

# Innovative Compilation Mode of Higher Vocational Teaching Materials Based on the Combination of Industry, College, Research and Application\*

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**Abstract**—The idea of curriculum development based on working process has been widely used in higher vocational colleges; compared with curriculum development, the construction of teaching materials lags behind, which has become the key factor restricting the reform and development of higher vocational education. In order to make the teaching materials suitable for higher vocational education, first of all, it is needed to innovate the mode and idea of compiling; and on this basis, the development path and form of the teaching materials should be reset to highlight the characteristics of the higher vocational education; then, through the cooperation of the school and the enterprise, an interdisciplinary compiling team is established to guarantee the quality of teaching materials compiled by the combination of industry, college, research and application, and realize the goal of cultivating talents in higher vocational education.

**Keywords**—higher vocational education; working process; teaching material construction; interdisciplinary team; learning tasks

## I. INTRODUCTION

The leap-forward development of higher vocational education has brought unprecedented development opportunities for the construction of vocational education teaching materials. However, there are not many teaching materials that really establish the functional orientation of "teaching materials to cultivate skilled talents around the needs of employing people in enterprises". Many teaching materials still have some problems, such as outdated content, single form, divorced from the reality of industry and occupation development, and lack of higher vocational characteristics, which have become a key factor restricting the reform and development of higher vocational education. In order to compile teaching materials suitable for higher vocational education and realize the goal of cultivating higher vocational talents, we must reform and innovate in compiling mode, development path, teaching material content and form, as well

as compiling team.

## II. BREAKING THE SUBJECT-ORIENTED TEACHING SYSTEM, AND INNOVATING THE COMPILATION MODE

The "Curriculum Reform Model based on working process" advocated by the Ministry of Education clearly proposes to "break the course teaching system of the original discipline, reconstruct the major and curriculum system based on the working process". It is obvious that the teaching materials of this model have at least three aspects of innovation:

### A. It Breaks the Original Curriculum Teaching System of "Subject Type"

The system of the traditional "subject type" compilation of teaching material of higher vocational education is denied, and the flag is clear to the world that the purpose of the establishment of the curriculum and the teaching material is to be fully served in the training target of the higher vocational education, and to "Develop highly skilled personnel for the production, construction, service and management of the first line". In order to realize the goal of talent training in higher vocational education and make enterprises satisfied with the quality of higher vocational education, higher vocational graduates should have certain working ability and basic working experience, on the premise that they can systematically complete some typical work tasks during the school period. Therefore, the curriculum teaching of higher vocational education is no longer just to impart professional knowledge, but also to let students learn how to work in as real a professional situation as possible. The content of teaching materials should also be a "learning field" for learning, which should be transformed from a specific "field of work", that is, a comprehensive learning task derived from the actual work and the integration of theory and practice.

### B. It Breaks the Inherent Mode of the Two Main Participants of Teaching and Learning

In the past, the teaching and learning of the curriculum system were limited to the internal institutions and personnel of the school, and the new system model requires extending

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from schools to enterprises, societies, teachers, students to employees, managers and social experts. Whether teaching and learning is successful or not, which not only the quality evaluation criteria of the school, but also the vocational qualification criteria, as well as whether it be competent to work task in the post group to measure .

### *C. It Breaks the Original Path of the Development of Professional Courses and Teaching Materials*

Most of the existing professional design and curriculum system of higher vocational education are based on the historical evolution, and then adjust or abandon, revise or supplement according to politics, economy, science and technology, cultural environment and so on. With the rapid development of science, technology and economy today, the method of historical evolution will have great limitations; in addition, there are great differences in the regional economic industrial structure and pillar industries in various regions of our country, and the demand for first-line high-skilled personnel will also have great regional differences. Therefore, the professional setting, curriculum system and teaching materials of higher vocational education in each region should have their own characteristics. Where does the characteristic come from? It must be developed on the basis of the investigation of the actual economic development of the region, the demand status for talents in the industry and the actual working process of the enterprise. The actual needs and working process of regional industries and enterprises determine what kind of major, curriculum system and teaching materials we need to set up. The content of theoretical knowledge in teaching materials is to introduce the evolution of discipline development, theoretical trends at home and abroad, theoretical literature review, etc., and then introduce the key theory and application, case analysis and so on.

