Advances in Educational Technology and Psychology (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/aetp.2024.080613
ISSN 2371-9400 Vol. 8 Num. 6

Exploration and Analysis of Ideological and Political Education in Advanced Mechanism Theory

Qian Li[1,a,*], Yongliang Zhang[1,b], Qin Dong[1,c]

[1]*School of Mechanical Engineering, University of Shanghai for Science and Technology, Jungong Road 516, Shanghai, China*
[a]*meql@usst.edu.cn*, [b]*yongliangz7377@163.com*, [c]*dongqin@usst.edu.cn*
[*]*Corresponding author*

Keywords: Advanced Mechanism Theory, Ideological and Political Education, Case Analysis and Teaching Reform

Abstract: This paper focuses on the important topic of integrating ideological and political education into the graduate course advanced mechanism theory. First, it discusses its importance in depth and emphasizes that in graduate education, ideological and political education can not only improve students' ideological and moral quality, but also have a far-reaching impact on their professional study and future development. Then, through the detailed analysis of many ideological and political cases in the course, it discuses how to integrate ideological and political elements into teaching content, teaching methods and specific ways of teaching evaluation. In terms of teaching content, it strives to combine scientific spirit and innovative consciousness with professional knowledge. In teaching methods, diversified means to realize the effective penetration of ideological and political education is explored. In teaching evaluation, a comprehensive system including knowledge mastery and ideological and political performance is established. It aims to cultivate students' scientific spirit, innovative consciousness, professional ethics and social responsibility, and finally realize the organic unity of knowledge dissemination and value guidance, and provide new ideas and methods for the improvement of graduate education quality.

1. Introduction

The ideological and political education of the course undoubtedly plays a vital role in the growth, development and shaping the quality of students[1-2]. In the process of students' growth, the correct values, outlook on life and world outlook are like a lighthouse, guiding their way forward. Ideological and political education, through systematic theoretical teaching and rich practical guidance, helps students distinguish right from wrong, good and evil, beauty and ugliness, so that let them know what is the real value pursuit[3]. In this diversified society, students are faced with all kinds of temptations and challenges. Ideological and political education can give them firm faith and correct judgment standards, so that they can keep a clear mind in the complex environment, and constantly improve their comprehensive quality[4]. At the same time, ideological and political education can effectively improve students' sense of social responsibility and mission. When

students deeply realize their responsibilities as a member of the society, they will cherish the opportunity to learn more, and strive to improve their ability, so as to better contribute to the society. Through ideological and political education, students can understand the needs and expectations of the society, and understand their role and role in promoting social progress and solving social problems. This sense of responsibility and mission will inspire them to do their best in their study and future work. In addition, ideological and political education also plays an important role in promoting the deep integration of knowledge and value[5]. In today's era, pure professional knowledge is no longer able to meet the comprehensive requirements of the society for talents. Students not only need to master solid professional skills, but also need to have noble moral quality and humanistic quality. Ideological and political education can combine moral norms and humanistic spirit with professional knowledge, so that students can cultivate good moral character and social responsibility while learning professional knowledge[6]. For example, in the study of mechanical engineering major, students should not only master advanced mechanical theories and technologies, but also take into account engineering ethics, environmental protection and other factors, so as to achieve the organic unity of technology and morality. With the continuous improvement of the requirements of higher education talent training in the new era, the ideological and political course has become an important direction of college teaching reform. As an important basic course for graduate students of mechanical engineering, advanced mechanical theory shoulders a great educational mission. On the one hand, it should impart professional knowledge and skills to students, and lay a solid foundation for students' academic research and future career development. On the other hand, it should pay more attention to the cultivation of students' ideological and political quality and comprehensive quality, so that students can become both professional ability and noble moral character. This paper will closely combine the characteristics of mechanism theory and analyze the ideological and political cases in the course. Through the study of these cases, we can dig out the ideological and political education elements contained in them, such as innovative spirit, teamwork, social responsibility and so on. In the teaching process, teachers can use a variety of teaching methods to organically integrate these ideological and political education elements into the course teaching. For example, students can be guided to think about ethical problems and social responsibilities in mechanical engineering through case analysis, group discussion and practical teaching, so as to cultivate students' innovative consciousness and team spirit. At the same time, teachers can also introduce the outstanding figures and advanced deeds in the field of mechanical engineering in China according to the course content, stimulate the students' patriotic feelings and national pride, and enhance their determination to contribute to the progress of national science and technology. This will help achieve the goal of organic unity of knowledge transmission and value guidance, and cultivate high-quality mechanical engineering professionals.

