

Research on Construction of *Automobile and tractor* Teaching Resource System under the Background of New Engineering

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Abstract

In order to provide strong support for the cultivation of excellent talents, the construction of first-class majors and the certification of engineering education, aiming at the practical problems that the existing teaching resources of the “Automobile and Tractor” course are not systematic and perfect, combined with the requirements of professional certification, the “process supervision”, “information feedback” and “effect evaluation” are taken as the elements of continuous improvement, and the “time series”, “time node” and “logical relationship” are taken as the organizational elements of teaching activities. A complete curriculum teaching resource system with “knowledge carrier”, “guidance carrier”, “interactive carrier”, “test carrier” and “auxiliary resources” as the core elements. The construction of the teaching resource system of this course can not only provide new theories and methods for the teaching of this course, but also provide reference and guidance for the teaching innovation and resource system construction of other courses.

Keywords

New engineering; Engineering education accreditation; Automobile and tractor; Teaching resource system.

1. Introduction

According to the *National Medium-and Long-Term Education Reform and Development Plan* and *National Medium-and Long-Term Talent Development Plan*, it is proposed to cultivate high-quality engineering and technical talents to meet the needs of economic and social development, to serve the country's new industrialization development path, to build an innovative country and a talent power strategy, and to provide demonstration and guidance for comprehensively improving the quality of engineering education personnel training [1-3]. At present, the revitalization of undergraduate education has been raised to the status of the core task of higher education reform and development in the new era. It is necessary to strengthen the independent training of top-notch innovative talents with digital intelligent education [4-5]. Among them, teaching resource is the necessary element to organize the teaching process. Rich and high-quality online and offline teaching resources can break the boundaries of education time and space, change the supply of educational resources and students' learning methods, and improve the quality of teaching [6-7].

Automobile and tractor is a comprehensive course with strong professionalism and training applied talents. It is the main and compulsory course of agricultural mechanization and automation major. Traditional teaching resources mainly include PPT, syllabus, lesson plans and other teaching auxiliary materials, but the relevant content is not systematic and complete

enough. Therefore, it is expected to build a teaching resource system with the characteristics of the times, complete and in line with the needs of the society for professional personnel training by carrying out research on the construction of curriculum-related teaching resource system. In this way, it can fully adapt to and meet the learning needs of people with different purposes and different academic qualifications. At the same time, in the process of construction, the ideological and political education is integrated into teaching, so that the learners can understand the current situation and trend of the development of automobiles and tractors at home and abroad, and master the corresponding technical content. So as to enhance the ability to use and cultivate students' awareness of responsibility to revitalize the autonomy automobile industry [8-10].

At the same time, through the reform and innovation of curriculum teaching, it can also provide a systematic and complete new theory and method for teaching of agricultural mechanization and automation and vehicle engineering major. Combined with the requirements of professional certification and under its guidance, the supporting conditions and elements of construction are optimized to provide strong support for excellent talent training, first-class professional construction and engineering education certification. The study is also in line with one of the core ideas of "supply-side reform and new engineering education", which is a hot topic in the current reform of higher education, to achieve the goal of "facing the needs of the industry, having excellent professional skills, and being able to apply the knowledge to solve practical problems".

