

Exploration of Ideological and Political Education with Material Mechanics under the New Engineering

Weibo Huang^{1,a}, Xiaoyu Zhao^{1,b,*}, Wenjia Lu¹, Jiahong Chen¹, Shuaijun Liu¹

¹College of Mechanical and Automotive Engineering, Zhaoqing University, Zhaoqing, China

^a huangweibo@zqu.edu.cn, ^b zhaoxiaoyu@zqu.edu.cn

*Corresponding author

Abstract: As a basic course for mechanical majors, "Material Mechanics" plays an important role in the whole professional education. As an innovative idea of higher education in the new period, ideological and political education plays an important role in the stage of higher education. Ideological and political education can not only cultivate humanistic quality and improve ideological consciousness of the students, but also improve political and ideological level of the teachers during the course of teaching. This paper expounds the methods of combining ideological and political education with professional teaching from the four aspects: the change of teaching concept, the change of teaching mode, the exploration of ideological and political elements and the introduction of advanced technology. From the multiple dimensions, the ideological and political elements are integrated into the assessment and evaluation system of "Material Mechanics" course, so as to check the mastery of professional knowledge and examine the results of ideological and political education for the students.

Keywords: Material Mechanics; Ideological and political elements; Combination method; Evaluation system

1. Introduction

Under the background of new engineering, the students are required to have the ability of interdisciplinary integration, innovation and solving the engineering problems on the basis of mastering the professional knowledge for the subject. "Material Mechanics" is the basic course of mechanical discipline, which has the characteristics of wide scope and difficulty. The course is the basis of the specialized courses such as mechanical principles, mechanical design, automobile theory and automobile design. "Material Mechanics" is a course that studies deformable object and provides the methods for designing component structures while ensuring safety and economy^[1].

The mechanical majors have the long history and broad background, which are of vital significance to the development of human civilization. In modern times, the strength of industry affects the fortunes of the country. Especially in the unpredictable world situation of today, the country is in urgent need of mechanical talents with solid professional theoretical knowledge, noble moral sentiment and firm political conviction. Therefore, the higher education in the new era not only pays attention to the professional education, but also pays attention to the ideological and political education. The ideological and political education is not a new course set up in addition to the specialized courses, which is the education concept of constructing the pattern of "three full education". The ideological and political education should be integrated with the theoretical courses to realize the basic task of "moral education"^[2]. On the basis of the completion for the professional theoretical teaching, every college teacher needs to explore seriously the organic integration method of ideological and political elements into the theoretical courses.

At present, many teachers have carried out research on the method of combining ideological and political elements with professional theoretical courses. The combination of ideological and political elements with "Material Mechanics" course is taken as an example. Wang et al.^[3] combined the objective of personnel cultivation and integrated the elements of business literacy into the ideological and political construction of "Materials Mechanics" course. The students were enabled to truly master the basic knowledge system of "Materials Mechanics". At the same time, It played a positive role in promoting the cultivation of correct outlook on the life and world outlook for the students. Xu et al.^[4] studied and discussed the new teaching reform direction and ideas of "Materials Mechanics" from the

three aspects of teaching content, teaching means and assessment methods. Zhu et al.^[5] explored the ideological and political elements involved in “Materials Mechanics” course from the depth and breadth levels. In the teaching design of the course, the teachers integrated the ideological and political elements of the depth level into the key and difficult links. Wei et al.^[6] combined the knowledge of “Materials Mechanics” course and deeply explored the ideological and political elements. The knowledge imparts, ability training with ideological education and value guidance were integrated to study and explore ideological and political cases and implementation methods of “Materials Mechanics”. The integrated cases were suitable for civil aviation characteristic colleges and universities.

“Material Mechanics” is a basic course for mechanical majors, which is taken as an example. This paper expounds the methods of integrating the ideological and political elements with the professional courses from the three aspects. Firstly, the significance of ideological and political education is clarified from the two aspects of teachers and students. Secondly, the combination methods of ideological and political education with professional teaching are studied from the change of teaching concept, the change of teaching mode, the exploration of ideological and political elements, and the introduction of advanced technology. Finally, the establishing method of the evaluation system from multiple dimensions is studied.