2. Importance of Ideological and Political Education in Advanced Mechanism Theory Course

2.1. Need for Cultivating High-quality Engineering Talents

The postgraduate students majored in mechanical engineering will become future engineers and technical personnel. They need to have not only solid professional knowledge and skills, but also good ideological and political quality, professional ethics and social responsibility. The integration of ideological and political education into the postgraduate curriculum can help students establish a correct outlook on world, life and values, cultivate students' innovative spirit, team spirit and engineering ethics awareness, and improve students' comprehensive quality and competitiveness.

2.2. Guidance of Organic Unity of Knowledge Transmission and Value

This course has strong theoretical and practicality. By integrating ideological and political elements into the course teaching, students can receive ideological and political education while learning professional knowledge. As a result, the objective of organic unity of knowledge transmission and value guidance can be realized. For example, when explaining the principles of kinematics and dynamics of the machine, students can be guided to think about the development of science and technology in promoting social progress, and cultivate students 'scientific spirit and innovation consciousness. When introducing the design and optimization methods of the mechanics, engineering ethics and social responsibility can be emphasized to cultivate students' professional ethics and social responsibility.

3. Feasibility of Ideological and Political Education in Advanced Mechanism Theory Course

3.1. Practical Contents Offering Rich Ideological and Political Elements

The course covers the knowledge of the structure, movement, power and other aspects of the mechanism, involving mechanical design, manufacturing, automation and other fields. In the course content, many elements related to ideological and political education can be dug out, such as scientific spirit, innovative consciousness, professional ethics, social responsibility and so on. For example, when explaining the development process of the mechanics, we can introduce the brilliant achievements of ancient mechanical inventions, stimulate students' national pride and patriotism.When analyzing the failure cases of the mechanics, we can guide students to think about engineering ethics and social responsibility, and cultivate students' professional ethics and social responsibility. When describing mechanical transmission and mechanism optimization, the design concept of environmental protection and energy saving can be introduced to discuss how to design more efficient mechanisms to reduce energy consumption and environmental pollution. At the same time, it can also explore how to ensure the safety of the organization, avoid the potential harm to the operator or the surrounding environment, so as to cultivate students' awareness of engineering ethics.

3.2. Diverse Teaching Methods Paving Effective Ways for Elements Integration

The teaching methods of mechanical learning courses include classroom teaching, experimental teaching, course design, interactive question and answer and other forms. In the teaching process, ideological and political elements can be integrated into the course teaching through a variety of teaching methods to improve the effectiveness of ideological and political education. For example, in classroom teaching, case teaching, problem-oriented teaching and other methods can be used to guide students to think about the advantages and disadvantages of contemporary mechanical inventions. In the experimental teaching, students are required to strictly abide by the experimental operation process, carefully record the experimental data, cultivate students' rigorous and realistic scientific spirit, and at the same time can cultivate students' team spirit and innovative consciousness. In the curriculum design, engineering ethics and social responsibility can be emphasized to cultivate students' professional ethics and social responsibility. In the interactive question and answer, a series of progressive and interrelated problem chains are designed around the core knowledge points of the mechanical learning course. These questions should not only investigate students 'professional knowledge, but also guide them to think about the ideological and political issues behind them, so as to cultivate students' logical thinking ability. In addition, teachers educate students through their own project experience, and cultivate students' strict and punctual

professional dedication and rigorous academic attitude.

4. Ideological and Political Cases in Advanced Mechanism Theory Course

Case 1: Dynamic static analysis of the plane mechanism

Teaching content: Dynamic static analysis of plane mechanism is an important part of organization learning. By analyzing the force situation in the process of movement, the internal force, external force and balance force of each component can be determined, which can provide a basis for the design and performance evaluation of the plane mechanism.