### III. RESETTING THE DEVELOPMENT PATH AND INNOVATING THE CONTENTS AND FORMS OF THE COMPILATION

Nowadays, the construction of disciplines is gradually formed and developed by summing up experiences and lessons in the process of industrialization. Therefore, the development of curriculum teaching materials in various disciplines has left traces of the process of industrialization, that is, the compilation of teaching materials emphasizes the relative integrity of the theoretical system of the subject to varying degrees, and describes the unique research objects, research methods, research purposes and so on. The more comprehensive the knowledge point is called the more extensive the research is, the more systematically the subject theory is expounded, the deeper the research is. The development of teaching material content of "Curriculum based on working process" in higher Vocational Education can't take this road naturally. In "The learning process of vocational education is a process of integration of work and learning, and the process of the integrated development of intelligence and physical and mental", the content of the professional course should be the process of teaching treatment and designing the typical work task as a learning task. The content of learning work task is that the "typical working

process of occupation" and the "learning goal" of the curriculum, the two gradually approach and achieve coordinated results. The method is to compare the learning content extracted from the typical work task description with the initially determined learning goal, and when it is found that the learning content can't meet the requirements of the learning goal, the learning content can be refined and supplemented; on the contrary, when the learning goal can't cover all the learning content obtained from the typical work task, the learning goal should be revised and improved.

In the current practice of combining industry, college, research and application with curriculum development in higher vocational colleges, learning situations are usually used to describe learning tasks. The learning situation is the "case" and the "environment" of the study designed on the basis of the typical work task, which is the result of the "teaching" processing of the typical work task. For students, the learning situation is a "Content is the job's learning task", short for learning task. The learning task is the materialization of the learning situation, which is derived from the practice of production or service, and can establish a direct link between learning and work (as shown in "Fig. 1").

In the compilation of teaching materials, the teaching contents can be presented in the form of teaching items to ensure students to go through learning tasks in a complete work process, that is, to arrange the teaching contents according to the objective order of completing the learning task activities, to naturally integrate knowledge, skills and attitudes into each link of the work process, so that students can construct the knowledge structure related to the work process, and to obtain experience and feelings through participation and reflection. For learning tasks that can't form a complete working process or require higher openness and design-oriented learning tasks, the teaching content can be presented in the form of a special topic. Although people with different positions, educational backgrounds and work experience perform different tasks, the basic structure of their completion process is generally the same, and the German Federal Vocational Education Institute divides the work process into six stages: clear tasks, planning, decision-making, implementation, control and evaluation. The knowledge structure of the course of the combination of industry, college, research and application in higher vocational education is essentially a fixed structure in the working process, which determines the order and mode of experience and knowledge construction in the curriculum, and also determines the structure of each learning task (item) in its teaching materials. As shown in "Fig. 1", the compilation of learning tasks can be organized according to the structure of "Task Description→Task analysis→Relevant knowledge→Task implementation→Task assessment→Expansion and improvement→Self-test and practical training after class".

