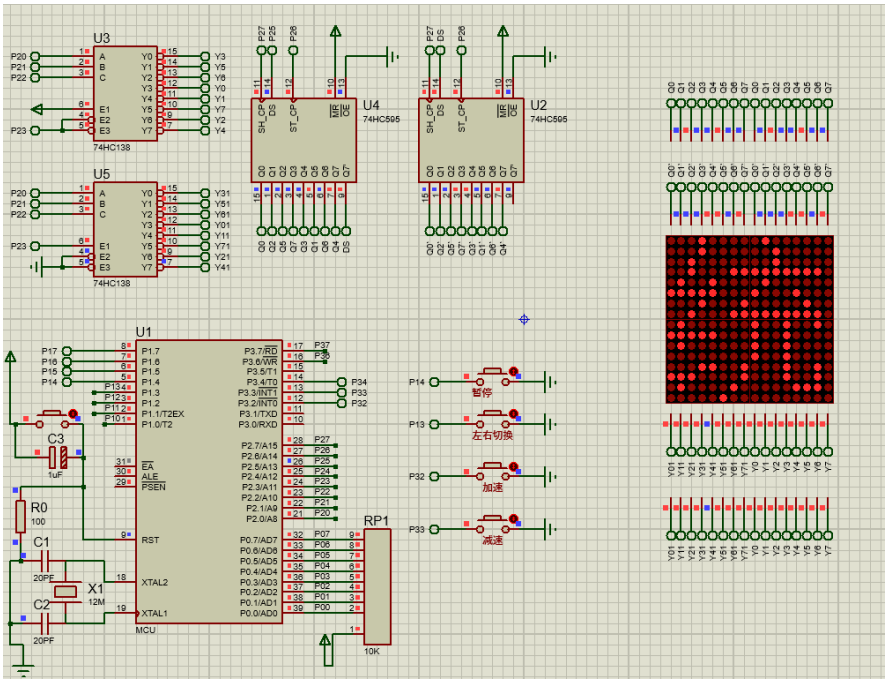

Fig. 8. key control 1 6*16 dot matrix cycle display "one country, two systems, peaceful reunification" simulation map

4 Teaching Methods of Innovative Practical Education

In order to find the implementation path of the integration of course content and ideological and political education, research and explore the teaching methods and teaching methods of the course, the teaching methods adopted in this course are as follows:

① Blended teaching method based on flipped classroom

This course adopts the mixed teaching method based on the flipped classroom. Teachers need to prepare teaching materials before class, arrange students into groups before class, issue learning task sheets, collect class exercises, and distribute learning task sheets to students.

After class, students need to arrange role tasks, division of labor and cooperation after class, conduct independent learning according to the task list issued by the teacher, watch related videos on the Internet, analyze electronic cases, and consult relevant materials on HowNet and other paper websites for supplementary learning.

In class, students are divided into groups, teachers listen to students' reports, watch students' homework results, solve doubts encountered by students in the process of learning knowledge after class, discuss and deepen the problems, and conduct deeper discussions with students Communicate, master students' learning situation through simple assessment, and at the same time strengthen the key points and difficulties that need to be mastered in the classroom. The teaching methods used in the whole teaching process include videos, Flash animations, multimedia courseware, mobile phone specifications, CNKI, professional forums, vocational education cloud platforms, etc.

② Project teaching method

This course adopts the project teaching method. Through these teaching cases, the explanation of the course is more vivid. The knowledge is no longer abstract content, but specific to common content in real life, which is easier for students to accept and absorb. At the same time, through the explanation of positive energy cases, students' professional quality can be cultivated more directly, so that students can put "morality" at the top of their lives.

5 Course Assessment Model Reform

The course started to implement online and offline hybrid teaching in September 2020. After three years of construction and implementation, the online teaching effect can obviously improve students' enthusiasm for learning. However, based on the limitation of the original assessment ratio, the process assessment is not enough, and it still cannot reflect the students' real learning effect, and it does not comprehensively consider the students' abilities in all aspects, resulting in one-sided assessment.

Therefore, a new compound assessment mode is now adopted in the teaching process to evaluate students from knowledge to ability to quality in an all-round way, to examine students' learning status in the form of process assessment, and to urge students to learn in a timely manner, which is conducive to improving learning result.

This course implements the reform of the assessment mode. The way of combining process assessment and end-of-term assessment is adopted to examine the students' learning situation. The final exam adopts the closed-book assessment method of Chaoxing Xuetong platform objective questions plus computer-based examination. The composition and proportion of comprehensive grades are shown in table 1.