Ideological and political elements mining: (1) Patriotism education elements: in the introduction of the dynamic static analysis method of the plane mechanism, we can introduce China's major achievements in the field of mechanical manufacturing, such as the transmission mechanism of high-speed rail, the lifting mechanism of large cranes, etc. These achievements demonstrate China's strong strength in the field of mechanical engineering, and have made great contributions to the country's infrastructure construction and economic development. By introducing these achievements, students can stimulate their patriotism and enhance their national pride and confidence. (2) Elements of innovative spirit education: the dynamic static analysis of plane mechanics requires the comprehensive use of multidisciplinary knowledge such as mechanics and mathematics. When explaining the analysis methods, students can be guided to use innovative thinking and explore new calculation methods and techniques. At the same time, we can introduce some innovative design cases of plane mechanics, such as new energy-saving transmission mechanism, adaptive balance mechanism, etc., so that students can understand the methods and ideas of innovation, and cultivate students' innovation ability. (3) Elements of teamwork spirit education: the design and analysis of graphic mechanics often require the cooperation of personnel from multiple professional fields. In the teaching process, students can be organized to conduct group project design, case discussion and other activities to cultivate students' sense of teamwork and collaboration ability. At the same time, we can introduce some teamwork cases in major engineering projects, such as the construction of the Hong Kong-Zhuhai-Macao Bridge (China) and the research and development of domestic large aircraft, so that students can deeply understand the importance of teamwork.

Teaching implementation process: (1) In classroom teaching, teachers can display China's great achievements in the field of mechanical manufacturing and innovative design cases through multimedia, so as to stimulate students' interest in learning and patriotism. At the same time, teachers can guide students to use innovative thinking to explore the dynamic static analysis method of the plane mechanism. When explaining the analysis method, combined with the actual cases, let the students better understand and master. (2) In experimental teaching, teachers can divide students into groups to complete the experimental task of dynamic static analysis of plane mechanism. In the beginning of the experiment, teachers can operate the experimental device and emphasize the important aspects during the process, so that students can understand the process comprehensively and avoid many mistakes. When the experiment is carried out, teachers give guidance and suggestions to solve the practical problems. After the experiment, students can be organized to summarize and exchange the experimental experience.

Case 2: The motion analysis of the space mechanism

The motion analysis of teaching content space organization is one of the difficult contents in mechanical learning. By analyzing the position, speed and acceleration of space mechanism, students can understand the movement law of space mechanism and this provide the basis for the design and optimization of space mechanism.

Ideological and political elements mining: (1) Patriotism education elements: When introducing

the motion analysis method of space mechanisms, China's mechanical design achievements in the field of aerospace can be introduced, such as satellite antenna deployment mechanism, space station manipulator, etc. These achievements not only reflect China's technical strength in the field of aerospace, but also make important contributions to China's modernization drive. By introducing these achievements, students can stimulate their patriotism and enhance their national pride and confidence. (2) Elements of innovative spirit education: The movement analysis method of space organization is relatively complex, which needs to be applied to mathematics, mechanics and other multidisciplinary knowledge. When explaining the motion analysis method of space mechanism, students can be guided to use innovative thinking and explore new analysis methods and techniques. At the same time, some innovative design cases of space mechanisms can be introduced, such as new space robot machine, reconfigurable space machines, etc., so that students can understand the innovation methods and ideas of space machines, and cultivate students' innovation ability.(3) Elements of teamwork spirit education: The design and analysis of space mechanisms often requires the cooperation of professionals from multiple disciplines. In the teaching process, students can be organized to conduct group discussions, project design and other activities to cultivate students' teamwork consciousness and teamwork ability. At the same time, we can introduce some team cooperation cases in major engineering projects, such as China's manned space project, Chang' e project, etc., so that students can deeply understand the importance of teamwork.

Teaching Implementation Process: (1) In classroom teaching, teachers can show China's achievements in the field of aerospace in mechanical design and innovative design cases of space mechanisms through multimedia teaching means, so as to stimulate students' interest in learning and patriotism. At the same time, teachers can guide students to use innovative thinking to explore the motion analysis method of space mechanisms. When explaining the motion analysis method of space mechanism, teachers can combine the actual cases, so that students can better understand and master the analysis method. (2) In experimental teaching, teachers can divide students into groups to complete the experimental task of motion analysis in space mechanisms together. Before the experiment, the teacher can introduce the experimental purpose, experimental principles and experimental steps to the students, so that the students can have a comprehensive understanding of the experiment. In the process of the experiment, teachers can patrol and guide students to solve the problems encountered by students in time. After the experiment, the teacher can organize the students to summarize and exchange the experiment, so that the students can share the experimental experience and experience.

