

The Compilation of Engineering Practice Teaching Materials in Universities under the New Situation

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Abstract: Teaching Materials Are an Important Carrier of Knowledge Dissemination and Teaching Activities. Universities Should Implement the State Council Issue the Opinions, about Strengthening and Improving the Construction of Textbooks in the New Situation, through Strengthening the Construction of Practice Textbooks to Accomplish the Goals of Strengthening Practical Teaching and Improving the Quality of Personnel Training. Based on the Analysis of the Present Situation of the Domestic Engineering Practice Teaching Materials, Put Forward the Suggestions for the Compilation of the “Six Needs” of the Practical Teaching Materials in the New Situation, Including, Needs to Have the Consciousness of the National Strategic and the Strong Pertinence, Moreover Needs to Pay Attention to the Problem-Oriented, the Choice of the Content, the Quality and the Team Training.

1. Introduction

In 2016, the Office of the Cpc Central Committee and the Office of the State Council Jointly Issued the Opinions on Strengthening and Improving the Construction of Teaching Materials for Middle and Primary Schools under the New Situation. in 2017, the State Council Established the National Teaching Materials Committee and the Ministry of Education Established the Teaching Materials Bureau. This Fully Shows That the Cpc Central Committee and the State Council Attach Great Importance to the Teaching Material Work. Colleges and Universities Should Shoulder the Historical Responsibility of Teaching Material Construction. Practical Teaching Plays an Important Role in the Training of Applied Talents and Innovative Talents. Engineering Training Has Become the Concrete Form of Engineering Practice Education(Sun et al,2011). Therefore, When Compiling Engineering Practice Textbooks, We Must Fully Implement the Spirit of the 19th National Congress of the Communist Party of China on “Building a Strong Country in Education is the Basic Project for the Great Rejuvenation of the Chinese Nation” and the Opinions on Strengthening and Improving the Construction of Teaching Materials in Primary and Secondary Schools under the New Situation Jointly Issued by the Central and State Offices, and Strengthen the Full Points of Existing Engineering Practice Textbooks on the Basis of the Requirements of Personnel Training. Analysis, and Combined with the Actual Situation of Colleges and Universities to Study Carefully, and Strive to Achieve a Sense of National Strategic Overall Situation, Have Strong Pertinence, Pay Attention to Problem Orientation, Pay Attention to Content Selection, Pay Attention to the Quality of Teaching Materials, Pay Attention to Team Training.

2. Analysis of the Current Situation of Engineering Practice Teaching Materials

Engineering Practice Course, Different Colleges and Universities Have Different Course Names, Some Are Called Engineering Training, Some Are Called Engineering Practice, Some Are Called Metalworking Practice. the Course Names of Different Colleges and Universities Are Different, and the Teaching Materials Are Also Different.

At Present, There Are Many Kinds of Engineering Practice Teaching Materials in China, There Are More Than 200 Kinds According to Incomplete Statistics. through Comparative Analysis of

Some Engineering Practice Textbooks Published in Recent Years (Table 1), It is Not Difficult to See That Although There Are Many Kinds of Engineering Practice Textbooks, These Textbooks Include the Basic Contents of the Original Metalworking Practice: Basic Theoretical Knowledge (Safe and Civilized Production, Basic Knowledge, Engineering Materials and Metal Heat Treatment), Conventional Processing Methods (Casting, Forging, Welding, Turning, Milling, Grinding, Fitter). in Different Teaching Materials, Relevant Contents Have Been Added to Different Degrees, Some of Which Have Added the Introduction of Automatic Manufacturing Methods Such as Numerical Control and Special Processing, Such as “Mechanical Manufacturing Engineering Training” Edited by Wang Jiwei and “Metalworking Practice” Edited by Chen Zhipeng; Some Have Added the Introduction of 3d Printing Forming Technology, Numerical Control Laser Carving, Plc Control and Simulation Knowledge, Such as “Engineering Training -- - Metalworking Practice “; Some Have Added the Introduction of Electrical, Electronic or Mechanical and Electrical Knowledge, Such as” Engineering Training “Edited by Sun Fanghong and” Basic Course of Mechanical and Electrical Engineering Training “Edited by Zheng Meng; Some Have Been Compiled for Non Mechanical Majors of Engineering, Such as” Engineering Training (Engineering Non Mechanical) “; Some Have Been Compiled for Non Engineering Majors, Such as Han Zhimin.” Engineering Training (Non Engineering); Some Are Compiled in Combination with Innovative Training, Such as the “Concise Course of Engineering Training and Innovative Production” Edited by Qian Hua.