2. Significance of ideological and political education

2.1 Self-improvement of college teachers

The college teachers in the new era should not only have the higher level of professional knowledge, but also shoulder the mission to educate the talents for the Party and the country. Mechanics is the "mother of mechanical discipline". And then, “Material Mechanics” is the foundation of mechanics. The relevant “story” is told to the students from the professional point of view and “Material Mechanics” course, which is necessary ability of the teachers. The combining process of the ideological and political education with the professional education is also the improving process of teaching ability, ideological and political level, and humanistic accomplishment of the teachers. The teachers should strive to become a “big Mr.” in the new era. Most college teachers have the doctorate degree, so they have the strong abilities in their professional fields. A doctor should be the man of many talents, and his knowledge should cover the wide range. In the explored process of the ideological and political elements, the teachers can enrich their knowledge base and perfect their knowledge system.

2.2 Overall improvement of ideological quality for students

In the past, the higher education, especially the education of engineering majors, paid more attention to the education of professional knowledge, but neglected the humanities education. The reasons for this result are both subjective and objective. With the development of The Times, under the background of new engineering, the college students only master the professional knowledge on the books, which is far from meeting the demand for the talents in the society of today. The science and engineering students generally do not have the same depth and breadth of knowledge as the liberal arts students. This is due to the fact that the science and engineering students rarely read the humanities books outside of their professional courses. Therefore, some humanistic elements which are added in the teaching process of the professional courses can effectively improve the comprehensive quality of students. In the study of university, the students should not only improve their professional knowledge level, but also improve their humanistic cultivation and political consciousness. They must strive to be the “moral and talented” college students in the new era. Through the teaching process of ideological and political education, the students firm ideal and belief. They will have the spirit of “great country craftsman” through the teaching of the course.

3. Combining method of ideological and political education with professional teaching

3.1 Change of teaching concept

Most of the engineering teachers in the colleges and universities are trained by the old education system and concepts. Objectively, the humanistic education skills of most engineering teachers are biased. Subjectively, most of the engineering teachers do not pay enough attention to the ideological

and political education and think that it has nothing to do with the engineering professional education. The ideological and political education is for the whole higher education, not just for the certain major or the certain school. The party and nation attach great importance to the ideological and political education of the colleges and universities, and the leaders of the party and nation have also made the important instructions on the ideological and political education^[7-8]. Therefore, the majority of engineering teachers should fundamentally change their thoughts and raise the ideological and political education to the same level as the professional education. It is the so-called “educate people first educate yourself” and “profound knowledge is the teacher, good behavior is the model”. The teachers of the colleges should change the teaching concepts and make great efforts to improve own humanistic quality and political consciousness, so as to truly achieve moral education.

3.2 Change of teaching mode

The traditional teaching mode mainly focuses on the classroom teaching. But this teaching mode can no longer meet the requirements of professional education under the new engineering background. The students should not only be able to complete the course learning with quality and quantity by the guidance of the teachers, but also be able to exert their own subjective initiative to preview and review the professional knowledge by using online and offline resources under the background of the new era. Therefore, the teaching of “Material Mechanics” under the background of new engineering should integrate the teaching of the teachers with the independent learning of the students. At the same time, the online teaching is integrated with offline teaching. The teaching model of the flipped classroom should be made efforts to explore. The decision of learning should be controlled by the students^[9]. The students are encouraged and guided to use the library and online teaching resources to complete the study of the relevant chapters independently before the class. While in the class, the students have more time to contact with the more cutting-edge knowledge and learn to solve the practical problems. The theoretical knowledge is consolidated through the practice. The whole reform roadmap of teaching mode is shown in Fig. 1.

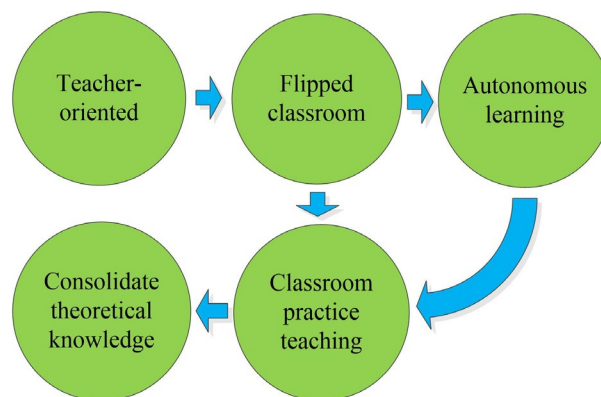


Fig. 1 Teaching mode reform roadmap

3.3 Exploration of ideological and political elements

In addition to the professional knowledge education, the teachers should also pay attention to the education of humanistic quality and political consciousness for the students. As the typical basic course of engineering specialty, “Material Mechanics” has the characteristics of great difficulty, strong professionalism and wide involvement. Based on the professional background and course content, the teachers deeply explore ideological and political elements. The teachers teach the professional knowledge and improve the humanistic accomplishment of the students. We must not apply the ideological and political education into preaching.