Case 3: Mechanical innovation design

Teaching content: Mechanical innovation design is one of the important contents of mechanical learning. Through innovative mechanical design, mechanics with novel structure and function can be designed to meet the needs of different fields.

Ideological and political elements mining: (1) Patriotism education elements: When introducing the innovative design methods of mechanics, the innovative achievements of Chinese scientists in the field of mechanical science can be introduced, such as new robot mechanisms, deformable machine, etc. These achievements not only reflect China's innovation ability in the field of mechanical science, but also make important contributions to China's modernization drive. By introducing these results, we can stimulate students' patriotism and enhance their national pride and self-confidence. (2) Elements of innovative spirit education: Mechanical innovation design requires students to have innovative consciousness and innovative ability. In the teaching process, students can be organized to participate in mechanical innovation design competition, scientific and technological innovation activities to cultivate students' innovation ability. At the same time, we can introduce some successful cases of mechanical innovation and design in the past, so that students can understand the methods and ideas of mechanical innovation, and stimulate students' enthusiasm

for innovation. (3) Team spirit education element: mechanical innovation design often requires the cooperation of professionals from multiple disciplines. In the teaching process, students can be organized to conduct group discussions, project design and other activities to cultivate students' teamwork consciousness and teamwork ability. At the same time, we can introduce some teamwork cases in major engineering projects, so that students can deeply understand the importance of teamwork.

Teaching Implementation Process: (1) In classroom teaching, teachers can display the innovative achievements of Chinese scientists in the field of mechanical learning and the successful cases of mechanical innovation design through multimedia teaching means, so as to stimulate students' interest in learning and patriotism. At the same time, teachers can explain the methods and ideas of mechanical innovative design, and guide students to use innovative thinking in mechanical design. In the process of explanation, teachers can combine practical cases to let students better understand and master the design methods.(2) In practical teaching, teachers can organize students to participate in mechanical innovation design competition, scientific and technological innovation activities, etc., so that students can exercise their innovation ability and teamwork ability in practice. At the same time, teachers can arrange some mechanical innovative design projects, so that students can form a team to complete the design task together. In the process of project implementation, teachers can give students guidance and help to solve the problems encountered by students in time.

Case 4: Design and analysis of the cam mechanism

Teaching content: The design and analysis of cam mechanism is one of the key contents of cam science. Through the design of the contour curve and the analysis of the motion rule, the specific motion output can be realized, which is widely used in various mechanical devices.

Ideological and political elements mining: (1) Patriotism education elements: when introducing the design and analysis method of cam mechanism, China's achievements in the field of automatic equipment manufacturing can be introduced, such as the cam drive system of high-precision CNC machine tool, the cam drive mechanism of automatic production line, etc. These achievements reflect China's technological progress in the field of advanced manufacturing, and have made important contributions to the country's industrial modernization. By introducing these achievements, students can stimulate their patriotism and enhance their national pride and confidence. (2) Educational elements of innovative spirit: the design and analysis of CAM mechanics requires innovative thinking and practical ability. When explaining the design method, students can be guided to explore the new cam contour curve design method and motion law. At the same time, some innovative cam mechanism design cases can be introduced, such as flexible cam mechanism, intelligent cam control system, etc., so that students can understand the innovative ideas and methods, and cultivate students' innovative ability. (3) Team spirit education elements: the design and application of cam mechanics often require the cooperation of personnel in multiple professional fields such as mechanical design and control engineering. In the teaching process, students can be organized to conduct team project design, problem discussion and other activities to cultivate students' sense of teamwork and collaboration ability. At the same time, we can introduce some teamwork cases in major engineering projects, such as the research and development of intelligent manufacturing system and the manufacturing of high-end equipment, so that students can deeply understand the importance of teamwork.

