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Exploration of Stratified Teaching Pathways for Advanced Mathematics in Higher Vocational Colleges: Taking Tarim Vocational Technical College as an Example

Decheng Liu*, Qian Gao*, Linjie Ma, Yue Wu

Tarim Polytechnic, Alar 843300, China

Corresponding author: Decheng Liu, m13657590135@163.com

Abstract: In view of the large difference in higher mathematics learning ability among students in newly built colleges and universities, this paper puts forward the implementation of stratified teaching. Taking Tarim Vocational and Technical College as an example, this paper analyzes the present situation of education and teaching and advanced mathematics teaching in the school and puts forward the implementation path of advanced mathematics-stratified teaching. It mainly includes the selection and compilation of textbooks according to local conditions, the use of information technology means, diversified assessment and evaluation of students, the establishment of extra-curricular tutoring mechanism, the establishment of a group as a unit of help and supervision system, the use and mining of digital teaching resources and other paths to effectively teach students according to their talents and achieve the purpose of education.

Keywords: Higher mathematics; Stratified teaching; Status quo; Exploration; Paths

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1. Introduction

Stratified teaching is a very common, practical and effective teaching mode commonly used in higher vocational colleges, especially for higher vocational colleges in remote areas with large differences in students [1]. Higher mathematics has a high degree of abstraction, strict logic and wide applicability. The structure of students determines the difficulty of students learning higher mathematics. The unified teaching method can no longer adapt to and meet the requirements of the new higher vocational colleges with complex structures, large differences and insufficient teachers. It can not only improve the comprehensive ability of teachers' education and teaching but also improve and change students' learning habits and interests to achieve the purpose of educating students in accordance with their aptitude.

2. Current situation of higher mathematics teaching in higher vocational colleges

2.1. Current situation of education and teaching in Tarim Vocational and Technical College

2.1.1. The school has been running for a short time and the overall teaching level is not high

Tarim Vocational and Technical College was established in April 2020. It is a comprehensive higher vocational college with multiple disciplines and belongs to Alar City, the first Division of the remote Xinjiang Production and Construction Corps. The number of students in the three years of running the college is 358 to 6,500 in September 2023, and there are 178 full-time teachers. With the rapid expansion of the school scale, the quantity and quality of teachers cannot keep up with the growth rate of students. Moreover, most of the teachers rely on recruitment. Education and teaching work experience is seriously insufficient, and education and teaching can only ensure normal operation.

2.1.2. The structure of students is complex and diverse

There are 6,500 students in the school, 60% of whom are ethnic minority students, most of whom come from the remote and backward Hotan, Kashgar and other four prefectures in southern Xinjiang. The students have limited Mandarin proficiency and weak basic knowledge. The way of enrollment is single enrollment and unified enrollment. The students are mainly secondary vocational and high school graduates [2], and the students outside Xinjiang account for 31.6%. The mixed class of Minhan students and students inside and outside Xinjiang is adopted to study together. The highest score of the college entrance examination is 438 points, and the lowest score is 178 points. To ensure the learning effect of students, stratified teaching is the necessary means to implement individualized teaching.

2.1.3. The quantity and quality of teachers are insufficient

Tarim Vocational and Technical College has 4 advanced mathematics teachers, 2 of whom are in administrative positions. They come from secondary vocational schools and lack teaching and management experience in colleges and universities. The other two are new teachers, who just graduated from the university, the professional level is not high, and education, teaching, student management ability and experience are seriously insufficient, especially since the difficulty of large classes is greater, only to ensure the completion of teaching tasks, teaching effect and quality is difficult to guarantee.

2.2. Current situation of higher mathematics teaching

2.2.1. Insufficient attention

As a public basic course in higher vocational colleges, the higher mathematics curriculum is not well understood and paid enough attention to. It focuses too much on the establishment of professional core courses and thinks that its role is not significant. The opening of courses and class time arrangement is relatively arbitrary, class time arrangement is small, and the investment in teachers and course construction only meets the needs of the operation.

2.2.2. In large-class teaching, individuation is not prominent

With the rapid increase in the number of students, the number of teachers is far from meeting the needs of normal classroom teaching, so teachers can only adopt the way of large class teaching. Large-class teaching has a large number of students and is difficult to manage. Most of them are taught by teachers and passively accepted by

students. Due to the limited class time, large number of students, and little participation of students in the class, it is acceptable for students with good foundation, but it is difficult for students with weak foundation to keep up, and even causes students to hate learning. The teaching purpose is difficult to achieve well.

2.2.3. Unified teaching materials, teaching content, no pertinence

The school has only been established for 4 years, and it has operated independently in the mode of colleges and universities for less than 3 years. The teaching experience and professional knowledge are insufficient, and there is no ability to develop teaching materials. The selection of teaching materials for higher mathematics is the "13th Five-Year Plan" national vocational education textbooks commonly used throughout the country. At present, the school has 20 majors, and now the use of unified teaching materials, unified teaching content, teaching syllabus, teaching plan and teaching objectives, the pertinency of the profession is basically no, at the same time, the selection of textbooks and our students are not high, the general content is more difficult, students are more difficult to learn, the teaching effect is not good. For example, at the beginning of the use of Hou Yaohe edited "Higher Mathematics" (fifth edition) textbooks, many important points, teaching content arrangement and selection of exercises more difficult, in only one year. Hu Guirong and Yi Tongmao wrote "Higher Mathematics" (third edition), the knowledge points are still too many, and the teaching content arrangement and selection of test questions, and example questions are relatively simple, but it is not enough to match the level of the current students.

