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Research on the Hybrid Teaching Strategy of Mathematics in Higher Vocational Education under the Concept of Achievement Orientation

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Abstract: *With the continuous updating of modern educational concepts and the rapid development of educational technology, the results oriented concept and blended learning mode have emerged. Vocational education aims to cultivate specialized talents who can adapt to the needs of production, construction, management, and service on the front line. Mathematics, as a fundamental discipline, plays an indispensable supporting role in the learning of students' professional knowledge and the cultivation of their vocational skills. This article briefly analyzes the problems in vocational mathematics teaching, explores the mixed teaching strategy of vocational mathematics under the results oriented concept, helps improve teaching quality, and promotes students' comprehensive development.*

Keywords: *achievement oriented concept; Vocational mathematics; blended learning*

1. Introduction

With the rapid development of the economy and society and the continuous upgrading of industrial structure, various industries have increasingly high requirements for vocational talents. They not only need to master solid professional skills, but also need to have good comprehensive qualities, innovation ability, and lifelong learning ability. Traditional vocational mathematics teaching often focuses on the explanation of theoretical knowledge, which is not closely integrated with practical professional applications, making it difficult to meet the needs of vocational education for talent cultivation. The OBE philosophy focuses on the learning outcomes that students can ultimately achieve through the educational process, emphasizing that teaching activities should be designed and implemented around these outcomes to ensure that students possess the knowledge, skills, and qualities necessary for their future careers and lives. This concept has led to a shift in education from the traditional teacher centered, knowledge imparting model to a student-centered, ability building model. Therefore, based on the results oriented concept, exploring the mixed teaching strategy of mathematics in higher vocational education, strengthening the integration of mathematics teaching and professional teaching, and enhancing students' mathematical application ability have become urgent needs to promote the development of higher vocational education and cultivate high-quality vocational talents.

2. The Problems of Blended Teaching in Higher Vocational Mathematics

2.1 Teaching has become superficial

In blended learning of mathematics in vocational colleges, some teachers have not fully understood the connotation of blended learning and only regard it as a simple combination of online resources and offline classrooms. When teaching online, teachers only copy traditional teaching content onto online platforms, allowing students to learn independently through recording videos or pushing courseware, lacking effective interaction and guidance with students. In offline classrooms, there is no in-depth explanation and discussion on the difficulties and questions of online learning, and the traditional teaching mode is still continued, resulting in the inability to fully utilize the advantages of blended learning, low student learning enthusiasm, and poor knowledge mastery.

2.2 Uneven distribution of online teaching resources

There are significant differences in the construction and allocation of online teaching resources for

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vocational mathematics. Some universities have invested heavily in information technology construction and have abundant and diverse online teaching resources, such as high-quality teaching videos, interactive exercises, virtual mathematics experiments, etc. However, due to limitations in funding, technology, or faculty, some universities lack online teaching resources, with only basic electronic textbooks and a small amount of outdated teaching videos. Even within the same institution, there is an imbalance in online mathematics resources for different majors. Popular majors may receive more resource allocation, while students in relatively unpopular majors may have difficulty accessing sufficient and suitable online learning materials, which to some extent affects the overall improvement of teaching quality and the realization of educational equity[1].

2.3 Lack of hierarchical teaching evaluation

At present, the evaluation system for blended learning of mathematics in higher vocational education is not perfect enough, lacking comprehensive and multi-level evaluation of students' learning process and learning outcomes. The evaluation method is still mainly based on traditional final exam scores, which account for a large proportion, and there is a lack of effective tracking and evaluation of students' performance in the online learning process, such as learning time, enthusiasm for participating in discussions, and quality of homework completion. At the same time, there are no differentiated evaluation criteria for students with different learning abilities and foundations. Students with a good foundation may achieve better grades under traditional evaluation methods, but their advantages in self-directed learning and innovative thinking have not been fully reflected; Even if students with weak foundations make efforts and progress in the learning process, they may not receive the recognition they deserve due to poor final exam results, which is not conducive to stimulating the learning motivation of all students and improving teaching effectiveness.

