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A Study on the Construction of a Diversified Evaluation System for Mathematics Classroom Teaching in Vocational Universities

Shi Wang*

Hainan Vocational University of Science and Technology, Haikou 571126, China

Corresponding author: Shi Wang, ws10121@126.com

Abstract: Undergraduate vocational education is becoming increasingly important in developing modern economy and technology, especially the key role of mathematics courses as a fundamental discipline in cultivating applied talents. The evaluation system of undergraduate vocational mathematics education mostly adopts a single final examination model, which does not fully reflect the students' practical ability, innovative thinking and vocational skill needs. Therefore, it is particularly urgent to establish a diversified evaluation system. This system should focus on students' comprehensive skills, including problem-solving, teamwork and self-directed learning, to promote the integration of mathematical knowledge with practical career needs. Research has shown that the multidimensional nature of evaluation and the establishment of feedback mechanisms can effectively motivate students, improve learning outcomes and ultimately promote the quality of undergraduate vocational education.

Keywords: Undergraduate vocational education; Mathematics classroom teaching; Diversified evaluation system; Quality of education; Evaluation feedback

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1. Introduction

As a part of the higher education system, undergraduate vocational education has the task of cultivating applied talents with vocational skills and practical abilities. With the development of the modern economy and technology, the demand for highly qualified talents in society is constantly increasing, and the position of undergraduate vocational education in the talent training system is becoming increasingly important. The education reform calls for improving the quality of undergraduate vocational education, especially in cultivating students' vocational skills and practical abilities. It is necessary to promote the improvement of teaching quality through a scientific and reasonable teaching evaluation system [1].

As a fundamental subject in vocational education, mathematics runs through many vocational courses. Mathematical knowledge is not only the basis for cultivating students' logical thinking and problem-

solving skills but also plays a key role in mastering many vocational skills, such as engineering technology, information processing and economic analysis. Through mathematics education, students can build a solid theoretical foundation and learn to apply mathematical knowledge to solve practical problems. Therefore, mathematics courses have an irreplaceable importance in the vocational basic education system.

At present, the evaluation system of vocational undergraduate mathematics teaching mostly adopts the traditional single evaluation method, which mainly relies on final examination scores as the basis of students' ability assessment. This model cannot fully reflect students' learning process, practical ability and innovative thinking ability [2]. In addition, the existing evaluation system does not fully take into account career needs and does not comprehensively measure students' comprehensive abilities, such as teamwork and problem-solving skills. Therefore, reforming the existing evaluation system and building a diversified evaluation model has become an urgent need to improve teaching effectiveness.

Diversified assessment is not only an assessment of students' mastery of knowledge but also a comprehensive examination of their learning attitudes, practical skills, ability to work in teams and innovative thinking through different dimensions of assessment methods [3]. It helps to cultivate students' awareness of self-directed learning and to enhance their adaptability in complex professional environments. A diversified assessment system can motivate students to develop comprehensively and better cope with future professional challenges.

Vocational undergraduate mathematics education must not only provide students with basic knowledge but should also be combined with practical vocational needs to help students transform mathematical knowledge into practical skills. Through the establishment of a diversified evaluation system, it is possible to better integrate students' classroom learning with their practical work applications and make mathematics education truly serve the cultivation of vocational skills. The reform of the evaluation system will promote the organic integration of teaching content and professional requirements, and improve the quality of undergraduate professional education.

2. Analysis of the current situation of mathematics teaching in vocational education and training

2.1. Characteristics of mathematics teaching in vocational education and training

2.1.1. Career orientation and practicability of mathematics course

An important difference between mathematics teaching in vocational universities and that in ordinary universities lies in its vocational orientation. Mathematics courses should not only impart theoretical knowledge but also focus closely on students' future career needs and apply knowledge to practice. The practical nature of mathematics is reflected in many vocational courses. Students need to have a certain level of mathematical application skills to deal with the technical problems they encounter at work. Therefore, career orientation and practicality have become the core characteristics of mathematics education for vocational students.

2.1.2. Analysis of differences in students' mathematical background

Vocational students come from a wide range of backgrounds and their mathematical background is uneven. There are both students with a good mathematical background and groups with weak mathematical skills. This fundamental difference poses a great challenge to teachers in the teaching process and requires them to take

into account the needs of students at different levels. This difference places higher demands on the design of teaching content and the choice of teaching methods. Teachers need to adopt flexible teaching strategies to help students improve comprehensively.