2. The Architecture Design and Implementation Path of Teaching Resource System

2.1. Architecture design

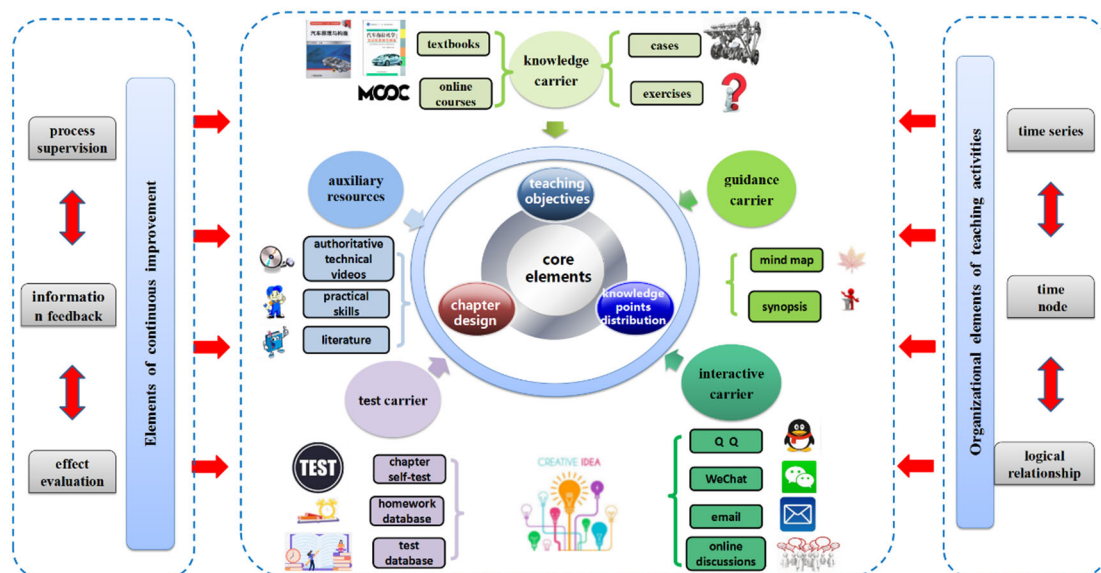


Figure 1. The relationship between teaching resource architecture and logical topology

Based on the nature of the field of curriculum knowledge and the distribution of credits, through investigation, analysis, induction, summary and demonstration, the relevant elements of promoting the achievement of curriculum teaching objectives, as well as the time series and logical relationship between the relevant elements are promoted. Constructing "process supervision", "information feedback" and "effect evaluation" as continuous improvement

elements; taking “time series”, “time node” and “logical relationship” as the organizational elements of teaching activities; “teaching objectives”, “distribution of knowledge points” and “chapter design” as the core elements; “knowledge carrier”, “guidance carrier”, “interactive carrier”, “test carrier” and “auxiliary resources” as support elements to support complete teaching resource system. The relationship between teaching resource architecture and logical topology is shown in Figure 1.

2.2. Implementation path

The specific implementation path of the teaching resource system construction is shown in Figure 2. Firstly, according to the set research objectives, the research retrieval and scheme design are carried out. After the demonstration, the teaching resource system construction is carried out with the teaching objectives, chapter design and distribution of knowledge points as the core elements. Secondly, it is divided into two master lines: new form of textbook compilation and online resource system construction. In terms of teaching-material, it mainly corrects existing problems and updates old knowledge points and upgrades them to MOOC new form of textbook. Online resource system construction mainly includes five aspects: knowledge carrier, guidance carrier, interactive carrier, test carrier and auxiliary resources. At the same time to establish an objective and fair course evaluation system, continuously optimize the allocation of resources after integration and consolidation. the system evaluation and demonstration of the formation of the characteristics of the times, perfect, in line with the social needs of the professional curriculum teaching resources system; After the evaluation and demonstration of the system, a professional course teaching resource system with the characteristics of the times, complete and in accordance with the needs of the society is formed. Finally, based on the established teaching resource system, the students' engineering quality is comprehensively improved, and the multi-level and modular curriculum resources are established. It is a beneficial exploration and practice for the implementation and application of MOOC and SPOC new teaching mode in combination with the characteristics of agricultural engineering, and finally realizes the demonstration and guiding role. Finally, based on the teaching resource system created, comprehensively improve the engineering ability of students, establish a multi-level and modularized curriculum resources. To carry out useful exploration and practice for the implementation and application of MOOC and SPOC new teaching mode in combination with the characteristics of agricultural engineering, and ultimately achieve the role of demonstration and guidance [11].