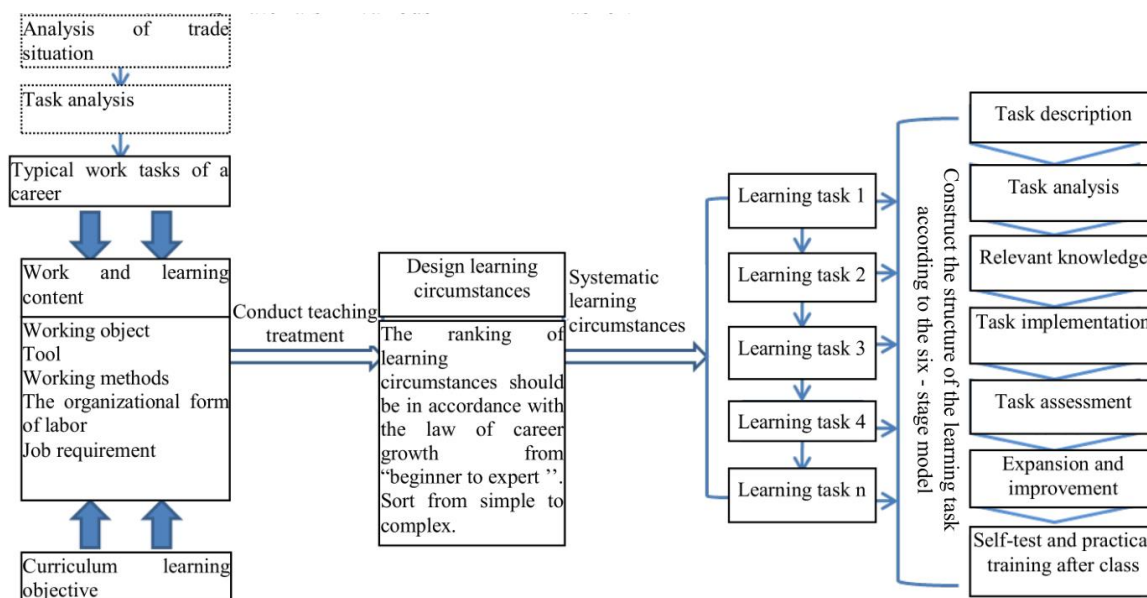


Fig. 1. Development path of higher vocational teaching material based on working process.

From the above analysis, it can be seen that the content selection of learning task is the key to the development of teaching materials combined with industry, college, research and application. Therefore, in the design of learning tasks, special attention should be paid to the following issues:

#### A. The Choice of Learning Task Should Be Typical

Well-designed learning tasks not only require certain typicality in major, but also have certain educational and teaching value, but also reflect the real professional work situation, have direct relationship with the actual production or commercial activities of the enterprise, and have practical application value. At the same time, it is not only the application of existing knowledge and skills, but also requires students to think and practice in an integrated way, to learn new knowledge and skills in a certain range, and to solve practical problems that have never been encountered in the past.

#### B. The Design of Learning Tasks Should Be Systematic

In the traditional subject teaching materials, the ranking of learning content is determined according to the knowledge logic of professional subject content, while the ranking of learning content of teaching materials based on working process should be determined according to the law of career growth from "beginner to expert", from simple to complex, from shallow to deep, step by step. In order to get beginners to get started, some tasks can be designed by the author through teaching experience, that is, to design some meaningful, interesting and specific simple tasks, on the basis of which the gradual transition to the completion of complex comprehensive tasks. Through different difficult learning tasks, the people in the low-level ability development stage are brought into the higher level ability development stage. The designed learning task can be completed by a section, or by each section of a large section step by step, or by a whole chapter and section to complete a more complex task step by

step. At the same time, the following chapters can also apply the simple tasks completed in the previous chapters to improve them to master new knowledge and skills.

#### C. The Form of Learning Task Should Be Intuitive

The content of teaching materials should be presented to readers in the most direct and effective way, which can quickly grasp the interest points of readers, attract attention and effectively convey the information to readers. Boring dogmatic content and form are often easy to resent readers, especially for higher vocational students, and the use of interactive form and lively language can effectively improve readers' interest in reading. Teaching materials can be written in the form of small cases, short stories, illustration, charts, cartoons and even videos to illustrate the profound truth. The layout should be sparse and varied; the chart design should be beautiful and rich in means; the illustration should be properly used and echoed in coordination with the text. In short, the way of expression is as far as possible to achieve both graphics and text, lively form. If there are conditions, two-color printing or color printing can be used to enhance students' interest in reading.

#### D. The Content of Learning Task Should Be Transitive

It is not possible for the teaching materials to provide all the work process and professional information, but to provide some relevant information, set up a series of guiding questions, through rethinking, students continue to extend new knowledge, lead to new theories, so as to cultivate students' ability to deeply understand and expand the application of the problem. Knowledge, skills and experience need a series of processes, such as transfer, reorganization, assimilation and so on, in order to form real ability or quality. The mechanism of ability transfer should be provided in the teaching materials to ensure the readers' understanding of the teaching content and the acquisition of their skills. Its implementation can be realized through problem discussion, thinking expansion, related links, comprehensive ability test, after-class homework,

simulation training and so on. It can also be realized in the form of three-dimensional teaching materials, such as CD-ROMs, supporting websites, supporting work pages, manuals and so on.