2.1.3. Challenge of combining mathematics with vocational skills

Although mathematics plays an important role in the development of vocational skills, it is not easy to combine mathematical knowledge with practical vocational skills. When learning mathematics, many students find it difficult to relate abstract mathematical theory to specific professional practice, which leads to their lack of interest and initiative in learning. The main challenge in teaching is how to make students understand the application of mathematics in the professional field through actual cases and project design to improve their professional skills.

2.2. Deficiencies of current teaching evaluation system

2.2.1. Limitations of single-score evaluation

At present, the evaluation system of vocational undergraduate mathematics courses is mainly based on the final examination results, which relies too much on the paper-and-pencil test of students' theoretical knowledge and ignores the evaluation of practical ability, innovative thinking and vocational skills. A single performance evaluation method cannot fully reflect students' learning results, especially the examination of students' comprehensive ability is relatively weak, which leads students to pay excessive attention to test results and neglect the cultivation of vocational skills.

2.2.2. Lack of evaluation of students' practical ability and innovation ability

The existing evaluation system focuses more on the mastery of theoretical knowledge, ignoring students' performance and ability in practice. Mathematics, as a basic course in undergraduate vocational education, should pay more attention to how students apply knowledge in practical work, while the existing evaluation system lacks the evaluation of students' practical ability, problem solving ability and innovation ability. This deficiency limits the development of students' comprehensive quality and cannot meet the needs of modern employment.

2.2.3. Imperfect evaluation and feedback mechanism

In the teaching process, timely feedback is very important to improve the learning effect of students. However, the feedback mechanism is relatively weak in the current evaluation of vocational undergraduate mathematics teaching. Teachers usually give grades only after the final examination, which lacks continuous feedback on students' learning process and cannot effectively help students find and improve learning problems. This evaluation model leads to a lack of interaction between teachers and students and also limits students' opportunities for self-reflection and improvement.

2.3. The gap between students' learning needs and professional competence requirements

2.3.1. Diversity of vocational skill needs

With the rapid development of industry, different professions have different needs for mathematical skills. The learning needs of vocational students are not limited to the mastery of mathematical theory but also require the ability to deal with complex problems in the actual working environment. This diversity of needs requires the

teaching evaluation system to be more flexible in reflecting the development of students' vocational skills in different areas, but the current evaluation system cannot fully adapt to this diversity of needs.

2.3.2. Insufficient correlation between the application of mathematics and vocational skills

Although mathematics is widely used in many vocational fields, the relationship between mathematics education and vocational skills is still not close enough. It is often difficult for students to relate their mathematical knowledge to their future career needs, which results in insufficient motivation to learn. The current teaching and assessment system does not effectively bridge the link between the mathematics curriculum and vocational skills, which makes students feel at a loss when faced with practical problems.

2.3.3. Students' interest and initiative in learning

The abstractness of the mathematics curriculum makes many students afraid of difficulties in the learning process, especially when they cannot understand the relationship between the mathematics curriculum and future professional needs, and students' learning interests and initiative decrease. The lack of unity and practicality of teaching evaluation also leads to students' inability to get a sense of achievement through diverse learning and display channels, which affects their enthusiasm for learning.

3. Theoretical basis of a diversified evaluation system

3.1. Theory of educational evaluation

3.1.1. The role of evaluation in the educational process

Educational evaluation is an indispensable part of the teaching process, which aims to help teachers and students understand the teaching effect and learning outcomes. Evaluation is used not only to assess students' academic performance but also to guide teachers to adjust teaching strategies and improve teaching design. In addition, the process of evaluation can promote students' self-reflection and growth, and encourage students' continuous improvement. Therefore, evaluation plays an important role in stimulating students' potential and improving the quality of teaching. However, an over-reliance on examinations or a single evaluation method may lead to students' learning motivation being limited to the examination and the cultivation of practical skills being neglected.

3.1.2. Multidimensional aims of teaching evaluation

The purpose of teaching evaluation is not only to evaluate students' academic performance but also to examine their problem-solving ability, innovative thinking, teamwork, and other skills. Through the evaluation system of multidimensional objectives, it can have a more comprehensive understanding of students' comprehensive quality, and carry out personalized guidance for different dimensions. However, the implementation of multi-dimensional evaluation is complicated, especially how to ensure the consistency and fairness of evaluation standards is a challenge to overcome.