3. Main Contents of Teaching Resources System

3.1. Teaching goal setting, knowledge system and chapter design

According to the requirements of professional talent training and the goal of engineering education accreditation, the teaching objectives can be divided into three aspects: knowledge objectives, ability objectives and quality objectives. Knowledge objectives enable students not only to understand the development status and trend of domestic and foreign automobiles and tractors and their important role in agricultural production, but also to acquire the theory of automobile and tractor construction, working principle and basic performance. Competence objectives include the following three main points: firstly, enable students to evaluate and analyze the main performance index, testing methods and common troubles of internal combustion engines and automobile tractors, and have the ability to use and maintain automobiles and tractors in a basic way; the second is to be able to apply the basic knowledge and technology of the major to the learning process, and consolidate the basic knowledge and improve the ability to use technology while learning new knowledge; thirdly, it allows students to lay the necessary professional foundation for the study of subsequent courses such as “agricultural mechanization production management”, solving practical problems and carrying

out scientific and innovative research. The quality objective is reflected in the fact that through the study of this course, students can cultivate the responsibility of revitalizing the independent automobile industry and the awareness of teamwork, mutual assistance, etc., improve the basic quality and focus on the development of wise potentiality of students.

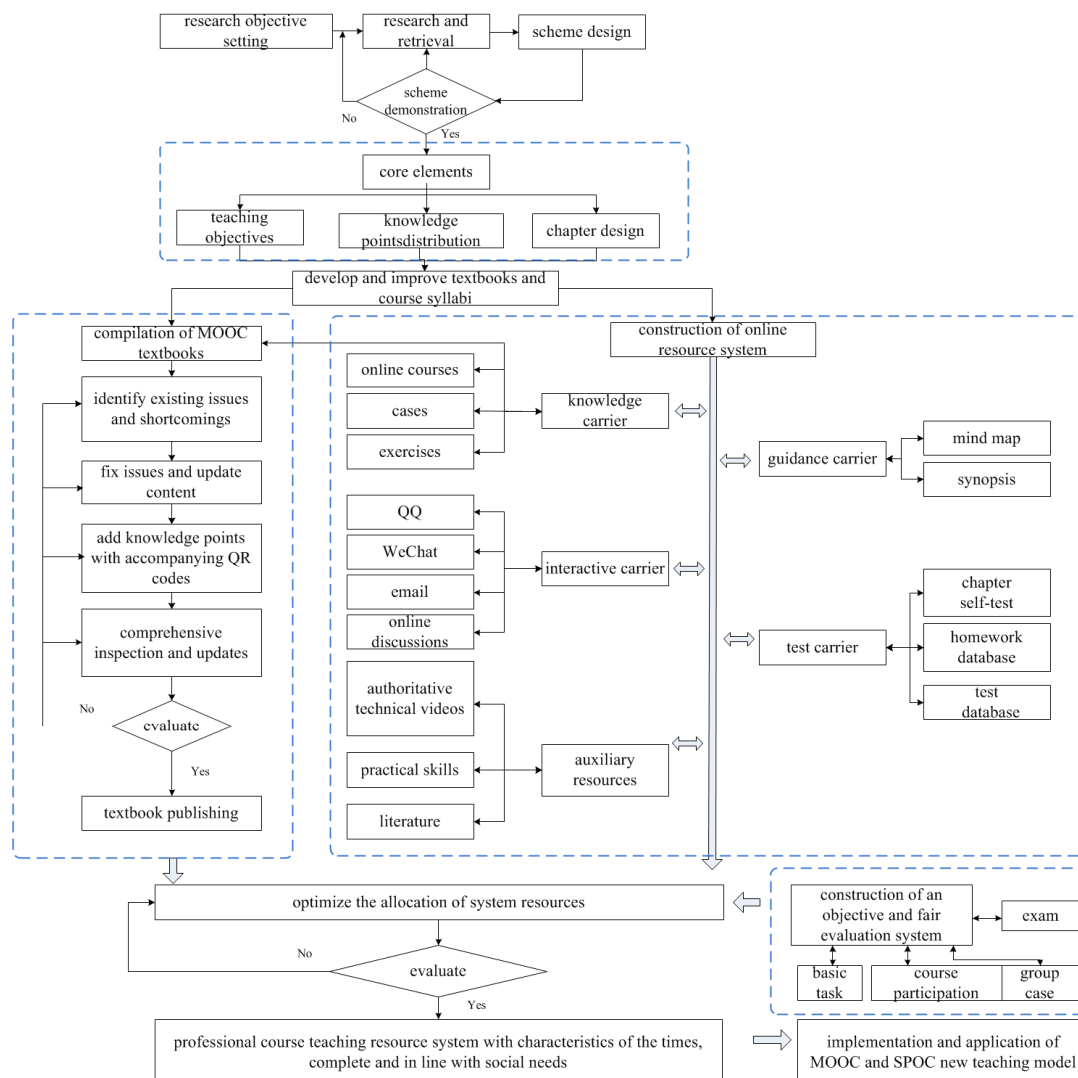


Figure 2. Technology road map of implementation steps

Based on the decomposition points of the graduation requirements for professional students, combined with the nature of the course knowledge field and credit distribution, and at the same time in order to fully adapt and meet the learning needs of people with different purposes and different academic backgrounds, *Automobiles and Tractors* knowledge system and chapters are reasonably configured. The course knowledge system focuses on the structure and principles of automobile tractors, while also introducing some theories of automobile tractors, electrical equipment and other related contents. The course can be divided into three parts: engine, chassis, and electrical appliance. It covers 22 technical chapters including basic knowledge of automobiles, basic knowledge of tractors, basic knowledge of engines, engine parts and crank-rocker mechanism, air-interchange system, diesel engine fuel supply system, gasoline engine fuel supply system, gasoline engine ignition system, lubrication system, cooling system, start-up system, transmission system, body and frame, driving system, steering system, braking system, working device, vehicle power supply, lighting and signal system, instrument and information system, hybrid and electric vehicles, and engineering vehicles. The course focuses

on comprehensiveness, timeliness and universality, so as to effectively promote the achievement of teaching objectives.

3.2. Auxiliary support elements construction

3.2.1. Knowledge carrier

