Research on the Multi-modal Digital Teaching Model Centered on Higher Vocational Learners

Yujing Qiao[a*], Ning Lv[b], Janhong Zhang[c]

School of Mechanical Engineering, Yangzhou Polytechnic College, Yangzhou 225009, China;

[a*]qiaoyujing@sina.com;[b]ning_lv@yzpc.edu.cn;
[c]527108495@qq.com
corresponding author:Yujing Qiao

Abstract. In the context of the development of digital technology, vocational colleges, as an important front for cultivating high-level vocational skills talents, are bound to undergo changes in their education and teaching. In order to study the learner-centered digital teaching model and cultivate high-quality vocational talents with digital literacy, a learner-centered multimodal digital teaching method for higher vocational education is proposed. By combining digital teaching resources, designing multimodal teaching activities, and constructing multimodal assessment systems, personalized learning support can be provided. After undergoing "learning-oriented transformation," tasks are transformed into "learning-oriented" ones that serve as effective carriers for curriculum implementation. By utilizing digital resources, the goal of curriculum teaching is achieved and students' professional skills are developed.

Keywords: Higher Vocational Education; Digital Teaching; Multi-modal Teaching; "Learning-oriented" Tasks;

1 Introduction

Today, the digital transformation of education has developed into a new requirement to adapt to economic and social development, solve the contradiction between supply and demand of talents and social development, and improve social productivity [1]. The core of digital transformation in education is to promote the digital transformation of all factors. The various elements of the total factor design in the process of teaching and learning, including teaching philosophy, training objectives, educational content, teaching modes, evaluation methods, teacher competencies, learning environments, etc [2]. Unlike undergraduate education, higher vocational education focuses more on technical and vocational education, emphasizing skills development and adopting a teaching model that combines practical operation with theoretical learning. Under the learner-centered teaching philosophy, the multimodal digital teaching model is the practical subject to realize this teaching philosophy, and is more suitable for digital teaching in higher vocational education.

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The concept of teaching is under the category of didactics, which is a term in English and German. It was first proposed by the 17th-century German educator Ratzeburg and the Czech educator Comenius. Its original meaning can be understood as the "art of teaching"[3]. The basic categories of instructional theory usually include teaching objectives, teaching content, teaching methods, and teaching media [4]. Student-centered digital teaching is an educational method aimed at better meeting students' learning needs, interests, and learning styles through technology and digital tools [5]. In the context of digital teaching reform, student-centered teaching is the process of placing students at the center of the teaching process. The fundamental change in teaching philosophy is an attitude towards students, rather than the traditional absolute relationship between teaching and learning, or between teachers and students [6]. It is a relationship of mutual respect and mutual learning. The cultivation of students' personality, the improvement of their comprehensive quality, the ability to analyze and solve problems, and the improvement of their learning quality are regarded as the purpose of teaching [7]. To achieve the aforementioned teaching objectives and meet the training needs of higher vocational schools, this article proposes a multimodal teaching method based on "learning-oriented" tasks, which enables students to master problem-solving methods and thereby learn how to learn. The national virtual simulation platform is utilized to provide beneficial practice.

2 The connotation of the construction of multimodal teaching mode in higher vocational education under digitalization

In the era of industrial intelligence, the way of conveying information and expressing meaning has evolved from relying solely on words to requiring the use of various senses to construct meaning, thus multimodal teaching emerges as the times require. Digital technologies such as VR and holographic technology have promoted more multimodal representations of meaningful content, teacher-student interaction, and interactions between teachers, students, platforms, and learning resources [8]. The so-called multimodal teaching model refers to a teaching method in which teachers integrate language, images, actions, sounds, and other symbols to construct meaning in a multimodal learning environment, form multimodal learning resources, and guide students to interact with multimodal learning resources and multimodal learning environments through multimodal tasks, in order to achieve the most effective input and recognition of multimodal information awareness and ability, and enhance students' higher-order thinking skills. With the continuous development of AI technology, such as with the help of ChatGPT or similar technologies, it is easier to generate multimodal resources for learning resources [9]. The multi-modal teaching model encompasses multiple elements such as training objectives, educational content, evaluation methods, and teaching environments. This study analyzes the entry point and application of multimodal teaching mode in vocational education.

The student-centered multimodal teaching model is a complete reflection of the curriculum teaching method. Student-centered curriculum teaching is the basic unit of professional teaching. Course assessment provides a direct source of data for evaluating

the achievement of graduation requirements. The curriculum is the last mile to ensure the achievement of graduation requirements. This requires classroom teachers to understand the connotation of student-centeredness and thoroughly grasp the concept. The digital construction of the classroom is subject to the structural space of the field, and the process is full of "variability" and "constructivity". Therefore, considering the classroom field from a holistic and systematic perspective, not only the interrelationships between the main participants (students and teachers) but also the structure of the learning space (digital and physical) should be taken into account.

