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Exploring the Process Assessment and Classroom Evaluation Mechanism in College Mathematics Teaching

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Abstract:
In this paper, we explore the process assessment and classroom evaluation mechanism in college mathematics teaching. In the first place, the applications of the process assessment and classroom evaluation mechanism are studied. And we analyze the integration of the process assessment and classroom evaluation mechanism as well as the application of the information technique to the teaching. Then, we further elaborate the dynamic cycle mechanism and the teaching model for process assessment and classroom evaluation mechanism applied in the course of Space Analytic Geometry. Eventually, some problems and suggestions are estimated and discussed. By utilizing the process assessment and classroom evaluation mechanism, it is expected to promote the enthusiasm of study for students and improve the quality of teaching for teachers.

Keywords:
Process Assessment, Classroom Evaluation Mechanism, College Mathematics Teaching, Space Analytic Geometry

1. Introduction

In the higher education system in China, the education mode of a single assessment standard based on the final examination is difficult to promote all-round development of the students. Therefore, the system of process assessment and the evaluation mechanism have emerged to employ in the teaching procedures. What are the process assessment and the evaluation mechanism?

The mode of process assessment means that tests are carried out at various stages in the whole learning process when assessing students' course grades in China. That is to say, quantitative assessments are made on students' performance from the class in various aspects, and the results from which are regarded as students' final grades. Compared with the final exam-oriented assessment mode, the process assessment has unparalleled advantages over the traditional familiar one. Process assessment follows the student-oriented concept in China. It not only pays attention to final results, but it attaches great importance to the experience of the process that takes interest as an

internal driving force, emphasizes and focuses on exerting students' subjective initiative. During the process assessment, it involves the inspection of knowledge and skills of students as well as comprehensive quality like thinking ability, communication skills, cooperation ability and innovation ability, etc. Basically, it can be said that this model can assess students' learning status comprehensively and accurately for a long time in a broad range and at multiple levels. Eventually, this assessment continuously promotes students to constantly keep enthusiasm to update their knowledge and achieve progress in order to reach comprehensive development. At present, the process assessment has received extensive attention from educators in China under the new educational situation. From a disciplinary point of view, the process assessment has penetrated into all areas of higher education, including ideological and political, history and foreign languages in liberal arts while physics, chemistry, engineering in sciences even some practical courses. From the perspective of teaching mode, the process assessment has been integrated with various teaching modes, such as MOOC, micro-class, blended teaching, flipped classroom, inquiry teaching, heuristic teaching based on questions, group discussion, and so forth. From the perspective of methods related to process assessment, there are diverse components such as mid-term and final testing, in-class quiz, assignments, writing essays, attendance records, group discussions on open topics, in-class questions and answers, even practical exams.

The classroom evaluation mechanism is a kind of evaluation mechanism adopted in the teaching process to evaluate the quality, performance and effect of students' learning, as well as the teaching methods, means and teaching effects. For students, the introduction of classroom evaluation mechanism not only lets them understand their advantages and disadvantages , but also inspires and promotes students' learning progress and all-round development in the correct direction. For teachers, it is also a better way to the diagnosis and improvement of teaching. To summarize, this mechanism is expected to improve the learning efficiency of students and the education level of teachers.

In a strict sense, the process assessment focuses on the experience of the whole teaching process, and the classroom evaluation mechanism corrects problems occurred in the teaching process. The former aims to guide the direction of the process while the latter is to control the process. Therefore, it can be seen that the classroom evaluation mechanism can be regarded as a kind of beneficial supplementary to the process assessment. It is noted that the process assessment and classroom evaluation mechanisms have been widely introduced into the courses of the humanities [1] and engineering practice [2] in the universities in China. Nevertheless, there are relatively few studies referring to explore college mathematics teaching with the two mechanisms. So, how should the assessment process and the classroom evaluation mechanism is integrated when they were introduced into college mathematics teaching? Additionally, with the development of information technology, how should we establish the two mechanisms based on information technology? Inspired by these problems, this paper is to explore process assessment and classroom evaluation mechanism in college mathematics teaching.

