

Integration of Ideological Education and Curriculum Teaching on "Mechanical Equipment Structural Design"

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Abstract: Curriculum ideology and politics provide a new concept for current higher education, and the way and effect of the organic integration of professional teaching and ideological leadership in engineering courses have become an issue of great concern at present. In this paper, the construction of professional courses on ideology and politics in universities was discussed. Combined with the course "Mechanical Equipment Structural Design, the teaching reforms were explored and practiced from the design of the top-level goal of ideology and politics, the overall layout of ideology and politics cases, the whole process of teaching and teachers' multi-faceted aspects, etc., the ideology and politics teaching system of the course was preliminarily constructed. The correct values and engineering concepts were imperceptibly guided and established for students, in order to achieve the purpose of shaping values into the teaching of knowledge and cultivation of abilities.

1. Introduction

Since General Secretary pointed out in the ideological and political conference of national universities that all kinds of courses and ideological and political theory courses should go in the same direction to form synergistic effect ^[1], the concept of curriculum ideology and politics has getting more and more attention. Therefore, how to melt the "salt" of moral education into the "water" of core courses of science and technology, so as to cultivate qualified and resolute socialist successors under the complex international situation in the future, is the problem of in-depth thinking for every college and university professional teacher at present.

The course "Structural Design of Mechanical Equipment" offered by our university is a compulsory course for majors of mechanical design, manufacturing and automation. This course synthesizes the latest technology of mechanical design, mechanical processing technology, computer technology and other disciplines, with the typical structural design of machine tools and their components as the main line, focusing on the basic theory of structural design of the spindle, support parts and main drive system, besides the principles and methods of motion design. The course covers knowledge points closely related to the design of various functional components of machinery and

equipment, and is the core basic theoretical knowledge that must be mastered in the design and development of important equipment in various industries. In the background of stringent regulatory frameworks governing advanced technologies abroad, China's pursuit of advancements in deep-sea exploration, aerospace, and information technology necessitates the cultivation of research personnel endowed not only with profound theoretical acumen but also with extraordinary attributes such as fortitude, resilience, ingenuity, and altruism. The nurturing of these attributes is a protracted endeavor, demanding educators to subtly instill and embody them throughout the pedagogical process. Consequently, this paper undertakes a review and contemplation of the teaching process of the "Mechanical Equipment Structural Design" course, proposing integration of elements of ideological and political education in several aspects, with the aim of achieving the quiet yet pervasive effects of ideological and political education.

2. Establishing ideological and political objectives in planning the syllabus

The teaching syllabus is a guiding document compiled to encompass instructional content, educational objectives, and class hour allocation. It serves as the primary reference for textbook development and instructional planning by teachers, as well as a crucial criterion for assessing students' academic performance and evaluating teaching quality^[2]. Accordingly, this course begins by delineating its content, aligning it with students' characteristics and educational goals, identifying points of convergence between professional knowledge and ideological and political education, incorporating elements of moral education, collecting relevant materials, and establishing the fundamental ideological and political principles of the course within the framework of the teaching syllabus.

In accordance with the guidelines outlined in documents such as the Guiding Outline for Ideological and Political Education in Higher Education Courses issued by the Ministry of Education^[3], this course proposes to focus on patriotism, dedication, scientific spirit, and personal integrity as the primary ideological and political education themes within the teaching syllabus. By elucidating the close relationship between the mechanical industry and human production and lifestyle, as well as the progress of science and technology, the course aims to integrate engineering literacy and professional knowledge into the curriculum, guiding students to consciously integrate their personal ideals into national and ethnic causes. Simultaneously, it aims to foster in students a scientific spirit characterized by continuous self-improvement, a quest for truth and pragmatism, and a commitment to excellence. The course is structured into eight chapters, with the allocation of ideological and political education objectives outlined in Table 1 within each chapter of the curriculum.

Table 1: Curriculum Ideological and Political Objectives Design Table.