#### IV. DEVELOPING TEACHING MATERIALS INNOVATION COMPILATION TEAM THROUGH THE COOPERATION BETWEEN SCHOOLS AND ENTERPRISES

The development of science and technology in the 21st century shows two characteristics: "discipline intersection on the basis of discipline differentiation" and "teamwork on the basis of individual research". Interdisciplinary team has gradually become an important organizational form of scientific research, and plays a strong multi-disciplinary cooperation advantage. The construction of teaching materials combined with industry, college, research and application, which breaks the subject system, requires the participation of teachers from different disciplines, related enterprises and interdisciplinary teams composed of industry and technical experts. To a certain extent, the degree of cooperation of interdisciplinary teams determines the degree of the combination of industry, college, research and application of teaching materials, which further determines the quality of students' comprehensive vocational ability training. Therefore, the establishment of interdisciplinary compilation team is the guarantee of teaching materials compilation combined with industry, college, research and application. The interdisciplinary teaching material compilation team is mainly composed of teachers who understand the needs of students, master professional knowledge and personnel or managers with skilled skills, simulate the real working process of the enterprise, and extract the resources of the enterprise into teaching resources. The textbook not only has teaching function, but also includes typical working process, and realizes the organic combination of theoretical learning and skill training with the actual work experience of the enterprise. In the concrete operation, the cooperation of the interdisciplinary teaching material development team can mainly realize mainly through the following three ways:

##### A. Achieving Cooperation Through the Project Approval of Horizontal Subjects

Higher vocational colleges and cooperative enterprises can jointly declare national, provincial, municipal or school-level scientific research or educational reform topics to make the teaching materials of interdisciplinary teams come into practice, and teaching materials can be used as one of the achievements of the subject. The members of the interdisciplinary team cooperate through the form of the project, the relationship between the two sides will be closer, the level of research will be more in-depth, the output results can not only be applied to teaching, but also bring direct social and economic benefits to enterprises, and realize the collaborative innovation between schools and enterprises. At the same time, there is a special allocation for the research of the project, which also ensures the smooth development of teaching materials in terms of funds.

##### B. Realizing Cooperation Through Joint Running of Schools

Higher vocational colleges and enterprises run schools jointly, set up a professional steering committee composed of school teachers and enterprise experts, collude professional design, curriculum development and construction, jointly undertake teaching, practical training and other teaching tasks, and adopt the mode of running a school, such as "order type", "middle school factory", "school shop" and so on, which are oriented to enterprises and market needs. For example, in the "order-type" talent training mode, higher vocational colleges need to offer specific courses according to the specific requirements of enterprises for talent demand, especially the practical skills courses with strong industry characteristics and distinctive post characteristics. This requires higher vocational colleges to carry out project-based teaching reform of professional courses according to the specific requirements of cooperative enterprises, or to carry out teaching treatment of courses and training materials developed by enterprises themselves according to the characteristics and learning rules of higher vocational students. In this process, the training goals and needs of both sides are the same, so we can form a close interdisciplinary team to jointly develop the curriculum of the combination of industry, college, research and application, and to compile the higher vocational teaching materials based on the working process.

##### C. Realizing Cooperative by Employing and Training Double-qualified Teachers

Teachers in higher vocational colleges should not only know the teaching of theoretical knowledge, but also go to enterprises, society, practice the front line, investigate the needs of enterprises for talents, master the vocational qualification standards and the skills of their actual post group work, and will operate skillfully and become veritable "double-qualified" teachers. Cooperation with part-time experts in the development of curriculum compilation teaching materials can not only achieve close cooperation between interdisciplinary teams, but also enable teachers to deeply understand and master the work skills of the actual post group, and increase the professional literacy of full-time teachers in higher vocational colleges. Only teachers with high professional ability can train talents with the same high professional quality.

#### V. CONCLUSION

To sum up, in order to compile teaching materials suitable for higher vocational education, we should first innovate compilation models and ideas, break the original curriculum teaching system of "subject type", break the inherent mode of the original two main participants of teaching and learning, reset the development path, innovate the contents and forms compilation, and highlight the characteristics of higher vocational education. The content of curriculum of the combination of industry, college, research and application in higher vocational education should be the process of teaching typical work tasks and designing them as learning tasks. The content of learning work task is that the "typical working process of occupation" and the "learning goal" of the curriculum, the two gradually approach and achieve



coordinated results. The knowledge structure of the combined curriculum of industry, college, research and application in higher vocational education is essentially a fixed structure in the working process. It determines the order and mode of experience and knowledge construction in the curriculum, and also determines the structure of each learning task (item) in its teaching materials. The compilation of learning tasks can be organized according to the structure of "Task Description→Task analysis→Relevant knowledge→Task implementation→Task assessment→Expansion and improvement→Self-test and practical training after class". Finally, through the cooperation between schools and enterprises, an interdisciplinary compilation team is set up to ensure the quality of the teaching materials compiled by the combination of industry, college, research and application, and to achieve the goal of cultivating talents in higher vocational education.

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