2. The Application of Process Assessment and Classroom Evaluation Mechanism in College Mathematics Teaching

2.1. The Application of Process Assessment in College Mathematics Teaching

There are many branches for college mathematics, including Mathematical Analysis, Geometry, Algebra and Equations, etc. These disciplines emphasize logical reasoning. They are difficult to understand for students because of being abstract which are not basically as vivid and invisible as the humanity subjects, nor as clear and practical as engineering subjects. Actually, each specific mathematics course also has its own characteristics. Therefore, when the teaching of one course is to be carried out, it is needed for college teachers not only to be familiar with its content and structure, but also fully understand its unique characteristics. Moreover, as teachers, we also need to have an in-depth understanding of students' learning status and identify their advantages and disadvantages.

Based on the characteristics of the subject and the situation of the students, we can then design a new assessment mode to enrich the connotation of the process assessment. When designing the mode of process assessment, it is necessary for us to follow the principles of student-oriented, feasibility and effectiveness. Initially, the process assessment mode designed based on the principle of student-oriented can stimulate students' interest, give play to students' subjective motivation, and enlighten students' thinking. Then, the principle of feasibility is that the design of process assessment mode is reasonable and executable. For instance, when a course is particularly difficult, it seems to be inappropriate for students to write essays about it as a way of assessment. Last but not the least, the principle of effectiveness means students could promote the improvement of themselves through assessment mode. During the process assessment, students can achieve comprehensive quality and overall development via acquiring knowledge and skills.

Under the guidance of the above principles, we focus on applying several modes from a series of process assessment methods, such as in-class quiz, classroom discussions on open topics, writing essay, in-class questions and answers, and micro-class learning inspections. Before adopting some certain process assessment modes, it needs to design the distribution of assessment time and the weight values of assessment modes, as well as the switching of assessment modes under various teaching methods. Especially for the weight values of assessment modes, we can make them optimal through the regression analysis of data derived from the practise process.

2.2. The Application of Classroom Evaluation Mechanism in College Mathematics Teaching

Classroom evaluation mechanism is a significant part of the teaching process which runs through every step of teaching. It can be said that it is an effective method to diagnose teaching problems, optimize teaching plans, improve teaching goals and promote student development [3,4].

In the process of evaluating students, teachers need to respect students, understand the students' psychology, pay attention to individual differences, and try to carry it out in a relaxed and pleasant atmosphere, so as to provide an emotional foundation for stimulating innovative thinking. When students encounter difficulties, them should be encouraged in time to urge them to overcome difficulties bravely. And when students perform very well, they should be generously praised to make them feel a sense of achievement and joy. In the process of criticism, teachers should grasp the proper principle, that is to say, not only does it not hurt the self-esteem of students, but also allows students to recognize the importance of the problem to actively improve in the

right direction. During the assessment process, teachers can also use body language, such as eyes contact and gestures besides verbal languages.

At the same time, teachers also need to grasp the timing of evaluation, and pay attention to the combination of real-time evaluation and delayed evaluation. Real-time evaluation allows students to feel motivated and adjust their behavior at that time, but sometimes it is necessary to give students space and time to form their own emotional cognitive experience and self-reflection. Then teachers offer the evaluation, and students will be more prone to accept the results and be agreeable. It is expected that this handling way can be more effective.

In the evaluation mechanism for students, there are diverse subjects and modes of evaluation, including teacher evaluation, student self-evaluation of student, and group mutual evaluation with the way of online or offline evaluation. Specifically, self-evaluation of student can improve students' thinking ability independently, cultivate their self-confidence and sense of responsibility while group mutual evaluation can cultivate students' spirit of unity, cooperation and mutual help. It is also multi-dimensional from the content of student evaluation. It not only covers knowledge skills and thinking ability, but also interests, process participation, mental health and morality, etc. When it comes to evaluation for teachers' teaching, it mainly derives from self-evaluation of teachers, evaluation of students and peer evaluation. Through these evaluations, teachers themselves would find problems in teaching process and correct them effectively.

