

Investigation and Analysis of the Course of Automatic Control System based on the Interest Oriented

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Abstract

As a required course for automation major, automatic control system is difficult for higher vocational students due to its strong theoretical nature and lack of initiative. In view of the above problems, this paper takes the interest orientation as the starting point, and designs a positive questionnaire for the course, mainly focusing on the types of college entrance examination students, the degree of interest in learning, the way of assessment, the time of learning the course after class, the difficulty of teaching content, the satisfaction of topic selection of design report, etc. Through the analysis of the results of the questionnaire, the data and factors of higher vocational students in the course of automatic control principle are obtained, and the design and teaching method of double main line teaching content based on interest orientation are put forward. Through the implementation of relevant teaching methods, to a certain extent, it improves the enthusiasm and initiative of students' learning, and improves the quality of classroom teaching of the course of automatic control principle.

Keywords

Automatic control system; Interest orientation; Questionnaire survey; Double main lines.

1. Introduction

As a required course for automation related majors, the course of automatic control principle has the characteristics of strong theory, higher basic requirements and generally higher learning difficulty [1]. Due to the strong theoretical nature of the course of automatic control principle, the first course involves advanced mathematics, calculus, college physics, linear algebra, etc., so the learning of the course is difficult and boring, often unable to raise students' interest in learning. The teaching of the course of the principle of automatic control is very difficult. For higher vocational colleges, it is more difficult to set up the course of the principle of automatic control [2].

Literature [3] puts forward the teaching method of automatic control principle course based on "decision-making driving". Through this teaching method, students can form correct engineering and scientific consciousness, and can give the most appropriate and efficient solutions to problems under the limitations of various real environments, Develop correct value orientation; document [4] discusses and studies the teaching reform of the course "principle of automatic control" for the application-oriented undergraduate colleges, aiming at improving students' innovation ability, carries out curriculum reform and research; document [5] applies the research object of robot composition to the teaching of the course "principle of automatic control", reflecting the characteristics of the combination of theory and practice of this course

The application of robot reduces the difficulty of theoretical teaching, and the actual teaching effect is good.

Based on the interest orientation[6,7], this paper designs a positive questionnaire for the course, which mainly focuses on the types of college entrance examination students, the degree of interest in learning, the way of assessment, the time of learning the course after class, the difficulty of teaching content, the satisfaction of topic selection of design report, etc. Through the analysis of the results of the questionnaire, the data and factors of higher vocational students in the course of automatic control principle are obtained, and the design and teaching method of double main line teaching content based on interest orientation are put forward. Through the implementation of relevant teaching methods, to a certain extent, it improves the enthusiasm and initiative of students' learning, and improves the quality of classroom teaching of the course of automatic control principle.

2. The Design of Curriculum Questionnaire

The course of automatic control system is a professional course, especially for the students of higher vocational colleges, it is difficult to learn. Therefore, in the design of the questionnaire, it is mainly aimed at the students' college entrance examination source category, learning interest, assessment method, after class learning time, teaching content difficulty, and design report topic selection satisfaction, teaching method evaluation, and not seriously attending the course.

The logical thinking chart of questionnaire design is shown in Figure 1. The whole questionnaire includes three parts: basic questions, interest questions and influencing factors. The basic questions include students' gender and the source of college entrance examination students; the interest questions include the degree of learning interest and learning time; the influencing factors include assessment method and content difficulty. Through the trinity of the questionnaire design thinking, it is concluded that there are 6 questions in this course.

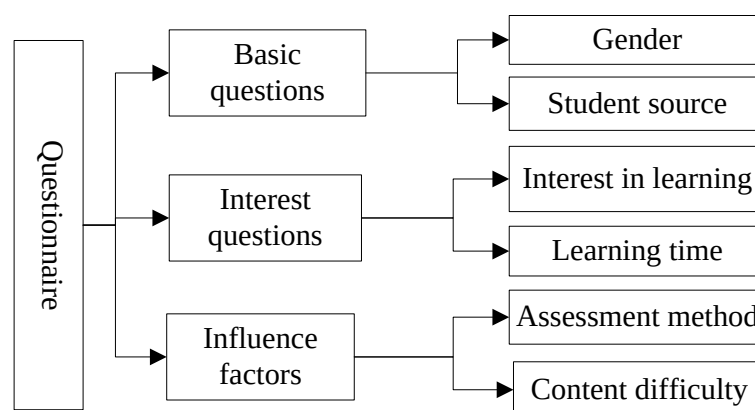


Figure 1. The logical thinking chart of questionnaire design

3. Survey Results and Analysis

3.1. Research Results and Analysis of Basic Questions

references at a time may be put in one set of brackets [3, 4]. The references are to be numbered in the order in which they are cited in the text and are to be listed at the end of the contribution under a heading References, see Figure 1.

