Teaching Reform and Practice of Curriculum Politics in the Course of Interchangeability and Technical Measurement

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Abstract. In order to meet the needs of innovative excellent engineering talents, this paper carries out the reform and practice of curriculum politics in the course of "Interchangeability and Technical Measurement". The teaching design of "Three-combination and Four-link" is adopted to carry out online and offline blended teaching with project-based teaching method. Taking product accuracy design and detection as the main line, the selected engineering cases are divided into various teaching links in the course. At the same time, a set of ideological and political cases of engineering practice is established and the condensed ideological and political elements are integrated into the engineering cases. Process tracking and result tracking are used to investigate the effect of course implementation. The results show that the implementation of the curriculum reform has effectively stimulated students' learning motivation, enhanced students' comprehensive qualities such as teamwork spirit and overall situation consciousness, and comprehensively improved students' practical ability.

Keywords: Interchangeability and Technical Measurement · Curriculum politics · Teaching reform · Case set

1 Introduction

"Interchangeability and Technology Measurement" is a basic professional technology course for mechanical majors in colleges and universities [1–3]. The course has many terms, standards, concepts and symbols, a wide range of knowledge, and is very closely integrated with engineering practice [4, 5]. However, the class are only 32 hours. These lead most students to think that the course is boring and difficult to learn. When faced with complex engineering problems, students cannot comprehensively use the knowledge they have learned to solve problems [6, 7]. In recent years, the state has put forward "New Engineering" and "Six Excellence and One Top" plan 2.0 and so on. The course of "Interchangeability and Technical Measurement" is in urgent need of teaching reform to meet the needs of innovative excellent engineering talents training. In addition, the important positions of the country need not only people with strong professional ability, but also people with noble virtue and ability. At present, curriculum politics has become one of the important methods to build a high-level talent cultivation system [8–10]. In summary, this paper explores the reform of the course "Interchangeability and Technical Measurement".

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2 Materials and Methods

2.1 Instructional Design Theories

This course adopts the teaching design of "Three-combination and Four-link". "Three-combination" includes the integration of curriculum politics and cases, the blending of online and offline, and the combination of teaching, learning, thinking and changing. "Four-link" refer to the engineering cases design link, the ideological and political elements concise link, the teaching design link and the teaching reflection link.

2.1.1 The Engineering Cases Design Link

Based on the school's positioning, students' situation and professional personnel training requirements, the cases of garbage belt conveyor, jack-up load-shifting machine and gear hobbing machine are determined. Taking product accuracy design and detection as the main line, the engineering cases are divided into each teaching link of the course.

2.1.2 The Ideological Politic Elements Concise Link

Combining the socialist core values, the world outlook and methodology of dialectical materialism, and the traditional virtues of the Chinese nation, the ideological and political elements of the curriculum are deeply explored, and the entry points of the ideological and political elements with engineering cases and course knowledge points are identified.

2.1.3 The Teaching Design Link

Integrate curriculum politics elements into engineering cases, and establishes an ideological and political case set of engineering practice. Following the concept of new engineering, taking learners as the center, using project-based teaching method, online and offline mixed teaching is carried out.

2.1.4 The Teaching Reflection Link

Track the results of curriculum implementation in real time, then reflect on the teaching according to the feedback of the results, and form corresponding improvement measures to continuously improve the curriculum.

2.2 Implementation of Curriculum Organization

2.2.1 Let the Students Be the Master of Learning

2.2.1.1 Solve 'What' Before the Course

- Autonomous learning and testing: Send preview tasks through online software, let the students take the question to watch the national high-quality class and completes the corresponding test.

- Online discussion: Problems encountered in learning are posted on the online platform and discussed with students or teachers.

2.2.1.2 Solve the 'Why' in the Course

- Breakthrough of major and difficult points: Explain the problems of high error rate of pre-class test and high participation in discussion area.
- Engineering case discussion: Introduce engineering cases related to the knowledge points of this course and raise engineering issues. Let the students analyze the problems in groups and try to propose solutions. Then the groups evaluate each other, and the teacher reviews each group.

2.2.1.3 Solve 'How to use' After the Course

- Online: By posting assignments, tests, and thinking questions online, these can help students fill in gaps.
- Offline: Publish the precision design and test assignments related to the course content in the project, which improves the students' ability to use knowledge comprehensively.
- Expanding learning: Publish extended materials to help students understand the new progress of discipline research.

2.2.2 Track Learning Outcomes

2.2.2.1 Process Tracking

- Leave a few minutes before the end of each class, let everyone use a sentence to summarize, can be the key and difficult points, what they have learned, or questions, and so on.
- After learning each chapter, students were grouped to draw chapter mind maps to further help sort out the knowledge context.

2.2.2.2 Result Tracking

- Tracking the effect of theoretical knowledge for project design. After class, the teacher will track the students' application and mastery of knowledge
- Tracking the effect of curriculum politics. A questionnaire survey was conducted after the course.
- Tracking the discusses of curriculum politics to the final examination paper.