Section 2 calculation of external couple moments, torque and torque diagram of Chapter III torsion in “Material Mechanics” is taken as the example. While teaching the necessary course knowledge, torque is used as a starting point to trigger the association of the students. In our professional context, torque is the main parameter of what equipment? As the mechanical major, especially the student of vehicle engineering, it is necessary to know that torque is an important indicator of the automobile. We can generally believe that the greater the torque, the better the acceleration performance of the automobile. When it comes to automobile, we must mention the development process of Chinese automobile industry from scratch and endured. The automobile industry embodies the level of

industrial manufacturing for the country. Even so far, a few countries such as the United States, Germany, France, Italy, Japan, South Korea, India and other European or Asian industrial powers have the ability to manufacture the complete vehicle. In 1953, we had our own first automobile factory, “Changchun First Automobile Factory”! In 1956, we manufactured the first “Jiefang” truck, which ended the history of our country not being able to manufacture automobile on own. Now, we have many automobile brands, which is something that each of us should be proud of. It is true that our new energy automobile has achieved the good results, but we still lag behind the international advanced level in the three major parts of the engine, gearbox and chassis. It requires our generation of car practitioners to inherit and carry forward the spirit of the older generation of car practitioners who are not afraid of difficulties and brave to challenge. To sum up, the exploring methods and ideas of ideological and political elements are shown in Fig. 2.

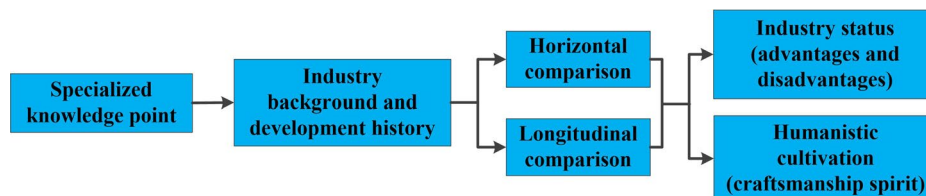


Fig. 2 Exploring methods and ideas of ideological and political elements

3.4 Introduction of advanced technology

Mobile phone has become the necessary equipment for every student. The good use of mobile phone has become a trend in the current teaching reform. “Rain Classroom” is a new type of online teaching tool, which can make full use of PowerPoint and wechat. It can embed the complex information technology, so that the students can access the learning materials during the whole day^[10-11]. Through “Rain Classroom”, the teachers can assign the preview tasks before the class. The learning activities such as signing in, learning teaching courseware and submission of classroom exercises during the class can be done by “Rain Classroom”. The homework after the class can be assigned by “Rain Classroom”. The students can also review what they have learned anytime and anywhere by “Rain Classroom”.

The exploration and integration of the ideological and political elements can also make full use of the advantages for “Rain Classroom”. The teachers can assign the ideological and political requirements before the class. The subjective initiative of the college students is fully stimulated to independently explore the ideological and political elements which are listed in Fig. 3. In the course of teaching, the teachers can supplement and expand the ideological and political elements excavated by the students independently. After the class, the students can talk about their feelings and thoughts on the ideological and political elements through “Rain Classroom”.

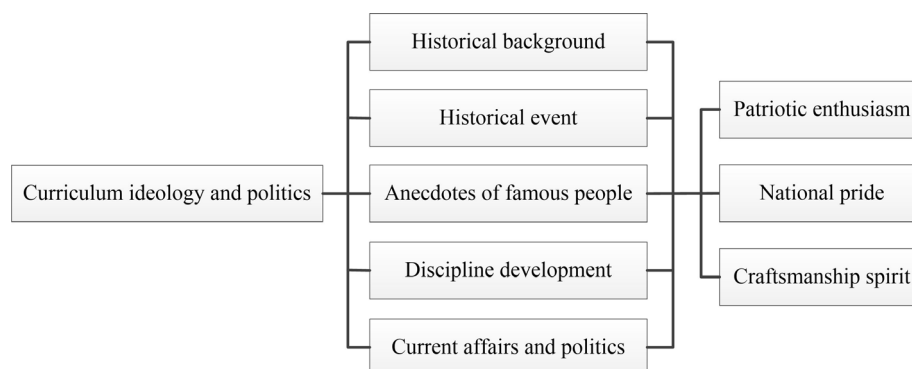


Fig. 3 Ideological and political contents

4. Establishment of assessment system

The purpose of adding ideological and political elements to the course of “Material Mechanics” is to improve moral level and cultivate artisan spirit of the students while learning the professional knowledge. Therefore, the traditional assessment method of the course, that is, simply examining the mastery of the professional knowledge, which does not meet the new requirements. The new evaluation