Teaching implementation process: (1)In classroom teaching, teachers can display China's achievements in the field of automation equipment manufacturing and innovative cam mechanism design cases through multimedia, so as to stimulate students' interest in learning and patriotism. At the same time, teachers can guide students to use innovative thinking to explore the design and analysis methods of cam mechanism. When explaining the design method, combined with practical application cases, so that students can better understand and master. (2) In experimental teaching,

teachers can divide students into groups to complete the design and analysis of cam mechanism together. Before the experiment, teachers introduce the purpose, principle and steps of the experiment, so that students can have a comprehensive understanding of the experiment. In the course of the experiment, teachers patrol and give guidance to solve the problems that students encounter in time. After the experiment, students were organized to summarize and exchange the experiment and share the experimental experience and experience.

Therefore, the contents and course of ideological and political cases can be related closely in this course. By constructing the integration of teaching content, ideological and political elements and teaching implementation, students can learn knowledge from the process of being willing to participate in the curriculum. Teachers can better obtain the students' emotional value, so as to understand the degree of the students' understanding of the course.

5. The Implementation Effect of Ideological and Political Education of Advanced Mechanism Theory Course

5.1. Improve Students' Interest and Enthusiasm in Learning

On the one hand, ideological and political education can introduce practical cases and historical stories to make students more intuitively understand the application and importance of mechanical learning in real life. For example, telling the key role of some classical mechanical structures in industrial production, transportation and other fields, making students realize that mechanism is not just an abstract theory, but closely related to our daily life. These vivid cases can not only stimulate students' interest in learning, but also help them to better understand and master their professional knowledge. On the other hand, ideological and political courses can also guide students from the level of values, so that they can realize that the significance of learning mechanisms is not only to acquire knowledge and skills, but also to contribute to the development and progress of the society. By telling the deeds of some excellent engineers, such as their perseverance and innovative spirit in the face of difficulties and challenges, students are encouraged to set up lofty ideals and goals, and stimulate their motivation to learn. When students' interest in learning is stimulated, their enthusiasm for learning will also improve. In class, students no longer passively accept knowledge, but actively participate in the teaching process. They will actively think about questions, ask questions, and interact with teachers and classmates.

5.2. Cultivate Students' Patriotism Spirit and Innovative Spirit

By introducing the development process of the field of mechanical science in China, students can understand the outstanding achievements in machinery manufacturing in ancient China. By understanding the history and the deeds of the people, the students' patriotic feelings are inspired. They are proud and proud of their home country, as they also enhance their national pride and confidence. This patriotism will inspire them to work harder to learn professional knowledge and contribute to the prosperity of the motherland. Teachers put forward some challenging design topics, such as the design of a new type of robot mechanism, the development of an efficient mechanical transmission system. Teachers can guide students to carry out innovative thinking training by way of brainstorming method, reverse thinking method, etc. Through these methods, students can break the traditional thinking mode, develop innovative ideas, and put forward more innovative design schemes. Students need to constantly try and explore. They may encounter various problems and difficulties, such as poor movement, intensity and so on. However, it is these problems and difficulties that encourage them to constantly think and improve, and cultivate their perseverance and the ability to solve problems.

5.3. Enhance Students' Team Cooperation Spirit

During group discussion and project design, students need to learn to cooperate. Team members need to have close communication and collaboration, clarify their tasks and responsibilities, and make reasonable project plans and schedules. During the implementation of the project, the team members need to support and cooperate with each other to solve the problems and difficulties encountered together. In this way, students can deeply understand the importance of teamwork, and cultivate their team spirit and teamwork ability. They can undertake different tasks according to their own strengths and interests, such as data collection, problem analysis, program design and so on. Through the division of labor and cooperation, students can give full play to their own advantages, improve work efficiency, and also cultivate their own teamwork ability.

5.4. Improve Students' Professional Ethics and Social Responsibility

By introducing the importance of institutional studies in engineering design, manufacturing and maintenance, students can recognize the social value and responsibilities of their major. Teachers can also add professional ethics to the course assessment, such as requiring students to comply with the relevant norms and standards in the design of homework, and pay attention to engineering safety and quality. In this way, students can pay more attention to the cultivation of professional ethics and develop good professional habits. When introducing the application of institutional learning in safety production, students can understand the working principle and design methods of some safety equipment, such as the safety device of crane, the safety system of elevator, etc. Through these cases, students can realize the important role of institutional learning in ensuring production safety and protecting people's lives and property, and enhance their safety awareness and social responsibility.