The knowledge carriers of this course mainly include textbooks, online courses, cases and exercises. The knowledge system and content of the textbooks are set according to the goals and requirements for cultivating outstanding talents in automobile and related majors in general higher education. In order to fully adapt to the characteristics of the information age and the needs of learners, equipped with first-class MOOC resources and compiled in a new form. By using audio and video information and internet technology, paper knowledge and electronic resources are organically connected through QR codes and their advantages are complemented. This enables students to change from the passive learning process in traditional classrooms to reasonable and orderly independent learning under the guidance of textbooks, improve the adaptability and effectiveness of the course, adapt to the needs of students, schools and social development, and ensure that the course teaching objectives are achieved efficiently and effectively. The textbook also designs chapters in a modular form, striving to comprehensively and systematically present the basic knowledge and technological level of vehicle engineering with automobiles as the core. The book is divided into four parts. It begins with a review, introduces automobile-related concepts, and describes the current status, development trends, basic components and classifications at home and abroad. Based on the engine and chassis chapters, it explains the fuel power source engines of conventional and hybrid vehicles, as well as the main structural chassis systems of the vehicle. The extended chapter systematically explains the types of new energy vehicles and their respective characteristics, components and working principles, and introduces tractors and engineering vehicles derived from automotive technology, extending learners' relevant professional knowledge and improving adaptability in the field.

The course is equipped with a provincial first-class online open course, which focuses on the working principle and structural composition of automobile. It adopts modular chapter design and content arrangement, taking into account both popularization and professionalism. It can be applied to the dissemination of general and popular science automobile knowledge, so that learners can understand the basic structure and working process of automobiles, master the basic use and maintenance methods, and have the ability to appreciate and evaluate automobiles at an elementary level. It can be positioned as a professional basic course for vehicle engineering major, providing necessary knowledge for students who study or engage in the research and development, manufacturing, application and management of vehicle engineering and related equipment, as well as industry technicians. On the other hand, it can also be applied to general or professional courses with different names such as "automobile and tractor", "automotive principle", "automobile introduction", and "Vehicle structure and working principle". Meanwhile, according to the different learning objects and their professional backgrounds, the course provides a combination of modules with various study hours. According to the requirements of the training plan, students can choose the corresponding outline and knowledge points to carry out personalized teaching activities.