3. Strategies for Blended Teaching of Mathematics in Higher Vocational Education under the Concept of Achievement oriented Approach

3.1 Determine teaching objectives in reverse based on learning outcomes

The core concept of Outcome Based Education (OBE) is to use the learning outcomes ultimately achieved by students as the starting point and foothold for instructional design and implementation. The primary task of applying the OBE concept in blended mathematics teaching in higher vocational education is to clearly and accurately define the learning outcomes that students should receive after completing the course. These outcomes are not limited to narrow knowledge categories, but widely cover multiple key dimensions such as knowledge application, skill acquisition, thinking ability advancement, and professional ethics shaping. From a macro perspective of career development, different majors have vastly different requirements for students' mathematical abilities. This diversity requires teachers to deeply analyze the job demands and career development paths of each major, in order to clarify the corresponding mathematical ability goals. Based on a precise grasp of the mathematical ability requirements of various majors, teachers need to reverse deduce and establish teaching objectives that are highly compatible with them. Teaching objectives should have clarity, measurability, and accessibility. Clarity requires teaching objectives to clearly and accurately articulate the mathematical knowledge and skills that students need to master, avoiding ambiguity or ambiguity. Measurability means that teaching objectives can be quantitatively evaluated through specific and objective assessment methods, in order to accurately determine whether students have achieved their goals. Accessibility ensures that teaching objectives are within students' existing knowledge and abilities, and can be achieved through reasonable efforts. It is challenging to stimulate students' potential, but not too difficult to deter them. In a blended learning environment, online teaching, with its advantages of abundant resources, flexible time, and the ability to independently control learning progress, can undertake the task of imparting basic knowledge and preliminary practice, and build a basic framework for students' autonomous learning[2]. Teachers can use online platforms to provide systematic and clear mathematical knowledge explanation materials, guide students to engage in self-directed learning, and design diverse online practice questions to provide real-time feedback on learning results, helping students consolidate their knowledge. Offline classrooms organize differentiated teaching activities based on different levels of teaching objectives. For the basic objectives, teachers guide students to carry out activities such as answering questions and analyzing common mistakes in basic knowledge, to strengthen their understanding and mastery of basic knowledge; For the expansion goals, teachers organize students to participate in group discussions,

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project practices, and other activities, guiding them to deeply apply mathematical knowledge to their professional fields, enhance their knowledge application abilities and innovative thinking, and ensure that each student can steadily move towards the established learning outcomes along a path that suits their own characteristics.

3.2 Design teaching content based on professional characteristics

The vocational and specialized characteristics of higher vocational education determine that mathematics teaching in higher vocational education must closely meet the actual needs of each major. Under the guidance of the results oriented concept, carefully designing mathematics teaching content based on different professional characteristics is the key to improving teaching quality and cultivating high-quality professional talents. There are significant differences in the demand for mathematical knowledge and skills among different majors. For example, science and engineering majors typically require students to master advanced mathematics, linear algebra, probability theory, and mathematical statistics to solve problems in engineering calculations, data analysis, signal processing, and more; Liberal arts majors focus more on applying knowledge such as statistics and operations research for market research analysis, resource optimization and allocation. Therefore, when designing teaching content, it is necessary to conduct in-depth research on the curriculum system and job requirements of each major, clarify the application scenarios and roles of mathematical knowledge in each major, and based on this, screen and integrate relevant mathematical teaching content. Teachers can break the inherent pattern of traditional mathematics textbooks arranged according to knowledge systems, take professional practical problems as the guide, organically integrate and optimize teaching content, closely integrate mathematical knowledge with practical problems in professional courses, and construct project-based and case-based teaching modules. For example, in the field of architectural engineering, knowledge of analytic geometry and solid geometry can be combined with practical work such as reading architectural drawings and calculating engineering quantities to design a teaching module called "Architectural Geometry and Engineering Calculation". Through this approach, students can learn and apply mathematical knowledge in solving practical professional problems, enhancing the pertinence and practicality of mathematical learning. In blended learning mode, teachers can integrate online teaching resources according to professional modules and provide personalized learning materials for students from different majors, including professional related mathematical knowledge explanation videos, case analysis documents, online test questions, etc., to help students gain a preliminary understanding of the application scenarios and methods of mathematical knowledge in their respective majors. Offline classrooms focus on in-depth discussions and practical operations around carefully designed professional practical projects or cases[3]. Teachers guide students to use mathematical tools to analyze and solve professional problems. Through group cooperation, project reporting, and other forms, students' teamwork and problem-solving abilities are cultivated, allowing them to truly feel the importance of mathematics in professional learning and career development, enhance their ability to apply mathematical knowledge in professional fields, and achieve effective transformation from learning mathematical knowledge to improving professional skills.