2.3. The Integration of Process Assessment and Classroom Evaluation Mechanism in College Mathematics Teaching - Taking the Space Analytic Geometry as an example

The goal of the process assessment is to provide the direction for the evaluation mechanism and the mode of the process assessment is to offer the carrier for the evaluation mechanism. Furthermore, the classroom evaluation mechanism not only promotes the implementation of the process assessment, but also provides the basis for the improvement of the assessment process and the teaching process. In real-time classroom teaching, we need to integrate the two properly.

In the application of process assessment, teachers need to inspire students in a timely manner. In detail, it include stimulating students' interest, encouraging students to complete knowledge or skill assessments, and cultivate students' cooperation and communication ability and innovative spirit. After the assessment, teachers can organize a variety of evaluations, which covers teacher evaluation for students, self-evaluation of student and group evaluation to summarize the advantages and disadvantages. Then teachers can encourage students to continue to maintain the advantages and correct the shortcomings. According to the valuable valuations, teachers could provide practical and feasible adjustment strategies to drive students' learning and strengthen their all-round development. Then all of them would proceed to the next stage of process assessment. In the new stage, students would demonstrate themselves better from the experience gained by the previous stage of the evaluation mechanism. Once again, they would use the evaluation mechanism again just like a circle. At the same time, after the first-stage process assessment, teachers also need to conduct self-evaluation in this new process. Through combining with student evaluation towards teachers and peer evaluation, teachers can discover problems in their own teaching and continue to improve the next new stage. Thus, the dynamic

cycle mechanism is formed (Figure 1), which integrates "teaching, learning, examination, evaluation, and reform" and improves learning efficiency of students and teaching quality of teachers.

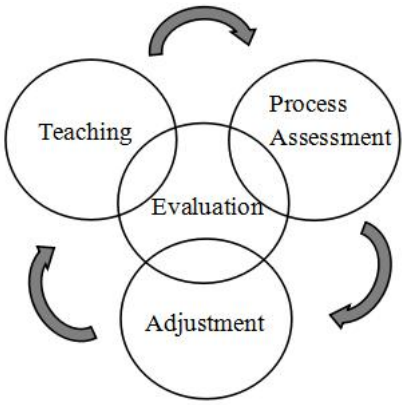

Figure 1. *The dynamic cycle mechanism adopted in College Mathematics Teaching.*

It is an example to demonstrate the application of the process assessment and classroom evaluation mechanism for the course of space analytic geometry. As we know, space analytic geometry is a basic course for mathematics majors in Chinese universities. As one foundation course to mathematics majors, this course introduces the vector and different types of coordinate systems. It also discusses the establishment of plane equation, straight line equation; space curved surface equation and space curve equation. Generally, space curved surfaces cover the cylindrical surface, conical surface and rotation surface. There are other special space curved surfaces such as ellipsoid surface, double curved surface and paraboloid. This course also describes the approaches of drawing of some spatial geometric figures. Finally, it explores the basic theories of the quadratic curve equation and the quadratic surface equation.

This course embodies the idea of combining numbers and shapes, and aims to cultivate logical thinking ability, spatial imagination ability and problem-solving ability of students. Among them, there are many formulas and figures, complex geometric structures. Previously, there are many obvious problems in teaching the course. In the past, the test mode of the course was single and dominated by the final examination. Among students, the plagiarism of the assignments was serious and the evaluation could not be followed up in time that couldn't stimulate the students' learning interest and motivation.

In teaching, we mainly use a blended teaching model of online and offline. Before class, it is needed for teachers to be ready for teaching the key points and difficulties in the content of each chapter in the textbook and its relations between each chapter. And it is also needed for students as freshmen to review elementary geometry, space geometry and plane analytic geometry studied in high school in China since space analytic geometry is an extension of these courses. There is the process assessment model in the course of Space Analytic Geometry. (Table 1)

From Table 1, we can clearly see that the process assessment mode includes three modules, namely assessment before class, in class and after class. And the weights of specific modes are given. The whole teaching content is divided into four stages and each stage takes within one month. There is an evaluation mechanism in each stage of the teaching process, including evaluation of learning content, learning methods, completion effects, interest stimulation, etc. Then teachers guide students to do self-

evaluation and mutual evaluation so as to promote and improve together. Meanwhile, praising students for good performance make them become more excellent and reminding and encouraging students for poor performance to let them improve. In addition, teachers also make self-evaluate and accept evaluations from students with constant reflection. Through the two-way evaluation between teachers and students, the deficiencies in learning for students and the problems in teaching for teachers are recognized. Then they can adjust and improve themselves in the next stage.