Table 1 Engineering Practice Teaching Materials

<i>Name of Teaching Material</i>	<i>Editor in chief</i>	<i>Publishing time</i>	<i>Primary coverage</i>
<i>Metalworking Internship</i>	Chen Zhipeng	2015	Basic theoretical knowledge (safe and civilized production, basic knowledge of metalworking practice, metal heat treatment), general processing methods (casting, forging, welding, turning, milling, grinding, fitter), automatic manufacturing methods (CNC, 3D printing, special processing, industrial robot)
<i>Engineering Training - Metalworking Internship</i>	Wu Jianhua	2016	Casting, forging, welding and heat treatment, turning, milling, planing and fitter, CNC turning, CNC milling, machining center, CNC wire cutting, 3D printing and forming technology, CNC laser carving, CAD / CAM simulation operation, PLC control, fluid drive control, production process simulation, independent design and completion of an internship work
<i>Mechanical engineering training</i>	Wang Jiwei	2014	Introduction, engineering materials and heat treatment, casting, pressure processing, welding, fitter, basic knowledge of cutting processing, turning, milling, planing, grinding, numerical control processing, special processing
<i>Engineering basic training course</i>	Liu Wenjing	2016	On the basis of traditional mechanical manufacturing, it enriches new technologies and processes such as numerical control processing, laser processing, flexible processing, robot welding, 3D scanning, 3D printing, as well as advanced processing and measuring equipment such as turning milling composite center, five axis processing center, three-dimensional measurement, and at the same time, it adds ceramics, assembly and plastic processing.
<i>Engineering Training</i>	Sun Fanghong	2016	Basic knowledge of engineering materials, casting, forging, welding, metal heat treatment, turning, milling, planing and grinding, benchwork, numerical control processing, special processing, industrial robot and plastic forming, 3D printing, electrical engineering
<i>Basic Course of Mechanical and Electrical Engineering Training</i>	Zheng Zheng	2015	General knowledge of safety and first aid, basic knowledge of common metal materials, metal heat treatment, welding, casting, turning, fitter, milling, grinding, planing and gear processing, CNC turning, CNC milling, CNC machining center, EDM, reverse engineering, electronic assembly, electrical assembly and sensor application
<i>Engineering Training</i>	Luo Fengli	2017	Overview, engineering materials and metal heat treatment,

<i>(Non Mechanical Engineering)</i>			casting, forging, welding, turning, milling, fitter, CNC machining technology, modern machining methods, electrical basic knowledge and three-phase asynchronous motor control circuit
<i>Engineering Training (Non Engineering)</i>	Han Zhimin	2017	Overview, engineering materials and heat treatment, casting, forging, welding, turning, milling, planing, boring, gear processing, grinding, fitter, numerical control processing technology, modern processing methods, electrical basic knowledge and indoor lighting circuit
<i>Brief Course of Engineering Training and Innovation</i>	Qian Hua	2016	Foundry, welding, Turner, fitter, advanced manufacturing technology, innovation training part mainly includes the production of iron technology and the production of intelligent car.
<i>Engineering Training and Innovative Practice</i>	Wang Shigang	2017	Basic requirements, safety knowledge, engineering materials and heat treatment, cutting, casting, forging, welding, milling, planing, grinding, benching, numerical control, special processing, mechanical manufacturing automation technology, mechanical innovation training and practice, innovative model training and Practice

There are two problems in all kinds of engineering practice teaching materials: one is that most of these teaching materials are compiled in combination with the actual situation of the author's University, and the practice teaching conditions and equipment of each university are not the same, which will inevitably bring inconvenience to the universities and teachers who want to choose the teaching materials but have not yet compiled the teaching materials; the other is that the engineering practice teaching requirements of engineering and non engineering are different, and their teaching time is different. It is obviously not appropriate to use the same teaching materials. However, there are only seven kinds of non engineering engineering training materials viewed from the book website. These two problems inevitably increase the urgency of compiling school-based teaching materials in Colleges and universities.