Overall objective	Sub-Objective	Chapters
Patriotic sentiment	National rejuvenation, pride	Chapter 1
	Self-improvement and cultural confidence	Chapter 2
Scientific spirit	Innovative, rigorous scientific literacy	Chapters 5 and 8
	Striving for excellence and climbing to the top	Chapter 6
Personal cultivation	Meticulousness and craftsmanship	Chapters 2 and 5
	professionalism	Chapters 3 and 7

3. Introducing ideological and political cases in designing teaching content

After the overall planning of ideological and political elements, relevant teaching cases are collected and explored, teaching segments are carefully designed, and teaching content is integrated to form an effective classroom teaching language that is able to effectively penetrate students' minds and ears. Accordingly, integrating ideological and political elements with knowledge points, layouts of ideological and political cases corresponding to various teaching contents are arranged as shown in Table 2, targeting the ideological and political goals listed in Table 1.

In the introductory course, while elucidating the mechanical structure design principles and fundamental requirements, emphasis is placed on acquainting students with the role and pivotal force of the machinery industry in transforming human life and production methods, as well as fostering technological advancements, through the introduction of various types of mechanical equipment in the national economy. This approach aims to inspire students' professional responsibilities. By delving into and distilling equipment design projects previously led or participated in by instructors, the focus lies on guiding students to persistently strive for excellence and diligently study within their professional domain. This is achieved through examining aspects such as functional requirements, design concepts and methodologies, coverage of curriculum knowledge points, comparison of performance indicators with similar foreign products, and experiences in overcoming research challenges. The overarching goal is to instill in student lofty aspirations and a sense of patriotism, as they contribute their wisdom and efforts towards the realization of the national development strategy as a major contributor to the country's key industries.

Table 2: Curriculum Ideological Case List

Chapters	Cases	Ideological goals
Preface	Project Design Cases	Patriotic sentiment
Principles of casting structure design	Ancient casting level	
Bearing structure and selection	The Research and Development History of High-Speed Rail and Wind Turbine Bearings	The scientific spirit of innovation and overcoming difficulties
		Innovative, rigorous scientific spirit
Optimization techniques	Optimize technology status and development	
Support element	Guide rail and other processing technology scheme	The scientific spirit of seeking truth and pragmatism
Machine tool drive train structure	The role of machine tools in advancing the industrial revolution	Professionalism
CNC machine tool	Great Powers, Domestic and International Technology Comparison	

When explaining the basic principles of structural design of castings, through the introduction of the history of the development of ancient Chinese bronze casting and the national treasures of bronzes, the exquisite and mature bronze smelting technology during the Shang and Zhou Dynasties more than 5,000 years ago were publicized, which awaken the students' cultural self-confidence and the courage of daring to be the first in the world. By linking and analyzing the principles of casting process and

structural design, students will be inspired to pay attention to details in design, and realize the guiding role of the idea of "no step by step can lead to a thousand miles, and no small stream can become a river and an ocean" in engineering design.

When explaining the processing technology of bearing guide rails, a comparative analysis of several processing schemes is conducted. This guides students to grasp the latest technology while also retaining traditional excellent craftsmanship. The aim is to fully integrate excellent traditional craftsmanship with cutting-edge technology, imbuing the educational elements of seeking truth and pragmatism.

When studying the structure of CNC machine tools, a comparative analysis of the performance parameters of domestic and foreign CNC equipment is conducted to identify the main reasons for the performance gap and propose solutions. Meanwhile, the performance and advantages of high-end CNC equipment independently developed in China with the support of major national projects are introduced. This aims to teach students, given the background of foreign key technology blockades, to neither underestimate themselves nor become complacent, thus inspiring them with a sense of professional mission to dedicate themselves to in-depth research.

Through the design of the aforementioned teaching segments, patriotism, engineering literacy, and scientific spirit are integrated into the teaching process of professional knowledge. This enables students to be subtly influenced by ideological cultivation while learning, achieving the effect of salt dissolving in water.

4. Ideological and political education throughout the teaching process

Curriculum Civics should not only stay in the process of teaching classroom knowledge, should also focus on civics education on the impact of students' daily behavior, to build a "pre-course - in the classroom - after the classroom" the whole process of nurturing chain, urging students to "know and act in unity", in the hand and foot Present the development of good quality^[4]. Therefore, in the teaching process of the various stages, the examination links were designed to coordinate the ideological and political goal, in order to cultivate students meticulous, excellence, gratitude and good behavior habits in practice. At the same time, the performances of the practice were calculated into the ideological and political assessment project. The ideological and political goals and the weight of each achievement are shown in Table 3.