3.3 Exploring the Implementation of Constructivist Teaching Models

Constructivist learning theory holds that learning is the process in which students actively construct a knowledge system through interaction with the learning environment based on their existing knowledge and experience. In the mixed teaching of mathematics in vocational colleges under the concept of outcome oriented teaching, implementing the constructivist teaching mode can help students better understand and master mathematical knowledge, improve learning effectiveness and the quality of learning outcomes. Online teaching platforms provide students with a rich variety of learning resources and vast space for independent exploration. Students can choose appropriate mathematical modules for learning based on their own learning pace, interests, and knowledge foundation. Teachers can use online platforms to create diverse learning scenarios, such as problem scenarios, case scenarios, simulation experiment scenarios, etc., to stimulate students' interest and initiative in learning.At the same time, teachers utilize the platform's online discussion areas, learning communities, and other functions to promote communication and cooperation among students, allowing them to share learning experiences, solve learning difficulties, and jointly build a knowledge system through interaction.The main forms of offline classrooms are group cooperative learning and project-based teaching. Teachers design challenging mathematical problems or project tasks based on students' feedback and needs during online learning. Students work in groups and attempt to solve problems through collaborative learning, discussion and exchange, and practical operations. In this process, students comprehensively

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apply the mathematical knowledge and methods learned online, combined with their own life experience and professional knowledge, to explore different solutions. The teacher closely observes the students' learning process on the side, provides guidance and assistance in a timely manner, encourages students to innovate boldly, and cultivates their teamwork ability, problem-solving ability, and innovative thinking. Through the organic combination of online and offline constructivist teaching models, students continuously enrich and improve their knowledge structure through active exploration, cooperation, and communication, achieving a transformation from passive recipients of knowledge to active constructors. This teaching model fully respects the subject status of students, focuses on their learning process and experience, can effectively improve the quality of students' learning outcomes, and meet the requirements of outcome oriented education for students' ability cultivation.

3.4 Constructing an evaluation system guided by educational goals

Under the results oriented concept, teaching evaluation is a key link in testing students' learning outcomes and measuring teaching quality[4]. To build an evaluation system guided by educational goals, it is necessary to break through the traditional single examination evaluation method and adopt a comprehensive, integrated, and diversified evaluation method to comprehensively evaluate students' development in knowledge, skills, attitudes, and other aspects. In terms of knowledge, in addition to the traditional final exams used to test students' overall mastery of mathematical fundamentals, online periodic testing sessions have been added to achieve real-time dynamic monitoring of students' understanding and application abilities of knowledge in each chapter. After the test, the system automatically corrects and provides real-time feedback on answers and detailed explanations. Students can quickly understand their learning weaknesses, and teachers can accurately grasp students' learning progress and knowledge mastery based on test data, and adjust teaching strategies in a timely manner. In terms of skills, emphasis is placed on assessing students' mathematical application skills. Comprehensive evaluations are conducted through various methods such as organizing professional project practices, mathematical modeling competitions, and experimental operations. Evaluation indicators cover project completion quality, problem-solving ability, and degree of method innovation. Starting from the dimensions of attitude and literacy, teachers should pay attention to students' comprehensive performance throughout the entire learning process, including participation in online learning, enthusiasm for offline group cooperation, attitude and perseverance when facing problems, etc. Through a combination of self-evaluation, peer evaluation, and teacher evaluation, a comprehensive and in-depth assessment is conducted on students' learning attitudes, teamwork spirit, innovation awareness, and self-learning abilities. In addition, the evaluation system should fully reflect dynamism and development, focus on students' growth and progress throughout the entire learning process, give full recognition and encouragement to students with relatively weak foundations but positive learning attitudes and significant progress, and enhance students' confidence and motivation in learning through awarding progress awards, publicly praising in class, and other methods.In this way, a virtuous cycle of mutual promotion between teaching and evaluation is formed, ensuring the efficient achievement of educational goals and laying a solid foundation for students' future career development and personal growth. By constructing such a comprehensive and scientific evaluation system, it is possible to accurately measure the learning effectiveness of students in blended mathematics teaching in vocational colleges under the outcome oriented concept, effectively promoting the continuous and steady improvement of teaching quality[5].

4. Conclusion

In summary, implementing blended learning in vocational mathematics guided by the results oriented concept is not only an inevitable choice in line with the trend of educational reform, but also better meets the learning and development needs of students. In specific teaching practices, teachers can start by reverse determining teaching objectives based on learning outcomes, designing teaching content with professional characteristics as a reference, exploring and implementing constructivist teaching models, and constructing an evaluation system guided by educational goals. They can maximize the value of blended learning teaching models, comprehensively improve teaching quality, and safeguard students' comprehensive development in the future.

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