3.2. Theory of multiple intelligences

3.2.1. Gardner's theory of multiple intelligences and its implications for educational assessment

Gardner's theory of multiple intelligences states that intelligence is not a single thing, and individuals have many different types of intelligence, such as logical-mathematical intelligence, linguistic intelligence,

spatial intelligence, and so on. This theory suggests that the evaluation of teaching should pay attention to the development of students' multiple intelligences, not just the traditional evaluation of academic ability. Through a variety of evaluation methods, such as project display, case analysis, and team cooperation, it can better explore students' different abilities. However, ways to effectively identify and motivate each student's different types of intelligence in the teaching process need to be further explored [4].

3.2.2. Impact of intellectual diversity on mathematics learning

Students display different types of intelligence in mathematics learning. Some students excel in logical reasoning, while others have advantages in visual-spatial perception. Through the assessment method of multiple intelligences, teachers can help students to find their learning methods and improve the effectiveness of mathematics learning under personalized guidance. However, there is a great need for resources to implement the assessment of multiple intelligences, which places higher demands on teachers' ability to design and implement lessons [5].

3.3. Formative and summative assessment

3.3.1. Meaning and practice of formative assessment

The purpose of formative assessment is to help students continuously improve their learning methods and learning effects through continuous evaluation and feedback in the teaching process. This type of assessment can identify problems in students' learning in time and provide targeted guidance through personalized feedback. Its advantage is that it can provide students with opportunities for continuous improvement and enhance their learning ability and self-reflective awareness.

3.3.2. Characteristics and use of summative assessment

Summative assessment is usually carried out at the end of a term or course to assess the overall learning outcomes of students. It can help teachers assess students' mastery of course content, but its limitation is the lack of real-time feedback on students' learning process. Summative assessment is usually based on examination results, which tend to ignore students' practical application skills and innovative thinking.

3.3.3. Combining formative and summative assessment

Combining formative assessment with summative assessment can provide a comprehensive assessment of student's learning process and outcomes. By introducing formative assessment into the teaching process, teachers can dynamically adjust teaching strategies and test students' overall ability through summative assessment at the end of the course. This combined method can make up for the shortcomings of the single assessment method, but the requirements for its implementation are high. Teachers need to have the ability to flexible teaching design and reasonable arrangement of evaluation time nodes.

3.4. Evaluation feedback theory

3.4.1. Function and value of feedback in teaching

Effective assessment feedback can encourage students to improve their learning style and increase their self-efficacy. Feedback is not only to point out students' mistakes but also to provide suggestions for improvement to help students understand the gaps in their knowledge. Feedback plays a guiding and stimulating role in teaching and can help students to make continuous progress. However, the quality and timeliness of feedback

have a direct impact on its effectiveness. Teachers need to ensure that feedback is targeted and that students receive timely support when they need it.

3.4.2. Impact of feedback quality on student learning

High-quality feedback is not only about correcting mistakes but also about guiding students' thinking and learning habits. Through specific and clear feedback, students can make more directional improvements and improve the learning effect. Low-quality feedback may lead to students' loss of learning motivation and even frustration. Therefore, when designing the feedback mechanism, teachers should consider students' individual differences and learning progress, and provide personalized feedback suggestions.

4. Construction of a diversified evaluation system for mathematics teaching

4.1. Basic principles for the design of evaluation systems

4.1.2. Objectivity and impartiality

The first principle of the evaluation system is objectivity and impartiality. Objectivity ensures that the evaluation process is not influenced by teachers' personal biases or emotional factors and that the evaluation tools should be standardized and consistent. Fairness requires that all students accept the evaluation under the same standard to avoid unfair evaluation results due to differences in students' backgrounds, learning styles, or performance. By rationally designing the type of questions and examining students' learning effectiveness from different angles, it can be ensured that students' abilities are fairly reflected. Vocational undergraduate education emphasizes the practicality of skills, so the objectivity of practical assessment is particularly important.

4.1.2. Multidimensional and comprehensive

The construction of a diversified evaluation system requires a comprehensive coverage of students' abilities, including basic mathematical knowledge, application ability, practical problem-solving ability, innovative thinking, and so on. The mathematics course for professional students should not only evaluate students' academic ability but also pay attention to students' comprehensive qualities in team cooperation, professional skills, and communication ability. The evaluation system can comprehensively evaluate students' learning outcomes through tests, classroom performance, project practice, case analysis, and other forms to ensure multidimensional evaluation. Especially in vocational undergraduate education, the evaluation system should reflect the comprehensiveness of students' practical workability and learning achievements.