The basic questions include the gender of students and the source of college entrance examination students. 87.95% of the students were male and 12.05% were female. The college entrance examination students mainly include three levels. According to the relevant survey results, the students of science and engineering are the main sources of students, accounting for 74.7%; the students of literature and history and art are 21.69% and 3.61% respectively, which are basically more than one quarter of the students.

According to the gender of students and the proportion of college entrance examination students, it can be seen that some students of engineering major come from arts students, which is also one of the key factors affecting students' learning of automatic control principle. Therefore, in the relevant teaching process, we should adopt the hierarchical teaching mode and teaching thinking, so that students with different foundations can complete different learning contents and tasks to meet the teaching tasks and requirements of cost courses, and truly realize individualized teaching and stratified teaching.

3.2. Research Results and Analysis of Interest Questions

Interest questions include the degree of interest in learning and learning time, which are divided into two questions for investigation. The research question of learning interest is: what is your interest in learning the content of this course? The results are shown as below. Among them, 28.92% of the students are interested in learning and willing to spend time; 66.27% are interested in learning; 3.61% are uncertain and 1.2% are not interested. It can be seen from the data that interest is the key factor that directly affects the course learning, but there are also some students who are uncertain or even have no interest, so it is necessary to improve the theoretical teaching content to improve the enthusiasm and initiative of students' learning.

As shown in Figure 2, most of the students' learning time is between 30 minutes and 60 minutes, accounting for 74.69% of the total; however, 18.07% of the students' learning time is within 10 minutes, including those who are unwilling to spend time after class. 7.23% students spent about 2 hours on average after class. Compared with the previous survey results of learning interest, 30-60 minutes is mainly used to complete the standard time of homework, which does not mean that all students in this time range are interested in learning this course, but also combined with other issues for comprehensive analysis and research.

Options	Proportion
Two Hours	7.23%
One Hour	36.14%
Half Hour	38.55%
Within 10 minutes	18.07%

Figure 2. Extracurricular study time

3.3. Research Results and Analysis of Influencing Factors

The investigation of the influencing factors mainly includes two aspects: the way of examination and the difficulty of teaching content.

The survey results of assessment methods are shown in Figure 3. The traditional closed book examination and computer examination only account for 4.82% and 1.2% respectively. It can be seen that students are still very important for the change of assessment methods. The assessment method of open book examination accounts for 32.53%, while the assessment method of application design report accounts for 61.45%, which is the assessment method most students want. It can be seen from the results that the open assessment method and process assessment method are more popular with students. The reason is that the application design report can be completed by a team of many people, which can combine the theoretical knowledge of the course with the actual life, to a certain extent, it can improve students' interest

in learning; reduce the learning pressure and psychological burden of students with relatively poor foundation.

Options	Proportion
Closed-book examination	4.82%
Open-book examination	32.53%
Application design report	61.45%
Computer test	1.2%

Figure 3. Investigation results of assessment methods

The survey results of the difficulty degree of teaching content are shown in Figure 4. 72.52% of the students think that the teaching difficulty of the automatic control principle course is appropriate and in line with the students' learning situation; 18.51% of the students think that the difficulty is too large, which is close to one quarter of the survey population; and 6.95% of the students think that the difficulty degree is too simple (should be increased). It can be seen from the results that the difficulty and ease of teaching content directly affect students' interest and enthusiasm in learning. One of the important factors to be considered in the course of automatic principle is to adopt appropriate teaching content.

Options	Proportion
Suitable for students	72.52%
Difficult	18.51%
Simple	6.95%
Others	2.02%

Figure 4. Difficulty of teaching content

4. Thinking and Analysis of Teaching Reform

Based on the above research data and analysis, learning interest, the difficulty of the course, the content of the course, the teaching method of the course are the key factors that affect students' learning of the course of automatic control principle. Therefore, in the teaching of the course of automatic control principle, we should take improving students' interest in learning as the starting point, adopt the way of process assessment, combine theory teaching with practice teaching, adopt the actual project design to improve the interest and logic of the course, and gradually improve students' interest in learning, so that students can take the initiative in learning.

In view of the above problems and results, the teaching ideas and process reform of the course of interest based automatic control principle proposed in this paper are shown in Figure 5 below, adopting the double main line teaching design ideas, and the combination of project-based teaching, case analysis and design. The whole teaching idea includes two main teaching lines and five links. The course introduction and course requirements are the guidance and introduction stages of the course. Teaching main line 1 includes: theoretical basis of curriculum, project-based teaching, project research, experimental analysis and application summary; The design teaching main line 2 includes: curriculum design basis, case analysis, topic selection and demonstration, design and production and curriculum oral defense. In the course of topic selection and demonstration, students need to select an automatic control system to design and solve a practical problem based on the basic theory they have learned and combined with their real life. In the course of oral defense, students need to make ppt report and work demonstration.