Table 1. Composition and proportion of comprehensive grades

Composition of comprehensive grades				
Process assessment results (60 %)			final grade (40 %)	
item 1	item 2	item 3	item 1	item 2
attendance	Operation	Classroom performance	Superstar learning platform objective questions	computer test closed book
Accounting for 1 0%	30 %	20 %	Accounted for 1 2%	Accounted for 2 8%

The overall grade of this course is composed of 60% of the process assessment grade and 40 % of the final grade. The process assessment results are 10% for attendance, 30% for homework (online tests, course projects, experiments, etc.), and 20% for classroom performance (mainly including classroom interaction, topic discussions, chapter study times, etc.). The final exam consists of two parts. The first part is objective questions, which are completed on the Chaoxing Xuetong platform, with a total of 30 points; the second part is a total of 70 points for drawing programming questions. The test questions take into account all levels of ability, and the difficulty and quantity of the test questions are appropriate.

Judging from the student's final paper grades and students' overall evaluation results, it shows that the overall situation of the students is good, the students have a good grasp of the basic knowledge and the drawing of the hardware circuit, the students have a good grasp of the hardware working principle of the single-chip microcomputer, and have a good grasp of the drawing and single-chip software. The ability to use comprehensively is strong.

This course is a combination of practice and theory. Cases are introduced in the theoretical part, combined with case explanations, to improve students' understanding and interest in learning. This course is rich in network resources. The existing rich network resources on the Chaoxing Learning Link platform, including videos, cases, projects, exercises, homework and other materials, are conducive to students' learning and to improving students' ability and interest. Change the classroom teaching method in classroom teaching, pay attention to the student-centered, first ask questions in the classroom, guide students to think, and then guide students how to use classroom knowledge to solve problems. At the same time, establish classroom groups, focus on team learning, and strengthen the practice and explanation of basic knowledge. In the teaching process, increase the content of practice, encourage students to use more development boards, link theory with practice, focus on training students to master problem-solving methods, and improve the ability to analyze problems.

6 Effects of Innovative Practice Education

In recent years, in the competitions related to this course under the guidance of teachers of the course group, students have won 9 national competition awards, more than 40 provincial awards, and 15 municipal awards. For example, Ye Tianyu from Class 1 of 18 Telecom won the first prize in the National Finals of the 6th National Youth Science Popularization Innovation Experiment and Work Competition in 2019. Through the competition, professional knowledge, professional skills and innovative ability are integrated to cultivate students' mutual assistance and cooperation ability, stimulate students ' innovative consciousness, train innovative thinking, enhance innovative ability, and promote the improvement of training quality. In addition to training students' ability to innovate and practice, we also encourage students to organize data results into papers and publish them in relevant academic journals to further train students' scientific research ability and academic expression ability. We have learned to refer to many references [6 ~ 10]. Up to now, the author has directed students to publish 5 related papers [11

~ 15]. Through the close combination of theory and practice, it can help students consolidate classroom knowledge, improve hands-on ability, further stimulate students' desire for knowledge and innovative spirit, and achieve the goal of educating students in an all-round and whole-process ideological and political course.

In addition, relying on the exploration of ideological and political education and innovative education in this course, teachers actively participate in teaching and research discussions. In recent years, it has been approved for a number of city-level scientific research and curriculum reform projects, and has published many papers on teaching reform [16-18]. The author presided over 1 scientific research project of the Guangdong Provincial Department of Education and 1 scientific research project of Dongguan City related to single-chip microcomputers, presided over the 2021 provincial-level online and offline hybrid first-class undergraduate course "Single-chip Microcomputer Principles and Applications", Guangdong Provincial Higher Education Teaching Management Society The 2021 curriculum ideological and political construction project "Single-chip microcomputer principle and application", and the 2022 Guangdong undergraduate college teaching quality and teaching reform project 1 higher education teaching reform project. Truly achieve both teaching and learning, teachers and students make progress together.

7 Conclusion

The design of LED display controlled by single-chip microcomputer is an important content of the course of principle and application of single-chip microcomputer. The design innovation practice of LED works contains rich ideological and political elements, and is a good carrier for implementing curriculum ideological and political education and innovative education. This paper expounds in detail the ideological and political elements contained in the design and production of LEDs, and introduces how to use LEDs to carry out innovative experiments and explorations, so as to achieve the goal of cultivating students' scientific literacy and innovative spirit in an all-round way.

Through project-based online and offline hybrid teaching exploration and reform, it effectively solves the knowledge "island" problem, comprehensive application problem and innovative design problem in students' learning, and improves the development and design of complex engineering problems for students using single-chip computers. The innovative practice ability has enhanced the engineering thinking and teamwork awareness, and has the learning ability to continuously acquire knowledge and adapt to the development of science and technology. Students' satisfaction with teaching has been greatly improved. Through the questionnaire survey, the suitability of case setting, the efficiency of teamwork, the activeness of classroom participation, and the effectiveness of knowledge acquisition have all improved, and the overall satisfaction with teaching methods has also increased significantly.

About the author

Tan Hanhong, female, master, associate professor, research direction is electronic system design automation, embedded system and intelligent control.

Fund project

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