3. Suggestions on the Compilation of Practical Teaching Materials in Colleges and Universities under the New Situation

3.1 Be Aware of the Overall Situation of National Strategy

The construction of teaching materials is a strategic and basic project that concerns the future. Teaching materials embody the will of the state (Liu, 2017). In order to build a strong education country and realize the modernization of education, it is necessary to build a world-class textbook system with Chinese characteristics, which reflects the concept of Chinese education in the new era and the wisdom of Chinese education (Zheng, 2017). Therefore, the teaching materials compiled by our colleges and universities should have the awareness of the overall situation of national strategy.

From the “industrial Internet” of the United States to the “industrial 4.0” of Germany, from the “made in England 2050 strategy” of the United Kingdom to the “made in China 2025” of China, all countries put forward their own national strategies on how to develop the manufacturing industry. The development of the country is inseparable from manufacturing industry, the development of manufacturing industry is inseparable from skilled personnel, and the cultivation of skilled personnel is inseparable from high-quality teaching materials. Engineering practice is not only an important starting point for the cultivation of skilled personnel, but also an important foothold for the cultivation of skilled personnel. The engineering practice textbooks we have compiled must serve the needs of “made in China 2025” and “mass entrepreneurship and innovation” personnel training. For example, “Metalworking Practice” edited by Chen Zhipeng and “engineering training” edited by sun Fanghong added the content of “industrial robot”, while “engineering training and innovation practice” edited by Wang Shigang added the content of “mechanical innovation training and practice, innovation model training and practice”.

In response to the report issued by the general office of the CPC Central Committee, the general office of the State Council and the Ministry of education in 2016, the document on promoting the

construction of the “one belt and one way” educational action has been responded by many universities. We need to develop the education of overseas students. In order to connect with this national strategy, colleges and universities must have corresponding practical teaching materials (Wang and Shi, 2018). For example, our school has compiled “engineering training (for international students)” for the teaching needs of international students.

The compilation of teaching materials should implement the document spirit of the outline of national medium and long term education reform and development plan (2010-2020) and the outline of national medium and long term talent development plan (2010-2020), actively respond to the construction opinions of “Fudan consensus”, “Tianda action” and “Beijing Guide” on “new engineering”, and base on the present and aim at the future from the perspective of “new engineering”(Deng and Zhu,2018). Colleges and universities should take the initiative to integrate into the changes of this new situation, strengthen relevant research, and compile engineering practice teaching materials that meet the requirements of “new engineering” personnel training.

3.2 Have Strong Pertinence

After more than 20 years of development, practical courses such as engineering training have become an important part of the integration of engineering culture and general education in universities, and an important combination point of the intersection and integration of science and technology and Humanities and social sciences. For example, Tsinghua University, Shandong University, Central South University and many other well-known domestic universities have taken engineering training as a compulsory or elective course(Wei et al,2016). However, it is obvious that different teaching objects have different teaching requirements, teaching time and content. Moreover, the actual situation of each university is different, and the training conditions and equipment are different. Therefore, the teaching materials used in Colleges and universities should be different. Therefore, colleges and universities should combine different teaching objects such as liberal arts, science, engineering and international students to organize teachers to compile teaching materials that are consistent with their own practical teaching conditions. For example, the basic engineering training course edited by Liu Wenjing has added ceramics, assembly and plastic processing in combination with the actual situation of the school.