system should be established considering the coupling of learning process and test result. The assessment of the learning process should include both online and offline parts. The online assessment should include preview, self-exploration of ideological and political elements and online testing of the students. The offline assessment includes class attendance, class performance, homework completion and final exam scores. The final exam paper should also properly consider the ideological and political elements of the course, no longer simply examine the mastery of the professional knowledge. The ideological and political elements are integrated into the assessment and evaluation system of “Material Mechanics” course from multiple dimensions, so as to check the mastery of the professional knowledge for the students and examine the results of ideological and political education.

5. Conclusion

Combined with the professional background of mechanical major, this paper takes “Material Mechanics” course as an example to elaborate the method of combining the ideological and political elements with the specialized courses. The main conclusions of this paper are as follows:

Curriculum ideology and politics can not only cultivate humanistic quality and improve ideological consciousness of the students, but also improve political and ideological level of the teachers in the course of teaching.

The combination method of ideological and political education with the professional teaching is explained from four aspects: the change of teaching concept, the change of teaching mode, the exploration of ideological and political elements, and the introduction of advanced technology.

The ideological and political elements are integrated into the assessment and evaluation system of “Material Mechanics” from multiple dimensions, so as to check the mastery of the professional knowledge and the results of ideological and political education for the students.

Acknowledgement

We would like to express our appreciation to Quality engineering and teaching reform project of Zhaoqing University (zlgc2024067), the key topic of the university-level research fund project of Zhaoqing University in 2024 (ZD202410) and Zhaoqing University university-level research fund project (QN202334).

References

- [1] Zhang X C, Wang J Z, Li N, et al. *Exploration and practice of ideological and political teaching reform in mechanical engineering major curriculum: Taking material mechanics teaching as an example*[J]. *University Education*, 2022, 11: 55-57.
- [2] Wang X, Zhang Y, Qiu F, et al. *Preliminary study on the ideological and political education of material mechanics experiment under the background of new engineering*[J]. *Journal of Southwest Jiaotong University (Social Sciences)*, 2023, 24: 186-188.
- [3] Wang H W, Ji H W, Wang D A, et al. *Curriculum ideological and political construction of "Material Mechanics" focusing on business literacy*[J]. *Journal of Southwest Jiaotong University (Social Sciences)*, 2023, 24: 232-236.
- [4] Xu T, Huang J B, Ran J Q, et al. *Teaching reform and innovation of "Material Mechanics" course combining theory and practice*[J]. , 2023, 7: 120-122.
- [5] Zhu X W, Li M Y, Chen J Q, et al. *Excavation and teaching design of ideological and political elements in material mechanics*[J]. *The Guide of Science & Education*, 2022, 22: 119-121.
- [6] Wei G, Song S P, Hu J Q, et al. *Ideological and political research and element exploration of material mechanics course*[J]. *The Guide of Science & Education*, 2022, 9: 125-127.
- [7] Li J, Zhi M J, Qiu Y Y. *Construction of evaluation feedback system of ideological and political education: Taking experimental course of mechanics of materials as an example*[J]. *Journal of Southwest Jiaotong University (Social Sciences)*, 2023, 24: 254-258.
- [8] Zhang H Y. *Research on the path of strengthening college ideological and political work in the new era*[J]. *The Science Education Article Collects*, 2018, (33): 8-9, 12.
- [9] Cui H, Liu Z B, Yue W X. *Exploration of flipped classroom teaching mode in Theoretical Mechanics*[J]. *Journal of Jiamusi Vocational Institute*, 2024, 02: 192-194.
- [10] Chen C B, He J F, Wang T, et al. *Application of BOPPPS teaching model in Organic Chemistry*

based on rain-classroom[J]. Education of Chinese Medicine, 2022, 41(1): 77-80.
[11] Li Z H, Zhao L T. *Research on electrical engineering and electrical equipment teaching based on "BOPPPS+Rain classroom" teaching mode[J]. Chinese modern educational equipment, 2022, 17: 65-68.*