Table 1. *The process assessment model applied in in the course of Space Analytic Geometry.*

Process Assessment	Procedures	Percentage
Assessment Before Class	Attendance	10%
	Preview	5%
Assessment in Class	Questions and Answers in Class	10%
	Exercises in Class	10%
	Group Discussion	5%
Assessment After Class	Assignments and Questions After Class	15%
	Essay Writing	5%
	Mid Tests and Final Examination	40%

2.4. The Application of Information Technology in College Mathematics Teaching

In the process of application of the process assessment and evaluation mechanism, employing information technology can improve the teaching way and learning efficiency [5,6]. There are some new modes for process assessment by information technology, such as the use of application software for teaching. This way can make some teaching activities easily achieved such as finishing exercises in the classroom, question and answer, quizzes, and preview and review the knowledge by videos, etc. Certainly, they could be part of process assessment and are implemented conveniently and efficiently.

On the other hand, adopting the characteristics of hypermedia from information technology to collect information and record the entire learning process, the data for the process assessment and evaluation mechanism is real and specific with mass storage. It might be possible to make the objective and accurate numerical analysis and image analysis through mass storage and super-computing of information technology. In particular, with the rapid development of artificial intelligence, the introduction of artificial intelligence can automatically record students' learning information, analyze their interest characteristics, emotional fluctuations and implementation effects, etc. It not only provides teachers with the decision bases for personalized teaching, but also provides effective support for process assessment. It is also possible to use the resource sharing of information technology to provide timely feedback and suggestions which promotes the effective implementation of the evaluation mechanism.

Additionally, there are some problems needed to consider when applying information technology to process assessment. For instance, whether the frequent use of information technology in the classroom has caused students to have visual fatigue; whether the increase of information and knowledge in teaching process is out of the actual acceptance ability of students; whether the application of information technology in college mathematics teaching is a mere formality and how do we ensure the learning depth and effectiveness of the process assessment.

3. Suggestions of the Process Assessment and Classroom Evaluation Mechanism in College Mathematics Teaching

There are some problems and suggestions in the process assessment and classroom evaluation mechanism in college mathematics teaching that absorbs our attention. The first is that the process assessment should not be too frequent. Too frequent process assessments will not only affect students' interest and enthusiasm in learning, but also make students feel stressed and exhausted. Therefore, the frequency of assessments should be moderate and the assessment methods should be easy for students to accept. Secondly, the mode of process assessment should be targeted and adapted to the characteristics of the discipline and the knowledge ability of students. Thirdly, the process assessment should be true and reliable. When making classroom evaluation, it should not only care and respect students, but also it is accurate and objective so that students can be likely to recognize their own shortcomings through frank and real evaluation. For example, if there is plagiarism in the assignment, it cannot reflect the real situation of the students. And the assessment and evaluation based on assignment will become useless. In the end, the process assessment and classroom evaluation mechanism is not a tool to eliminate through selection or competition, but one new mode to promote learning for students and promote teaching for teachers.

4. Conclusions

As a teaching mode, the integration of process assessment and classroom evaluation mechanism in college mathematics teaching is discussed in the paper. Specifically, it first analyzes the application of the process assessment, the application of the evaluation mechanism and the integration of them as well as the application of information technology. In order to demonstrate the integration of process assessment and classroom evaluation mechanism, we take the space analytic geometry in college mathematics as an example. Finally, we present some suggestions in the implementation of process assessment and evaluation mechanism. It is believed that the application and implementation of the process assessment and classroom evaluation mechanism will improve the comprehensive quality of students, promote the all-round development of students, and enhance the teaching level and ability of teachers.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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