Research on the Quality Education Methods of Microcontroller Principles Course

Juan Lei*

Wuhan Donghu University, Wuhan, China
Corresponding author

Abstract: *The main form of quality education in university courses is to integrate advanced ideological theories, correct behavioral, positive spiritual pursuits, and moral guidance into the teaching of daily professional courses. In the daily teaching process, it subtly influences the thoughts and behaviors of students, helping them establish correct viewpoint, outlook on life, and opinion about value. How to integrate quality education with professional education effectively is a topic that many university teachers need to consider and try currently. Based on the author's actual teaching experience, this article takes the course of Microcontroller Principles as an example to introduce the author's quality education methods in various aspects such as teaching objectives, teaching methods, teaching content, course design, and assessment methods. And practice has proven that these methods enhance the learning effectiveness of students effectively.*

Keywords: *University courses, Quality education, Microcontroller Principles course*

1. Quality Education In University Courses

The main form of quality education in university courses is to integrate advanced ideological theories, correct behavioral, positive spiritual pursuits, and moral guidance into the teaching of daily professional courses. In the daily teaching process, it subtly influences the thoughts and behaviors of students, helping them establish correct national viewpoint, outlook on life, and opinion about value.

The significant difference between university education and primary and secondary education is that, the university teachers not only teach students necessary professional knowledge and skills, but also help them to prepare for entering society and to guide them to become ambitious and promising young people who meet the needs of the society, and to become the builders of the country ultimately.

The talents needed in modern society are the young people with both strong professional qualities and correct and positive values. The university education should also combine professional skills with moral qualities. In addition to necessary professional education, students should also be taught to use correct perspectives, moral standpoints, and positive methods to explore, discover, analyze, and solve problems. The education should be implicit in curriculum and professional education, and it should be subtle and natural[1-3].

2. Quality Education In The Course Of Microcontroller Principles

This article takes the course of Microcontroller Principles as an example.

2.1. Implementation Ideas

How to integrate quality education and professional education effectively is currently a topic that university teachers need to consider and try. The author has also been exploring and trying constantly in the teaching of the course of Microcontroller Principles.

In engineering courses, the Microcontrollers Principles course is a highly practical course. The main teaching task is to enable students to master the internal structure, working principle, programming technology, and application methods of the microcontroller chips through studying this course, provide necessary technical foundation for students to use microcontrollers in intelligent control.

The application of microcontrollers involves many external circuits, and minor circuit differences can

lead to functional differences. Specific problems require specific analysis. Based on the characteristics of the course, the author combines professional knowledge points with the basic qualities required by engineering and technical personnel in the course design, focusing on cultivating rigorous and meticulous scientific attitude of the students. The author explores the quality education points inherent in the courses taught, integrating the correct opinion about value and the cultivation of professional competence for engineering and technical personnel into classroom teaching. While cultivating students' good professional skills, it also motivating them to set lofty goals and pursue the right path. At the same time, the author attempts to combine some teaching cases with current major social concerns and major social events in the course, in order to inspire students to care for the society and the country.

For example, during the COVID-19 epidemic, we used some small intelligent medical auxiliary equipment which based on microcontroller as teaching examples to enhance students' professional identity and sense of mission. On the anniversary of the Wenchuan 512 earthquake, we used a rescue detection device based on microcontrollers as a topic for course design. This not only consolidates students' knowledge of microcontroller software and hardware design, but also exercises their professional skills, while also strengthening their sense of social responsibility.

Specifically, the author integrates the details of quality education from multiple aspects such as teaching objectives, teaching methods, teaching content, course design and assessment method, helps students to establish a positive outlook on life and society while learning professional knowledge, cultivate good professional qualities of engineering and technical personnel, and stimulate patriotic enthusiasm timely. The author integrates quality education into daily classroom teaching[4-5].

2.2. Implementation Methods

The author implements it from the following aspects.