2.2.4. The teaching method is single, the teaching effect is not outstanding

The content of higher mathematics is mainly knowledge points such as abstract functions, and simple teaching cannot adapt to the reality that students are weak in mastering knowledge. At the same time, young teachers, who lack experience in college education, teaching and management, are in the stage of standardization, standardization of teaching content, teaching plans, teaching courseware, teaching design, etc. The teaching methods and methods are mainly simple PPT teaching, and there are few researches on targeted and diverse teaching methods, so the teaching flexibility is insufficient and relatively boring. Students' enthusiasm and initiative in learning have not been fully mobilized, and the teaching effect is not obvious.

3. Implementation path of stratified teaching of higher mathematics

3.1. Select and compile teaching materials to make teaching materials and content digital, professional, diversified and hierarchical

The selection and compilation of higher mathematics teaching materials are based on the principle of "sufficient" to sort out and adjust the teaching content, to make the teaching practical, professional, diversified and hierarchical, and to realize the matching of teaching materials for talents. According to the actual development of school education and teaching, different teaching materials are selected and compiled in different development periods to meet the current teaching [3].

The newly built school mainly selects the existing published textbooks. First, it selects the general textbooks suitable for the difficulty of most students in the school, with appropriate difficulty and relatively complete knowledge points. Second, teachers sort out the teaching content according to the different characteristics and needs of the major, so that the teaching content of higher mathematics corresponds to the professional needs, and the teaching content is specialized [4]. Third, according to the types of higher mathematics teaching materials in

the market, choose the higher mathematics teaching materials suitable for the major to better serve professional teaching [5]. Mature schools mainly compile school-based textbooks for higher mathematics, combine the actual situation of the students in the region, sort out the teaching knowledge points, integrate the curriculum ideological and political knowledge points suitable for the teachers and students of the school and the related content of professional courses, select or compile appropriate examples and test questions, and establish the learning scope and difficulty of students at different levels. The teaching content, teaching methods and means are more appropriate to the students' reality, and the teaching effect is the best.

3.2. With information technology as the means, the teaching methods are diversified

In the current society with the rapid development of information technology, integrating information technology into teaching is the most effective and common way to carry out higher mathematics teaching at present, considering the weak foundation of students, the difficulty of learning and the characteristics of liking new things and new technologies. With micro-lessons, video, animation, Matlab, GeoGebra geometric drawing board and other multimedia information means to abstract knowledge points in a more concrete, visual, visual way to present to students, making the teaching class rich, flexible, more convenient for students to accept, and greatly improve students' interest in learning higher mathematics. How to improve teachers' information technology ability has become the top priority [6]. Organize teachers to participate in the learning and training of education, teaching and information technology inside and outside Xinjiang to broaden their horizons and improve their comprehensive teaching ability and quality [7]. Taking the teaching ability competition as the starting point, teachers are required to actively participate in teaching competitions at all levels, constantly improve their information-based teaching ability and level, further enrich teaching methods and improve teaching effects [8]. It is also important to give full play to the role of school teaching and research groups inside and outside Xinjiang, adopt collective lesson preparation, discussion and learning methods online and offline to form unified and standardized teaching materials that meet the actual conditions of the school, such as teaching design, information technology application, teaching methods and methods, so as to facilitate continuous improvement in practice, form teaching design and teaching methods suitable for themselves, and maximize the efficiency of students' learning. With the help of university MOOCs and other learning platforms, choose this aspect of the course learning, to achieve self-continuous improvement [9].

3.3. Diversification of student assessment

The overall level of students is not high, the level is different, the difference is relatively large, the assessment should be diversified, not only on the performance of heroes. According to the actual situation of students, the course assessment of higher mathematics students should be diversified, routine and hierarchical. Students at different levels should adopt the assessment and evaluation methods suitable for the students at this level, which are mainly based on the usual performance and supplemented by other methods such as examinations [10]. For example, the evaluation content includes the student's usual performance (classroom performance, homework, attendance, online task participation and completion degree, etc.) accounting for more than 60%, exam scores account for about 20%, and other grades account for 10%. At the same time, special contributions or students' participation in activities and competitions are set as additional grades to form diversified assessment and evaluation methods. It is conducive to the cultivation of comprehensive talents with comprehensive development of morality, intelligence, physical fitness and labor.