Aiming at different teaching objects, our school specially organizes competent teachers to compile a series of engineering training textbooks in combination with the teaching practice of our school. There are English engineering practice teaching materials for international students, engineering training (for international students), engineering training (non engineering) for arts and science students, engineering training (Engineering) for engineering students, and metalworking practice instruction for engineering majors. For arts and science students and international students, the requirements of engineering training are not high, and the time is short. The teaching materials are mainly to let students understand the conventional manufacturing and advanced manufacturing, have a preliminary understanding of electrical common sense, cultivate students' engineering literacy, expand the subject vision, experience engineering culture, experience the spirit of craftsman, preliminarily solve the problem of “walking apart like a mountain” in engineering discipline, and strive to do so. Go to “no separation”. Engineering training has relatively high requirements for engineering students, with more teaching time. Teaching materials focus on the combination of theory and practice, highlight ability training, strengthen practical teaching, let students learn mechanical and electrical technology knowledge, enhance physical and chemical ability, practice craftsman spirit, experience technological progress, and lay a theoretical and practical foundation for training high-quality applied talents. The instruction for metalworking practice is based on the training of the post technology and skills of the crew and the improvement of the students' practical ability as the main line. According to the requirements for the practical operation and practical skills of the crew stipulated in the competency assessment program for seamen of the people's Republic of China Maritime Administration, the instruction for metalworking practice is compiled in accordance with the teaching requirements for metalworking practice.

3.3 Pay Attention to Problem Orientation

Problem oriented design in textbook compilation is very important for the cultivation of students' innovative consciousness, spirit and ability. Through the setting of problems and the implementation of teaching, students' speculative consciousness and research ability can be cultivated, which can inspire students to think, question and collision of ideas(Zhao,2015), and improve students' ability of finding, thinking, analyzing and solving problems.

When compiling a series of teaching materials of engineering training, our school strengthened the design of “problem orientation”. For example, the whole book of engineering training (Engineering) focuses on the design and production of the carbon free car in the National College Students' engineering training comprehensive ability competition. It is designed scientifically and systematically to strengthen the students' engineering training effect, give full play to the students' potential, and improve their innovation awareness by making the actual work pieces. Each chapter includes “teaching objectives”, “question introduction” and “review questions”. “Teaching objectives and requirements” let students know the objectives and requirements of learning the content. “Problem introduction” attracts students to carry out the course learning with problems. For example, Chapter 1 “overview of modern manufacturing engineering” first proposes that “the design and manufacturing of carbon free car involves mechanical principle, mechanical design, circuit design, machining and other related professional knowledge. How to transform the idea of carbon free car into real object? There are many kinds of machining involved in the car without carbon. Is it to be processed by traditional ordinary machine tools, or by time-saving and labor-saving CNC machining, or by laser cutting, 3D printing and other processing methods? How to ensure the reasonable structure and accuracy of the car without carbon? “ Wait for a series of questions. “Review questions” enables students to check their mastery of the content.

3.4 Pay Attention to the Selection and Design of Contents

The core of teaching material construction is to compile the content of teaching material. The selection and design of teaching materials are very important. Therefore, as a practical teaching material, engineering training should be compiled under the guidance of “grasping the main line of moral education, highlighting skills, focusing on practicality and sufficient theory”. It should pay attention to the combination of systematization and contemporaneity, the combination of theory and practice, and in accordance with the standards and requirements of the textbook, strive to highlight the practicality, applicability, regularity and comprehensiveness of the content. Too much editing and content of teaching materials will inevitably lead to high price of teaching materials, increase the burden of students, and affect the overall Compilation Quality of teaching materials. For example, there are only 8 chapters in engineering training (for international students), 10 chapters in engineering training (non engineering), and 16 chapters in engineering training (Engineering).

When compiling, we should focus on the needs of the times, change the educational concept, keep pace with the times, reflect the characteristics of the times, absorb new teaching achievements, academic achievements and the experience of existing teaching materials, and carry out new exploration in the compilation of teaching materials. Add modern and special processing contents such as “3D printing” and “laser processing” to the content selection to stimulate students' interest in learning. The compilation of teaching materials should be as innovative as scientific research. For example, according to the needs of engineering students, the engineering training (Engineering) compiled by our school adds the content of “product processing analysis and cost accounting” in combination with the design and production of carbon free car, so that students can not only master the processing technology, but also understand the relevant knowledge of Mechanical processing process analysis and product cost accounting.

Safety education is an important part of university education, and engineering practice emphasizes safety most. The compilation of teaching materials must put safety education in the first place, compile appropriate safety operation procedures for different kinds of equipment, strengthen safety education for students, and cultivate their safety awareness. Reference is the extension of teaching, which is essential for students to expand their knowledge choice.