2.2.1. Revise The Teaching Objectives of The Course

In addition to the professional knowledge and skills that were required to be mastered, understood, and recognized originally, three levels of educational goals have been added as shown in Figure 1.
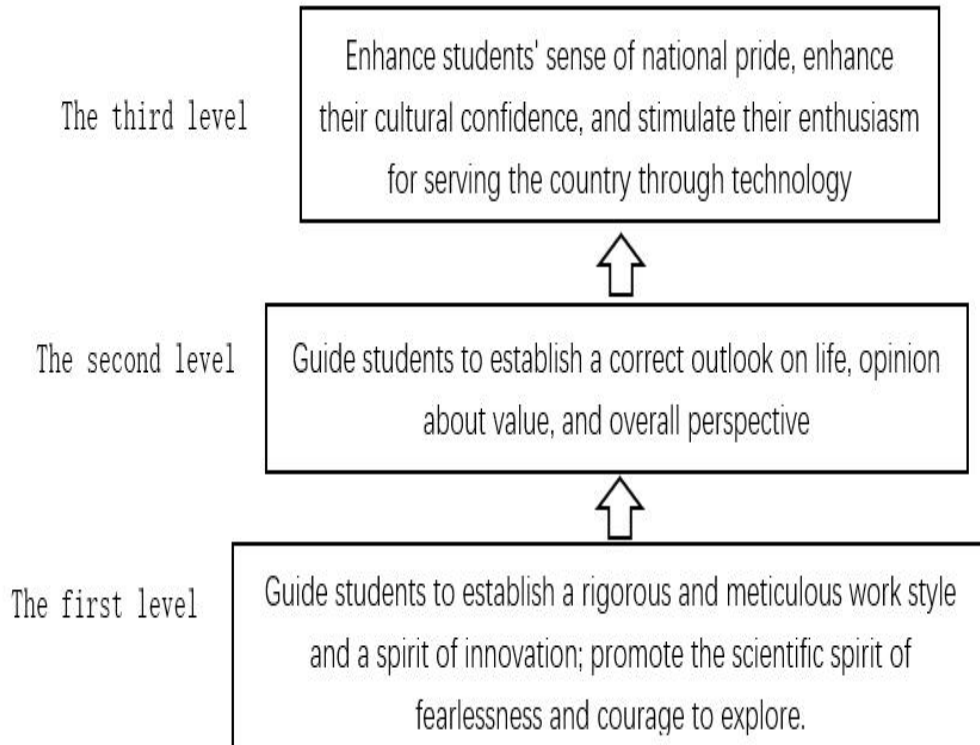

Figure 1: The teaching objectives of the course.

Firstly, starting from the characteristics of our profession, we strengthen the essential professional qualities of engineering personnel for students to ensure that they can possess the comprehensive

professional abilities required for their job positions after graduation. Then, on this basis, cultivate students to become excellent technical personnel needed by society as much as possible. Enable students to have a positive outlook on life, values, and a global perspective that meets the needs of modern society, so that they can achieve better life values. Furthermore, we will cultivate students' patriotism and national pride, so that they may become the professional and outstanding talents that the country needs.

These three levels progress layer by layer from shallow to deep.

2.2.2. Adopting Multiple Teaching Methods

For example, in the case teaching method, group collaboration exploration is used to help students establish a sense of teamwork; In the task driven approach, using progressive thinking questions helps students develop a scientific spirit of exploration, innovation, and continuous improvement, then enhance their own literacy comprehensively.

2.2.3. Reorganize The Teaching Content

Some quality elements are shown in Table 1.

Table 1: Quality element points of part of the teaching content in the course of Microcontroller Principles.