6. Suggestions on Further Strengthening the Ideological and Political Construction of Mechanical Courses

(1)Strengthen the construction of teachers. Teachers are the implementers of ideological and political development of the curriculum, and the ideological and political quality and professional level of teachers directly affect the implementation effect of ideological and political development of the curriculum. Therefore, we should strengthen the construction of teachers and improve their ideological and political quality and professional level. We can organize teachers to participate in ideological and political training and teaching seminars to improve their ideological and political quality and teaching level.

(2)Optimize the teaching content and methods to further optimize the teaching content and methods of institutional learning, and integrate the ideological and political courses into each link of teaching. We can explore the ideological and political elements in institutional learning to enrich the teaching content and make the teaching content more vivid and interesting. At the same time, diversified teaching methods can be adopted, such as case teaching, group discussion, project design, etc., to improve students' interest and enthusiasm in learning.

(3)Strengthen the practical teaching link. Practical teaching is an important part of the institutional learning curriculum, but also an important implementation link of the ideological and political curriculum. Teachers can organize students to participate in the institutional innovation design competition, scientific and technological innovation activities, so that students can exercise their innovation ability and teamwork ability in practice. At the same time, ideological and political education should be integrated into practical teaching to cultivate students' professional ethics and social responsibility.

(4)Establish the ideological and political evaluation system of the curriculum. The implementation effect of the ideological and political course can be evaluated through student evaluation, teacher evaluation, teaching supervision and other evaluation. Meanwhile, according to the evaluation results, the teaching content and methods should be adjusted in time, and the effect of the ideological and political implementation of the curriculum should be continuously improved.

7. Conclusion

Advanced mechanism theory is an important basic course of postgraduate students majored in mechanics. It is of great practical significance to integrate ideological and political elements into the teaching of mechanical learning. By excavating the ideological and political elements in institutional learning and combining with specific teaching cases, we illustrate the implementation methods and effects of ideological and political courses in the teaching of mechanical learning. Meanwhile, the paper puts forward suggestions to further strengthen the ideological and political construction of mechanical courses, so as to improve the teaching quality of institutional courses and cultivate high-quality talents with good ideological and moral quality and professional quality.

Acknowledgements

This work was sponsored by the project of "Ideological and Political Demonstration Course Construction Project of Undergraduate Courses of University of Shanghai for Science and Technology" and "Undergraduate Teaching Research and Reform Project of University of Shanghai for Science and Technology" and "Postgraduate Teaching Research Project of University of Shanghai for Science and Technology".

References

[1] Xu, L., Zhao, X., Hugh S. (2023) Ideological and political education in Chinese Universities: structures and practices. Asia Pacific Journal of Education, 43, 586-598.

[2] Zhao, X., Zhang, J. (2021). The Analysis of Integration of Ideological Political Education with Innovation Entrepreneurship Education for College Students. Frontiers in Psychology, 12, 610409.

[3] Chen, L., Xu, Z.P., Ji, M.J., Wu, G.L. (2019) Thinking on integration of ideological and political education into Human Parasitology teaching. Chinese journal of schistosomiasis control, 31, 431-433.

[4] Maganioti, A.E., Chrissanthi, H.D., Charalabos, P.C., Andreas, R.D., George, P.N. and Christos, C.N. (2010) Cointegration of Event-Related Potential (ERP) Signals in Experiments with Different Electromagnetic Field (EMF) Conditions. Health, 2, 400-406.

[5] Fan, F., Zong, Y. (2023) Exploring the Integration of Ideological and Political Education into the Graduation Practice of the Civil Engineering Major. Creative Education Studies, 11, 3730-3737.

[6] Li, Q., Shu, X. (2023) Effective Integration of Ideological and Political Education and Student Management in Colleges and Universities Based on the Coupled Coordination Model. Applied Mathematics and Nonlinear Sciences, 9, 1-18.