At the same time, the online courses are also equipped with rich digital resources such as videos, audios, cases, exercise books, etc. Taking the Xueyin Online platform as an example: there are more than 150 teaching videos, 280 auxiliary video resources, 500 non-video resources, and the total video duration is more than 2,200 minutes. In addition to being used for professional teaching and comprehensive quality electives in colleges and universities, the rich teaching resources can also provide learning assistance for knowledge updating and ability improvement for practitioners in related fields such as automobile and tractor design and

manufacturing, operation and repair, marketing or management, as well as technicians and drivers above the secondary college education.

3.2.2. Guidance carrier

In order to facilitate students to quickly and accurately locate learning content, the online course platform adopts a multi-column setting. The system constructs a mind map of and a context diagram of each chapter to achieve visual stimulation and associative memory, thereby enhancing the brain's ability to remember information. It can not only help students clearly understand the hierarchical structure and logical relationships, but also help students understand complex content in a short time. On the other hand, all chapters have condensed synopsis, which can help students understand the course content in advance and grasp the key points and direction of learning.

3.2.3. Interactive carrier

Through the construction of online interactive carriers, teachers can better understand each student's learning style and interests, thereby carrying out personalized teaching, meeting the learning needs of different students and stimulate their study interest. The interactive carriers for teachers and students in this course include QQ, WeChat, email, online discussions and other channels. Students can choose the interactive method according to their own situation and preferences. Through communication, teachers can also understand students' learning situation promptly and adjust teaching strategies based on feedback, thereby promoting the internalization of knowledge and the improvement of abilities.

3.2.4. Test carrier

The test carriers mainly include three aspects: chapter self-test, homework database and test paper database. Chapter self-test is used by students to timely understand their own knowledge learning and mastery. They can be carried out immediately after completing the corresponding chapter knowledge points to quickly check the learning effect. The construction of homework and test paper database can effectively help teachers evaluate students' learning situation and knowledge mastery. A database with more than 14,000 questions is created based on the course platform, with difficulty levels graded to facilitate teachers to set training questions for review and derivative questions for testing. Meanwhile, the platform's powerful combination function can provide teachers with unlimited diversity of homework and test papers, thus ensuring the authenticity and effectiveness of online test. In addition, in order to adapt to various types of learners, the homework database and test paper database are classified according to professional compulsory courses, professional elective courses and general education.

3.2.5. Auxiliary resources

The course comes with additional auxiliary resources such as authoritative technical videos, literature, practical skills, etc. Its purpose is to allow students to acquire new knowledge beyond their majors through a variety of channels, thereby meeting the learning needs at different levels. Students can choose appropriate learning methods according to their own characteristics to improve learning efficiency and effectiveness. By studying authoritative technical videos and reading literature, you can understand relevant research results, know the development trends of research, and lay a solid foundation for subsequent professional course learning, graduation thesis writing and scientific research. By studying practical skills videos, students can better combine theory with practice, thereby deepening their understanding of vehicle structure and principles. In the meantime, more than 2,600 pages of electronic teaching plans (PPT) were produced to facilitate learners to make up for deficiency, effectively avoiding repeated viewing of videos and saving a lot of time.

4. Results

Through the research on the construction of complete teaching resources for *Automobiles and Tractors* course, making full use of modern technologies and means, and the advanced course knowledge imparting methods represented by MOOC and SPOC and scientific learning process management, it is deeply loved and praised by students. Taking the Xueyin Online platform as an example, the cumulative number of course views reached 20.06 million times, the cumulative number of course selections reached more than 16,000 people, and the cumulative number of interactions reached more than 48,000 times. Meanwhile, it has obtained the provincial first-class online open course, high-quality online and offline course in universities, Ministry of Agriculture of general higher education “14th Five-Year Plan” textbook, “14th Five-Year Plan” textbook published by machine press, production-education integration textbook, a research project on course teaching material construction funded by the China Agricultural Science and Education Foundation. The construction of this teaching resource system ensures that students acquire more knowledge and skills within a limited time, and also creates efficient and good learning conditions and environment of “voluntary, autonomous and self-reliant” for students.

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