At the level of field structure, the structure of classroom digital transformation is a new structure with digital characteristics that arises from the connection of data, digital technology, physical space, and educational subjects, and from this, digital teaching environments, new teaching and learning methods, and virtual and real learning resources are derived. At the level of field relationships, the development of digital technology and its application in the classroom have had an impact on the teacher-centered classroom model. Teachers have transformed from knowledge lecturers to learning guides, helpers, and mentors who embody the idea of "serving student learning" and need to provide suitable services based on student needs from their perspective. Therefore, the construction of a multimodal digital teaching model should be based on the generation of the concept of "learning services" that conforms to the practical logic of educational digital transformation.

3 Learner-centered multimodal digital teaching mode design.

To achieve the construction of multi-modal digital teaching, it is necessary to clarify the elements of the teaching scenario first. In addition to the teaching subject, teachers and students, the four major elements of the teaching scene are teaching content, teaching methods, teaching environment, and teaching evaluation.

3.1 Study environmental design

Creating a positive learning environment focuses on creating a personalized integrated digital learning space for learners. The main manifestation of the teaching and learning environment in the information age is shown in Figure 1.

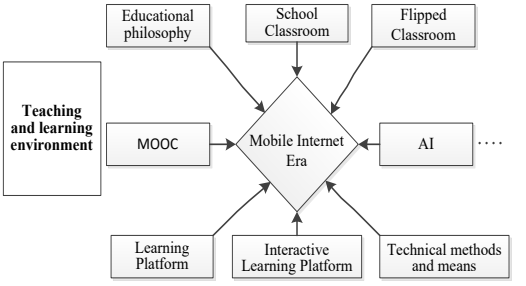

Fig. 1. The teaching and learning environment in the information age

As can be seen from the above figure, from the perspective of educational information and informatization, a good classroom environment is to create an intelligent and efficient classroom using artificial intelligence, big data, learning analytics and other technologies. In the process of teaching, we should pay full attention to the significant features of the intelligent, accurate, instant and personalized classroom under the informationization, and help students transform knowledge into wisdom, so as to promote the generation and development of students' wisdom.

3.2 Teaching process design

In the context of digital transformation, the teaching objectives of higher vocational education place more emphasis on cultivating students' digital competencies, comprehensive qualities, and professional literacy, as well as lifelong learning and career development abilities, in order to meet the needs of the future digital society. In the context of such digital teaching goals, a three-dimensional teaching goal is proposed, and the digital teaching goals for higher vocational education are designed in detail, as shown in Figure 2.

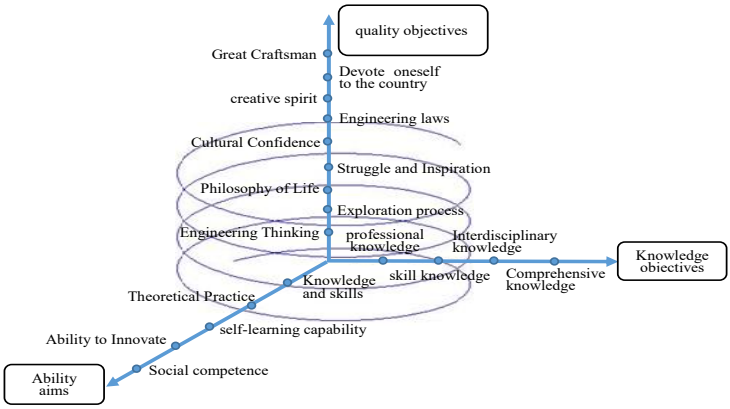

Fig. 2. Detailed design of three-dimensional integrated teaching objectives

Based on the teaching objectives, a realistic question is raised for teachers, that is, whether it is possible to design "tasks" suitable for vocational college students to complete the learning process through doing these "tasks". Practical exploration has found that such "tasks" exist, namely "learning-based" tasks. Therefore, for vocational students, a more suitable teaching method based on learning-based tasks is student-centered teaching and learning. The "learning-oriented" task is transformed from the work tasks contained in the "background work process" based on the curriculum through pedagogical transformation, and it carries the important task of achieving the "three-dimensional" goals of the curriculum. Based on the more generalized characteristics of learning tasks, the multimodal digital teaching model is the best way to achieve autonomous learning in "learning-based" tasks.