3.5 Pay Attention to Quality

To ensure the quality of teaching materials is the key to the compilation of engineering practice teaching materials. The quality of teaching materials is related to students' cognition and understanding of knowledge. However, in the actual situation of the development of colleges and universities and the needs of teachers' personal development, under the impact of the marketization and commercialization of the publishing industry, the drive of interests has affected the quality of teaching materials to varying degrees. On the one hand, some teachers lack the accumulation of technical skills and the ability of scientific research. In order to complete the task of scientific research and the promotion of professional titles, they have to write textbooks to cope with it. Naturally, they can't write good textbooks, which ultimately affects the students' acquisition of technical skills. On the other hand, some publishing houses have a strong business atmosphere and economic supremacy. They do not carefully review the manuscripts, which leads to the decline of the quality of teaching materials, and even “inferior teaching materials”.

In order to ensure the quality of personnel training, colleges and universities should focus on improving the quality of teaching materials as an important education project of the University, strengthen the compilation and use management of teaching materials, put forward basic standard requirements for compilation, review, use and publication and distribution, establish and improve the restraint mechanism and supervision review mechanism, strictly check and check, and comprehensively review the ideological, scientific and suitability of teaching materials. Teaching material is a very special commodity. Because there is not a kind of commodity that embodies the will of the country like textbooks, it cannot operate in a market-oriented way. Colleges and universities should not hand over all the work of teaching materials to publishers, but should strengthen the strict examination and review of manuscripts. The “engineering training (non engineering)” manuscript that we compiled in 2016, a well-known publishing house said that it could be published after seeing our manuscript, but we still found many problems, such as punctuation marks, typography, expression problems, style problems, unclear pictures, under the careful review of Professor Fu Shuigen of Tsinghua University and the main reviewer of teaching materials... And so on. After half a year's revision, reexamination and revision, we finally formed the final draft.

To improve the quality of teaching materials, we should not only rely on experience, but also carry out systematic, in-depth and detailed basic research and adhere to long-term theoretical and practical research(Yu and Shi,2018). High quality teaching materials are gradually formed in the teaching process(Duan and Feng,2008). The series of practical teaching materials compiled by our school, the teachers who participate in the compilation are all the front-line teachers of practical teaching, with relatively solid theoretical and practical foundation, and the content of the teaching materials is compiled by the compilation teachers in combination with their own teaching experience from the actual teaching needs to ensure the quality of the teaching materials.

3.6 Pay Attention to Team Training

The compilation of a textbook should be the integration of various research experts and scholars related to the content of the textbook(Wu,2017). Therefore, when organizing the compilation of teaching materials, colleges and universities should pay attention to team building and strive to build a teaching material compilation team with reasonable structure, profound academic attainments, solid business foundation and rich teaching experience.

The formation of the textbook compilation team and its role of “spreading, helping and leading” will be conducive to the training of the team, the exploration of reserve talents, and the establishment and improvement of the textbook construction echelon(Sun,2008). For example, we pay more attention to the rationality of the team structure when we set up the compilation team for the series of teaching materials of engineering training. There are different age groups of the post-60s, the Post-70s and the post-80s, different educational levels of undergraduate and graduate students, and different titles of professors, associate professors, senior engineers, senior technicians, lecturers and technicians. We often discuss the compilation of teaching materials together, which

promotes mutual learning and improvement. It will stimulate teachers' enthusiasm and creativity in scientific research, and cultivate teachers' rigorous scientific research attitude and meticulous work style. Such a team can not only effectively improve the professional level of young teachers, but also play a positive role in the preparation and publication of high-quality textbooks. Over the past two years, several young teachers in our team have actively applied for and obtained the school's textbook construction project in combination with their own teaching practice.

4. Conclusion

Teaching material is the knowledge carrier of teaching content and method, and the basic tool of teaching (Bai,2011). The quality of practical teaching materials will affect the quality of higher education and personnel training. In the new situation, colleges and universities should speed up the development of engineering practice teaching materials, better play the unique educational function of engineering practice, and improve the quality of education and teaching.

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