Teaching Content	Quality Element Points
The development history of microcontrollers	Guide students to pay attention to the enormous driving force of the scientific and technological on social progress, and strengthen their awareness of promoting the country through science and technology.
The current development status of domestic chips	Guide students to study hard to catch up with international advanced technology.
The power saving mode of microcontrollers	Introduce the concept of energy conservation and emission reduction, green development, and technological innovation.
Sequential circuit	Emphasize the spirit of collaboration.
Reset operation	Never forget your original intention and keep your mission in mind.
The syntax rules of the program	Strengthen awareness of rules.
Different functions of similar program statements	Cultivate a meticulous spirit.
Function set	To strengthen the importance of teamwork.
Integrated program design	Train students to focus on the big picture. Exercise students' patience.
Simplification of programs	The spirit of striving for excellence.
Program simulation	Cultivate a spirit of seeking truth, pragmatism, and continuous improvement.
Multiple design methods for keyboard circuits	Understand the diversity of things, cultivate scientific thinking and the spirit of exploration.
The internal associations of interrupt	Grasp the essence of the problem.
Interrupt priority of microcontroller	Guide students to plan their lives reasonably, distinguish priorities, and realize their life value.
Timing control of microcontroller	Extending to reasonable scheduling and improving efficiency.

Integrate quality elements into various key knowledge points.

For example, by using "interrupt priority", we can guide students to plan their lives reasonably, distinguish priorities, and realize their life value. By using "the essence of a timer is a counter", we can guide students to set aside phenomena and see the essence. By using the "reset timer" operation, we can derive a life philosophy of integrity and self-discipline.

For example, in the learning task of the microcontroller interrupt system，we design a thinking question for the monitoring device in the intensive care unit, let students to discuss in class how to apply

known professional knowledge to practice，In this way, while applying professional skills, it enhances students' sense of social responsibility.

2.2.4. Incorporating Quality Education Elements into Course Design

In course design, use teaching cases that contain elements of quality education.

Some of these cases are designed for classroom teaching, while others are used in post class practice. For example, in the learning task of the microcontroller interrupt system, a thinking question was designed for the monitoring device of the intensive care unit. In the after-school practice case of the microcontroller's timers, we simulate the countdown before rocket launch, encourage students to design the circuit of the timer and write the corresponding programs to stimulate their enthusiasm for technology.

In the classroom teaching process, each class is designed with a quality education section. The main teaching knowledge points of the course are integrated with quality education elements. In this way, knowledge transmission and quality education are carried out simultaneously[6-7].

2.2.5. Assessment Method

In terms of assessment methods, we adopt diversified evaluation methods, including quality evaluation, knowledge evaluation, and skill evaluation, and include the quality evaluation results in the final total score. In addition, we use online platforms such as Xuexitong to conduct data statistics and analysis on student learning behavior, and introduce extracurricular technology activities as bonus points for the final exam.

3. Conclusion

Comparing the final grades of students in this course over the past three years, it is found that the average score and the proportion of high scores above 85 have been increasing year by year, while the failure rate has been decreasing year by year.

We distribute survey questionnaires to students at different stages of the course, asking for their opinions on the course constantly.

The results of questionnaire surveys at different stages of the course show that students have increased their identification with the course significantly, and their learning goals are clearer. They also have a greater sense of responsibility and confidence. The introduction of quality education promotes students' learning enthusiasm effectively and enhances the teaching effectiveness of the course.

Acknowledgements

References

[1] Yigang, Z., Single-chip Microcomputer Principle and Interface Technology, Posts and Telecommunications Press, (2020), 377-378.
[2] Qun Fang. L., Kan, X., Xin, G., Single chip microcomputer and interface technology, Electronic Industry Press, (2015), 297-299.
[3] Feng, Z., Lin, L., Xiaohua, S., Exploration and Practice of the Course "Principles of Microcomputers and Applications of Microcontrollers". Education and Teaching Forum, (2033)11, 109-112
[4] Kun, W., Reform and Practice of New Classroom Teaching Models in Universities, Technology Perspective, (2018)5, 32-35
[5] Xingguo, Z., Ruting, D., Yujun, P., Exploration and Practice of the Transformation of Classroom Teaching Models in Applied Local Undergraduate Universities, Higher Education Forum, (2017)5, 53-55
[6] Linlin, D., Difficulties and Countermeasures of Online and Offline Blended Teaching Based on Online Open Courses, Education Weekly · Education Forum, (2020)8
[7] Chonghui, Z., Teaching Reform and Practice of "Digital Logic Circuit Experiment" Course. Industrial and Information Technology Education, (2023)12, 54-56