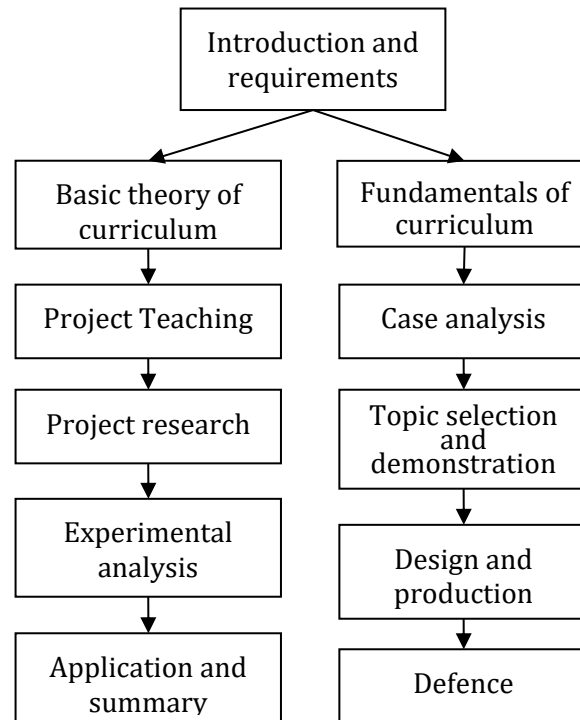


Figure 5. The teaching design ideas of double main lines

5. Result Analysis

Through the implementation of the teaching reform and design ideas of this course, guided by students' interests, the original topics are mostly some common automatic small devices and equipment, students' innovative thinking cannot be opened, and their enthusiasm and enthusiasm are not high. After the reform and guidance of this course, the innovation degree and quality of the improved topics have been greatly improved. In this paper, five teaching groups are selected for example and analysis of curriculum design topics. The comparison table of topics improvement is shown in Table 1.

Table 1. Comparison of topic selection improvement of curriculum design report

No.	Original topic	Improve topic selection
1	Automatic control curtain	Auto car auto sensing curtain
2	Demonstration model of automatic traffic lights	The design of multi intersection intelligent traffic lights
3	Automatic induction trash can	Automatic garbage bin classification based on voice control
4	Automatic induction street lamp	A new multifunctional automatic street lamp
5	Automatic blackboard eraser	Automatic blackboard wiping with watering and dust absorption function

As can be seen from table 1, the original topic 1 is "automatic control curtain", which is relatively common, with no innovation degree; the improved topic is "automatic vehicle induction curtain", on the basis of the original, the application field of automatic curtain is transplanted and innovated, and the automatic curtain is applied to the car. The original topic 2 is the demonstration model of automatic traffic lights, which is a common open-loop automatic control system. Through the teaching reform and methods of this course, the students of this group changed the original topic to "The design of multi intersection intelligent

traffic lights ". Similarly, the improvement effect of Topic 3 to topic 5 is also obvious. These design topics have strong practical application value and significance, so that students can learn with problems, to a certain extent, it stimulates students' interest in learning.

6. Conclusion

In this paper, through the investigation of three aspects of the course of automatic control principle, a targeted questionnaire is designed to investigate the types of college entrance examination students, the degree of interest in learning, the way of assessment, the time of learning this course after class, the difficulty of teaching content, etc., and the survey results are summarized and analyzed. Based on the analysis results, this paper puts forward the design of teaching content, teaching methods and teaching ideas based on interest orientation, which solves the problems of students' innovative thinking, low enthusiasm and enthusiasm for learning, improves students' interest in learning this course to a certain extent, and improves the quality of classroom teaching of automatic control principle course.

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References

- [1] Lai Qiang. Research on the teaching reform of the course "principles of automatic control" based on the training of engineering application talents [J]. Education and teaching forum, 2017 (40): 104-105.
- [2] Li Dongxia, Shi Qingyan. Exploration and practice of teaching reform of automatic control principle [J]. Journal of Wuhan University (SCIENCE EDITION), 2012 (S2): 153-156.
- [3] Sun Jian. Course teaching of automatic control principle based on "decision driven" [J]. Journal of Southwest Normal University (NATURAL SCIENCE EDITION), 2017 (4).
- [4] Ren Jin, Xu dianshuang, Li Xinxue, et al. Discussion on the teaching reform of the course "principle of automatic control" in Applied Undergraduate Colleges [J]. China electronic education, 2018, 92 (02): 31-34.
- [5] Song Haitao, Wang Xiafu, Wang Kui. The application of robot in the teaching of automatic control principle [J]. Education and teaching forum, 2019 (26): 165-166..
- [6] Wu Jiang, Liu Li, Ren Jianxing, et al. Exploration and practice of training mode of scientific research and innovation talents based on interest orientation [J]. China Electric Power Education, 2010 (36): 34-36.
- [7] Zeng Wenying. Research on teaching mode of higher vocational courses based on interest orientation [J]. Vocational education research, 2011 (01): 45-46.