The overall process of multimodal teaching/learning design based on "learning-oriented" tasks is shown in Figure 3. As a bridge for learning, tasks "drive" the completion of tasks, thereby achieving the desired learning effect.

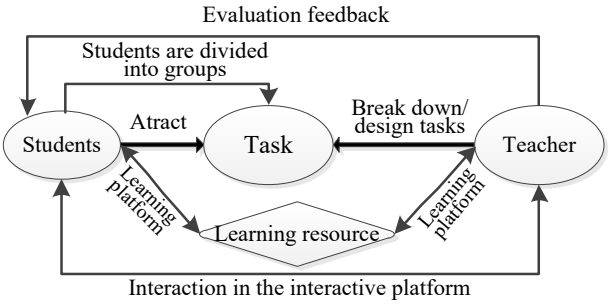

Fig. 3. Multimodal teaching/learning design based on "learning oriented" tasks

The specific settings are as follows:

1. Pre-class preparation: "teaching transformation" should create corresponding learning situations. When the real work task is transformed into a "learning" task, it is necessary to clarify the location and method of obtaining the necessary places, equipment, and information resources (applied knowledge) for completing the task. Teachers can integrate and design multimodal teaching resources according to the teaching situation, content, and needs of teaching activities, creating a "situation" that is not only suitable for task completion but also for learning.
2. In-class learning: In the process of learning in class, teachers are required to design communicative activities to stimulate learners' curiosity. Hearing and vision are the first mode, teacher's body mode is the second mode, and collaborative first mode enables students to focus on understanding the dialogue and video content between peers and teachers, so as to realize students' perception and initial construction of new knowledge. Use multimodal resources and intelligent tools to explore and construct new concepts through experimentation, while simultaneously creating deep knowledge.
3. Post-course evaluation and reflection: evaluating knowledge in interaction. With the rapid development of artificial intelligence and big data, the analysis of learners' learning process has gradually shifted from single-text analysis of accuracy to multimodal data analysis, such as learners' emotional fluctuations, tone, facial expressions, and cognitive order, which can reflect learners' interest and enthusiasm for learning content. Obviously, the evaluation of the multimodal teaching model is no longer just a score, but should be a "structured report", which can not only accurately depict the learners' profiles, but also provide feedback on the achievement of learners' core literacy and higher-order thinking skills, which can provide good guidance for both teachers and students.

4 Some beneficial digital teaching practices

The China National Virtual Simulation Experimental Teaching Course Sharing Platform provides rich teaching and learning materials for students. Based on the courses I teach, I have conducted well-tested experiments in cognitive experiments using the "Industrial Automation Virtual Simulation Comprehensive Experiment", as shown in Figure 4, the human-computer interaction interface of the three-dimensional virtual simulation platform is a part of it.

Fig. 4. 3D virtual simulation platform human-machine interaction

The entire experimental implementation process includes previewing before class, browsing the list of experimental projects, selecting experimental projects, and viewing project information. On this basis, perform the actual operation. If an error occurs during the operation, repeat the previous step. After completing the experiment, students fill out the experiment report and end the experiment.

The teacher guides students' operations online, checks their experimental operations, and finally evaluates their performance using an intelligent evaluation system. The intelligent platform is used to generate the result shown in Figure 5.

From the statistical results of the platform, it can be seen that after completing self-learning according to the preview requirements before class, all students achieved a 100% completion rate for the experiment, with a pass rate of over 85%. If there are wiring errors during the experiment, it can be re-operated, which effectively avoids equipment damage and personal injury caused by wiring errors in the actual field. This also illustrates the superiority of the digital 3D virtual simulation platform.

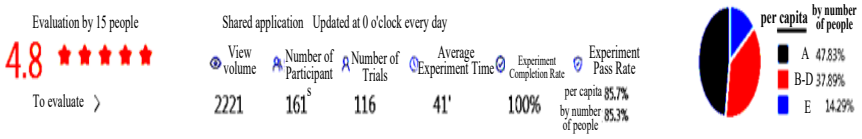

Fig. 5. The use results of the intelligent platform

5 Conclusion

Curriculum is always the core of talent cultivation, and “learning-oriented” task-oriented digital multimodal teaching is an effective carrier to realize student-centered, action-oriented applied knowledge education. Through "learning transformation" to form "learning-oriented" tasks, as an effective carrier of curriculum implementation, digital resources are utilized to achieve curriculum teaching goals and cultivate students' professional abilities, thereby achieving the goal of improving teaching quality.

Acknowledgements

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