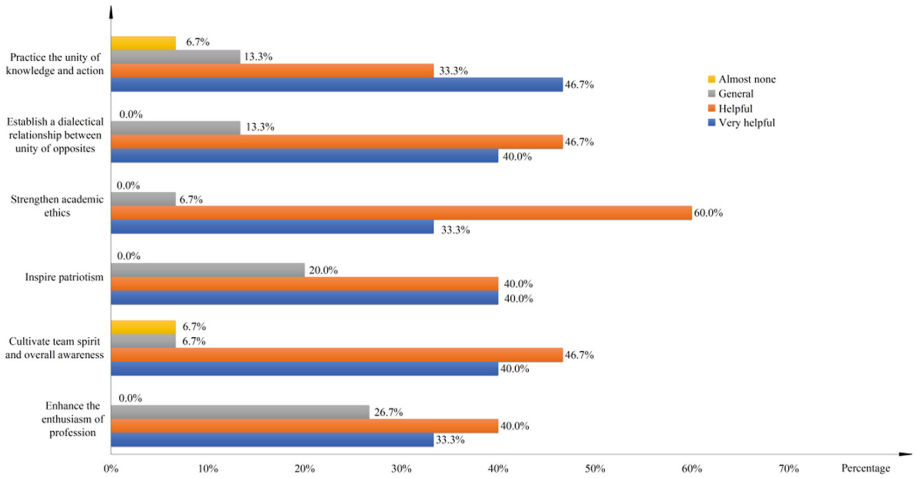

Fig. 1. The survey results of the questionnaire

2.2.3 Course Performance Evaluation Method

The results were composed of process evaluation (40%) and result evaluation (60%). The process evaluation included classroom performance (20%), precision design work (40%), test (20%) and experiment (20%). The final examination was used for the result evaluation.

3 Results and Discussion

3.1 Evaluation of Curriculum Effect

3.1.1 Results of the Questionnaire

The survey results are shown in Fig. 1. The results showed that: Most of the students found it helpful in enhancing their enthusiasm for their major, fostering team spirit and sense of the big picture, enhancing their sense of social responsibility, enhancing their academic ethics, and establishing a dialectic relationship among unity of opposites.

3.1.2 Final Grade

Figure 2 is the comparison of test scores before and after the curriculum reform. Compared with the class before the curriculum reform, the results of the classes after the curriculum reform are as follows:

- The failure rate decreased significantly; the number of people in the 60–69 score segment decreased significantly.
- Most of the 70–79, 80–89 and 90 points and above are significantly improved.
- The highest and lowest scores of the whole class are higher than those of the class before the curriculum reform, which shortens the score gap between students.
- The average scores increased by 27.3% and 11.1% respectively.

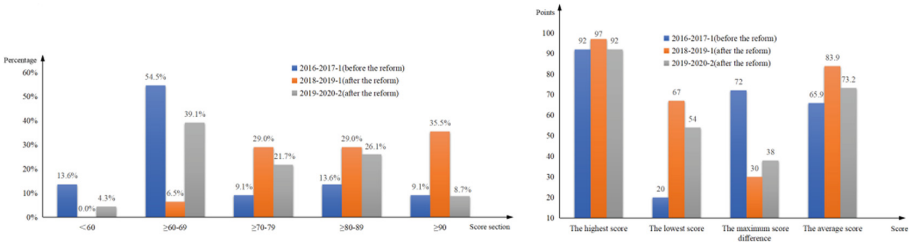

Fig. 2. Comparison of scores before and after the curriculum reform

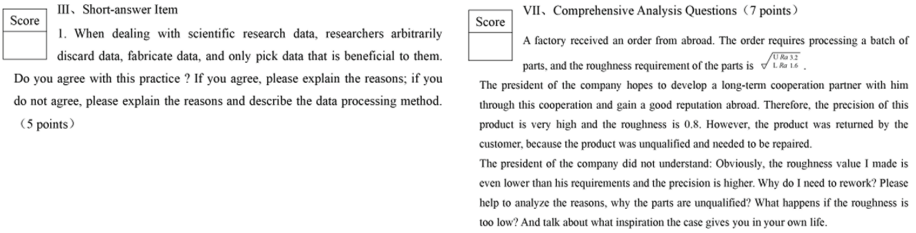

Fig. 3. Subjective questions in the final examination paper

The above results showed that: the combination of online and offline blended teaching makes up for the lack of time and space in the traditional offline classroom. The course stimulates students' learning vitality and motivation, so that each student can devote themselves to learning, and improve the learning efficiency.

3.1.3 The Answer of Subjective Questions

As shown in Fig. 3, the following two subjective questions were examined in the final examination paper. The results of the subjective questions show that the students did not approve of fabricating data, discarding data at will, and gave correct methods to deal with data. Students can dialectically analyze the harm caused by too large or too small roughness, and give their own perception from the perspective of life.

3.1.4 Evaluation of Students

Educational administration system evaluation 94.894 points (full score 95 points). Students' comments include: "The course is good at inspiring students' thinking"; "The teacher attaches great importance to the cultivation of students' innovative spirit and practical ability in teaching, and improves the level of analyzing and solving problems."

3.2 The Effect of Curriculum Reform

More than 70% of the students have participated in various competitions and research projects. More than 20 national or provincial competition awards were won. 6 national innovation and entrepreneurship training programs were won. More than 10 utility model patents have been approved. Published more than 20 academic papers.

4 Conclusions

Taking garbage belt conveyor, jack-up load-shifting machine and gear hobbing machine as examples, let students apply precision design theory to engineering practice. This improves students' ability to use knowledge comprehensively when doing graduation design and going to work. Based on the principle of combining knowledge teaching with value guidance, the project cases and the corresponding ideological and political elements are condensed to achieve the effect of "moistening things silently" in ideological and political education.

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