4.1.3. Practicability and flexibility

The mathematics evaluation system of vocational undergraduate education should fully consider the practical application of mathematics knowledge in the workplace, and ensure that the evaluation content can truly reflect the students' application ability in the future workplace. The design of evaluation tools should be flexible and can be adapted according to the differences of different teaching levels, teaching contents, and student groups. For example, different levels of evaluation tasks can be adapted for students with different backgrounds. The embodiment of flexibility is not limited to the diversification of the evaluation tools but also includes the adjustability of the evaluation frequency so that teachers can optimize the evaluation methods at any time according to the teaching progress.

4.1.4. Continuity and interactivity

Evaluation is not only a tool for the final summative examination but also a continuous tool that can reflect students' progress throughout the learning process. Through continuous and periodic evaluation, teachers can identify the dynamics of students' learning on time and adjust their teaching strategies. Mathematics teaching in vocational undergraduate education needs to be integrated with actual project and enterprise cooperation, so the evaluation should also be interactive, so that students, teachers, and enterprises can participate in the evaluation process together to form a friendly feedback interaction. Through the interactive feedback between teachers and students, we can help students to improve their learning strategies and also encourage teachers to improve their teaching methods.

4.2. Diversifying the subjects of evaluation

4.2.1. Teachers' classroom evaluation

Teachers' classroom evaluation is not limited to academic performance but also includes the consideration of students' learning attitude, participation, problem-solving thinking mode, and other comprehensive qualities. Teachers should combine observation in daily teaching activities to dynamically evaluate students' comprehensive abilities. The evaluation of vocational undergraduate mathematics can combine the application of mathematics and vocational skills, such as the performance of applying theoretical knowledge to project practice as one of the evaluation criteria. Through multi-dimensional classroom evaluation, teachers can more comprehensively grasp students' comprehensive ability and learning progress.

4.2.2. Student self-evaluation and peer evaluation mechanism

The introduction of student self-evaluation and mutual evaluation mechanisms can effectively cultivate students' self-reflection and team cooperation abilities. Through self-evaluation, students can be aware of their advantages and disadvantages in the learning process, and promote the improvement of autonomous learning ability. Mutual evaluation can not only enhance the interaction among students but also help students to learn different ways of thinking and problem-solving strategies in the process of evaluating others. The mechanism of students' self-evaluation and peer evaluation also helps to improve the fairness and transparency of evaluation, so that evaluation is no longer one-way feedback from teachers, but a process of multiple participation.

4.2.3. Enterprise assessment in school-enterprise cooperation

School-enterprise cooperation is an important part of basic vocational education. Enterprise assessment provides feedback and application scenarios for classroom teaching. Enterprises can evaluate students according to their performance in internships or off-campus projects, and examine students' mathematical application skills, professional quality, and problem-solving skills in practical work. This kind of evaluation includes students' ability to deal with practical problems in work and their ability to communicate and cooperate in a team. The evaluation of enterprises not only provides teachers with a basis for adjusting teaching but also provides students with an opportunity to understand professional needs.

4.2.4. Promoting social evaluation of the quality of VET

Social evaluation includes evaluations from employers, industry associations, graduates' employment feedback and other channels, which can effectively reflect the actual impact and social recognition of vocational

education. Through close cooperation with all sectors of society, the school can obtain information on the market demand for mathematics talents, make timely adjustments to the course content and teaching methods, and ensure that the mathematics course of vocational undergraduate education can closely meet professional needs. At the same time, social evaluation can also help students to understand the specific requirements of the market for mathematical application ability, and further stimulate students' learning motivation.

4.3. Multidimensional assessment content

4.3.1. Mastery of basic mathematical knowledge

The mastery of basic mathematical knowledge remains the core of the assessment system, and the stability of basic knowledge is the prerequisite for students' future application of mathematics to solve practical problems. Assessing students' mastery of core concepts, theorems and formulas through standardized tests or assignments ensures that students have a solid theoretical foundation. This type of assessment can be in the form of mid-term exams, final exams, in-class quizzes, etc. to quantify students' mastery of the core knowledge of the course.

4.3.2. Practical problem-solving skills

Vocational undergraduate mathematics education pays more attention to the application of knowledge, so the evaluation of students' practical problem-solving ability is an important part of the evaluation system. Students need to be able to use their mathematical knowledge to analyze and solve practical problems related to their careers. For example, through case analysis, project design, and other forms, they need to integrate mathematical knowledge into real career scenes to demonstrate students' ability to apply theory to practice.