3.4. Establish after-class tutoring system

According to the actual situation mastered by students, establish a system of after-school tutoring 1-2 times a week [11]. According to the difficulty of the problem, the tutoring staff is composed of teachers and selected some students who are caring, capable and have a solid grasp of knowledge, to ensure the quality of tutoring. The way of counseling is based on offline counseling and supplemented by online counseling, taking care of students at different levels [12]. The content and scope of counseling students are divided into different levels according to each group of students' learning and mastering knowledge and the strength of students' learning ability [13]. To ensure the quality of counseling, establish a monthly assessment system, supervise and inspect the quality of counseling every month, ensure the quality of teaching and learning, and ensure that there is no shortage of students, and consider the assessment, excellent evaluation, awards and grants for students who do better, so as to enhance the enthusiasm of students to help others.

3.5. The help and supervision system shall be established in groups

According to the fact that the student group is composed of Minhan students and students from inside and outside Xinjiang, combined with the characteristics of large differences in mathematical knowledge foundation and learning habits, the students in this class are evenly divided into good and poor students in Chinese and foreign students, and the way is carried out with the group's guidance as the main and cross-guidance as the supplement. A three-level help and support system can be established. Teachers focus on guiding and helping minority students in each group (students with good foundation and students with poor foundation), students with good foundation guide students with average foundation and students with poor foundation, Han students and ethnic students help in pairs, students at each level set the lowest goal, and supervise the results of help through daily testing. The students with outstanding achievements will be given preference in the final assessment and the regular evaluation and will be commended at the same time.

3.6. Make full use of and explore digital teaching resources

Advanced mathematics is universal, basic and universal, and online and offline teaching resources are abundant. Digital teaching resources of advanced mathematics on the online platform of "Internet + Education" can be fully selected, utilized and mined, and mixed teaching modes of online and offline students can participate in the class [14]. To achieve the diversity and pretentiousness of teaching content and teaching methods, and the flexibility of teaching design, one can reduce costs, take care of students at every level, improve students' interest in learning, and improve teaching effect and quality [15].

Disclosure statement

The authors declare no conflict of interest.

References

[1] Ningxia Y, 2023, Study on Learning Adaptation Problems and Countermeasures of Ethnic Special College Students in Guangxi, thesis, Guangxi Normal University.

[2] Liang C, 2024, Status Quo, Problems and Countermeasures of Logistics Management in Newly Upgraded Higher Vocational Colleges – A Case Study of Jiangsu Vocational College of Tourism. China Transition from Military to

Civilian, 2024(1): 75–76.

[3] Qi X, Qu S, Zhao Q, 2024, Research on the Construction of Professional Connotation and Dynamic Adjustment Mechanism in Higher Vocational Colleges. Modern Vocational Education, 2024(25): 89–92.

[4] Fu G, Gao L, 2024, Research on Curriculum Ideological and Political Cooperation Education Strategy in Higher Vocational Colleges from the Perspective of Education Digital Transformation. Modern Vocational Education, 2024(25): 25–28.

[5] Ma X, 2022, Research on Characteristic Specialty Construction of Higher Vocational Colleges in China Under the Background of Integration of Industry and Education, thesis, Guangxi University.

[6] Tang Y, Qian Y, 2024, Research on Training Model of Digital Accounting Talents under the Background of "Big Data and Artificial Intelligence." Science and Technology Wind, 2024(24): 43–45.

[7] Deng P, Zhao X, 2024, Research on the Construction of "Big Ideological and Political Course" Empowered by Digital Red Resources in Universities. Journal of Hunan First Normal University, 1–8.

[8] He D, Luo X, Song J, 2024, Teachers in Colleges and Universities Based on the Wisdom Tree Platform Hybrid Teaching Ability to Promote Research. Journal of Language and Cultural Studies, 32(5): 92–95.

[9] Shan X, 2023, Research on the Teaching Function of Digital Textbooks, thesis, Yunnan Normal University.

[10] Li X, 2023, Research on the Construction of Online and Offline Teaching Model of Higher Mathematics. Journal of Hubei Open Vocational College, 36(17): 154–156.

[11] Peng H, Hu C, Li J, et al., 2024, Construction of Training Model for Improving Students' Innovation Ability Based on "Competition + Project" Practical Activities – A Case Study of Materials Majors. Theoretical Research and Practice of Innovation and Entrepreneurship, 7(12): 121–124.

[12] Zhao L, 2023, Research on Case Mix Class Inquiry Teaching Strategy in High School Math, thesis, Southwest University.

[13] Wang L, Wang Y, Jiang Y, et al., 2024, "Student-Academic Linkage" to Help Cultivate Innovative Talents in Colleges and Universities – A Case Study of College of Pharmacy, Hangzhou Normal University. Talent, 2024(12): 165–168.

[14] Wang H, Hu C, Zhu J, 2024, Reform and Exploration of Mixed Teaching of "Higher Mathematics" – A Case Study of Zhangjiajie University. Science and Technology Wind, 2024(19): 145–147.

[15] Shang M, Zhang Z, Luo A, et al., 2024, Exploration on Online and Offline Mixed Teaching Reform of Civil Engineering Materials Course – Under the Application-Oriented Training Model. Modern Commerce and Industry, 45(18): 262–263.