First of all, in terms of course attendance, the rule of counting three times late as one absence was formulated in order to cultivate the students' good habit of being punctual and respecting other people; as for the absence, it is stipulated that it must be with a justifiable reason and documentary proof to cultivate the students' character of rigorous and honest manner.

Secondly, in order to fully and timely understand the degree of students' mastery of knowledge points, teachers before and after class will release online thinking and discussion questions on the course platform, requiring students to follow and reply after previewing and reviewing, which will provide feedback on the understanding of knowledge points and at the same time prompt students to cultivate the scientific spirit of diligent thinking and hard work ; teachers and students will interact with each other at any time during the class on the content of the lecture such as robbing or selecting, which will improve the concentration and head-up rate of students' listening, and also stimulate students to be the first to strive and challenge the enterprising spirit.

At the same time, for the homework, in addition to the correct rate, ones with neat handwriting, answer the questions in a well-organized manner, the beautiful layout design will be recommended to release in the class group, as a way to encourage students to treat the study meticulously, the spirit of craftsmanship and excellence.

In addition, throughout the entire teaching process, set up 1-2 times of mutual assessment of

homework, before the students review the teacher announced the standard answer in advance, and then students receive randomly distributed homework for correction. In this process, not only to test the timeliness of the students to complete the mutual assessment homework, but also to set up a complaint monitoring mechanism for the results of mutual assessment, allowing students to challenge the grading results to the teacher. If the teacher arbitrates and finds that there are obvious deviations in the grading, the marking student will receive a zero for this ordinary grade. Through the physical practice of mutual assessment, students' sense of responsibility and meticulous scientific literacy are enhanced, while the hard work of correcting homework is felt to cultivate a sense of gratitude and dedication.

Table 3: Whole process of ideological and political education

Teaching stage	Inspection method	Ideological and political objective	percentage
Attendance rate	Number of late arrivals	Punctuality, timekeeping and respect for others	2%
	Reasonableness of leave	Rigor and integrity	
Classroom performance	Discussion participation	Think positively and study hard	2%
	Number of snatches	Strive for excellence and challenge	
Quality of work	Well-written and beautifully laid out	Meticulousness and excellence	1.5%
Mutual evaluation	Timeliness and accuracy	Responsibility, Meticulousness, Gratitude	2.5%

5. Multi-faceted role modeling, practicing what we preach

Curricular ideology and politics cannot be taught in an empty manner, and the establishment of moral education requires teachers to educate others before correcting themselves, and teachers must be physically active to set a good example. For the spirit of science, craftsmanship, national sentiment and other objectives of the course of political thinking, especially teachers need to teach through the course and the process of management^[5,6] to implicitly lead the demonstration.

Teachers' attitude towards teaching is reflected in how many minutes they arrive at the classroom in advance, whether the teaching PPT and other resources are abundant and perfect, whether the knowledge points are explained skillfully and thoroughly, whether they will switch classes frequently or find substitutes, whether the homework correction and the online Q&A are timely, and whether the comments are detailed and the answers are patient. All these will unknowingly have an impact on students' values and sense of responsibility, which will lead to the formation of a meticulous and serious attitude towards things.

In terms of teaching management, whether the regulations on the submission time of assignments and tests, and the rules for evaluating regular grades can be disclosed in a timely and transparent manner, and whether these principles can be strictly implemented in a fair and impartial manner, will implicitly build up students' awareness of the rule of law and the regulations, and physically interpret the bottom-line thinking of doing things.

In addition, in some special circumstances, teachers need to patiently listen to students' doubts.

When they find deficiencies in teaching through literature review and other methods, teacher should bravely admit and correct the bias or imperfections in the explanation of the knowledge points. In this way, students can be more encouraged and inspired to challenge authority and innovate boldly, which is a more direct and effective curriculum ideology and politics.

6. Conclusion

This paper discusses the method of integrating the curriculum ideology and politics with the teaching "Structural Design of Mechanical Equipment" in the light of the teaching practice of the course. The course has carried out systematic construction from the top level of the syllabus planning, the overall layout of the ideological and political objectives, and the reconstruction of the teaching cases in chapters, and implemented the general curriculum ideological and political plan covering the whole teaching process, the teachers' multi-orientation and full content, so as to lay a solid foundation for the continuous improvement of professional teaching integrating ideological and political education of the course, improving teaching quality and enhancing educating effects. It is expected to provide useful reference for the cultivation of talents in mechanical engineering in our country.

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