4.3.3. Attitude to learning and autonomous learning skills

The evaluation system should not only focus on students' academic performance but also on students' learning attitudes and autonomous learning ability. A good learning attitude and autonomous learning ability are the key to students' continuous progress in their future careers. Evaluate students' learning attitude through their daily performance in class, completion of homework after class, and enthusiasm to participate in class discussions. Assessment of self-learning skills can be reflected by allowing students to complete more complex projects or tasks independently.

4.4. Diversification of evaluation methods

4.4.1. Combining quantitative and qualitative assessment

Quantitative evaluation, such as standardized examination, can objectively measure students' mastery of knowledge points, but such evaluation methods often cannot fully reflect students' comprehensive ability. Qualitative evaluation can capture students' thinking mode, innovation ability and practical skills by observing students' performance in the project, class participation and problem-solving process. The combination of quantitative evaluation and qualitative evaluation can more accurately reflect students' comprehensive ability and ensure the fairness and comprehensiveness of the evaluation results.

4.4.2. Comprehensive evaluation of classroom performance, homework and project practice

The comprehensive evaluation includes students' performance inside and outside the classroom, such as participation in class, quality of speech in discussion, completion of homework after class, and practical

application ability in project practice. Classroom performance can reflect students' mastery and participation of knowledge. After-class homework can test students' further understanding and application of knowledge, while project practice can reflect students' ability to integrate mathematical knowledge into the actual professional situation. By combining these three aspects, a comprehensive assessment system can be built.

4.4.3. Dynamic tracking and periodic assessment

Dynamic tracking evaluation is a continuous evaluation method that can reflect the changes and progress of students in the learning process. Through periodic quizzes, homework checks and project progress reports, teachers can grasp students' learning situation at any time and adjust teaching strategies in time. This assessment method can help students clarify the direction of their progress and let teachers know which teaching links need to be further improved.

5. Assessment feedback mechanism and improvement strategies

5.1. Timely feedback and personalized guidance

Timely feedback is an important part of a diversified evaluation system. In the teaching process, teachers should provide timely feedback to students after each assessment, which helps students to understand their learning situation in a short time and adjust their learning strategies in time. Feedback is not limited to simple grades or comments, but also includes detailed analysis of students' knowledge, problem-solving methods, thinking process, etc. According to students' different learning bases and abilities, teachers can provide personalized guidance to help students identify learning deficits and make targeted suggestions for improvement.

5.2. Improving teaching based on evaluation results

The diversified evaluation system is not only to evaluate students' learning effect but also to provide the basis for teachers' teaching reflection and improvement. By analyzing students' evaluation results, teachers can find out which teaching contents or methods need to be adjusted. For example, if most students perform poorly in a certain knowledge point, teachers can re-examine the teaching design of that part or adopt more vivid and intuitive teaching methods to improve it. At the same time, teachers can optimize the teaching process according to the evaluation results to ensure that students' learning can reach the expected goal at each stage.

5.3. The role of feedback in teacher-pupil interaction

Evaluation feedback is not only a one-way transmission of information from teachers to students, but also a bridge for teacher-student interaction. In the feedback process, teachers should actively listen to students' opinions and suggestions and understand students' difficulties and needs in the learning process. Through this interaction, teachers can better understand students' learning motivation and interests to improve teaching methods. In addition, by interacting with teachers, students can also have a deeper understanding of their learning process and increase their interest and confidence in mathematics courses.

5.4. Continuity and long-term assessment feedback

Evaluation feedback should be continuous and long-term, not limited to the one-time examination or test results, but throughout the teaching process. Through regular feedback, teachers can dynamically track

students' learning progress and ensure that the evaluation process is synchronized with students' growth. At the same time, long-term evaluation and feedback can also help students form learning habits of continuous improvement and cultivate students' self-reflection ability and autonomous learning consciousness.

6. Conclusion

By analyzing the current situation of mathematics teaching in vocational colleges, it shows the gap between the shortcomings of the current evaluation system and the needs of students. The construction of a diversified evaluation system can not only consider students' abilities more comprehensively, but also effectively improve students' learning motivation and professional ability. According to the theory of multiple intelligences, the combination of formative evaluation and summative evaluation, and the theory of evaluation feedback, the evaluation system proposed in this paper will bring a new perspective to the teaching of mathematics in vocational colleges, and help improve the quality of teaching and the comprehensive development of students. Through the implementation of the evaluation system, teachers can better respond to students' basic differences and professional needs, promote the combination of mathematics teaching and practice, and better prepare students for their future careers.

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