Research and practice of Online and offline mixed teaching mode -- taking ordinary differential equation teaching as an example

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Abstract: According to the characteristics of the ordinary differential equation course and the learning needs of related disciplines, the necessity of adopting the online and offline mixed teaching mode becomes increasingly prominent. This paper analyzes the problems existing in the teaching of ordinary differential equation course, and In response to the problem, suggestions are given from three aspects, to adjust the course structure and to implement the mixed teaching, to change the classroom by science and technology and to arm the students with knowledge, to improve the evaluation system and to enhance students' confidence. It is expected to simulate students' interest in learning ordinary differential equation course and build an efficient ordinary differential equation classroom.

Key words: online and offline; Teaching mode; Ordinary differential equations course

As we all know, in the traditional mathematics classroom, the teacher is often in the dominant position in the class, and almost all the learning behaviors of students are carried out according to the teacher's requirements. This method of teaching knowledge seems to be direct and efficient, but in fact, it just only makes the teaching progress faster. For students, in most cases, they cannot understand and apply the knowledge, thus burying hidden dangers for the communication between teachers and students. According to the problems found in the traditional teaching mode and the attempt of the online and offline mixed teaching mode, it is found that the development and implementation of the online and offline mixed teaching mode has many meanings for the innovation and reform of the ordinary differential equation course.

1. The problems existing in the traditional ordinary differential equation course teaching

(1) Emphasis on theoretical teaching and lack of application training

As one of the compulsory courses for mathematics majors, the study of ordinary differential equation can help students master more mathematical knowledge points, so as to achieve the purpose of training students' thinking logic and rigor. For example, the existence and uniqueness theorem of the solution of the ordinary differential equation, the continuous dependence and differentiability theorem of the solution to the initial value, the property and structure of the solution of the linear ordinary differential equation of the higher order, and the proof and derivation of other theorems. Many college mathematics teachers consciously and frequently exercise students' mathematical thinking and theoretical deduction ability in the teaching process, hoping to help students explore the higher-level mathematical world in this way. As everyone knows, for students of different bases, this practice will not only mobilize students' interest in learning, but will make the classroom boring, unable to attract most students' attention to learning, resulting in the phenomenon of teachers "hard teaching" and students "total decline".

The differential equation model can be used in many practical problems, especially in solving practical problems in different fields such as machinery, chemistry, economy, biology, physics, etc., the differential equation is widely used. This course fully reflects that mathematics comes from life and serves life. If the two can be integrated organically in the process of learning mathematics knowledge, college mathematics classroom will be a different scene. However, in the traditional teaching activities, teachers often overemphasize the study of theoretical knowledge, and lack the consciousness of extending mathematics to life, which reduces the value and function of ordinary differential equation course.

(2) Cramming education is serious, and there is no interaction between teachers and students

With the improvement of China's overall strength, earth-shaking changes have taken place in the field of education. Information-based teaching is replacing the traditional teaching mode of "one blackboard, three feet platform and one chalk". As we all know, mathematics is usually related to heavy calculation and a lot of reasoning, which is difficult for students to master by themselves, and requires teachers' timely and appropriate guidance and effective guidance. However, the actual situation is that no matter how difficult or easy the knowledge is, the teacher only uses one teaching mode, that is, the cramming teaching mode. In this mode, the teacher is responsible for "moving the mouth", and the students only need to "move the ears and hands", and the link of "using the brain" is seriously missing. In the long run, this will only widen the gap between students and students, and suppress students' confidence and enthusiasm in learning differential equation courses.

(3) The evaluation method is single and the evaluation content is one-sided

The biggest characteristic of traditional education is "to judge heroes by points". Although teachers do not judge a student by a single test result, it is very common to emphasize the final exam over the process assessment. This kind of evaluation is an excellent way under the exam-oriented education model, but it is difficult for this kind of evaluation to give full play to its due value in today's era of focusing on the diversified development of students. The diversified evaluation method includes not only the result test scores of students, but also the process assessment of students in each learning link. In addition, "innovation" is also a general direction of the new curriculum reform, which emphasizes that in the process of learning and applying knowledge, students need to combine self-understanding and self-construction

of mathematical knowledge system, and innovate problem-solving ideas, learning methods, and framework construction, so that students' knowledge can become their own mathematics in a real sense. Rather than the book mathematics obtained by rote memorization and rote copying. There is therefore an urgent need for a new type of assessment among groups of students.

2. Effective measures to implement the mixed teaching mode of online and offline

(1) Adjust the curriculum structure and implement mixed teaching

A good textbook plays an indispensable role in helping students learn the course. At present, there are many versions of ordinary differential equation textbooks, but they all contain the classic knowledge framework of this course. From the perspective of theory and comprehensiveness, they are all good textbooks and classic textbooks suitable for double-first-class mathematics majors to learn. However, for ordinary colleges and universities or non-mathematics undergraduate students, there will be a problem of more textbook content and less learning hours, which reduces the quality of classroom teaching and students' learning effect.

According to the current popular new curriculum reform, training of compound and innovative talents and other ideas, teachers can try to readjust or plan the course structure, and then narrow the distance between students and ordinary differential equation courses.

First of all, teachers can screen the contents of ordinary differential equation textbooks and find out the parts that meet the abilities of ordinary universities or non-mathematics majors and belong to the contents of classic textbooks for teaching. Such as the definition and classification of partial differential equations and ordinary differential equations, the elementary solution of first-order ordinary differential equations, the structure and properties of higher-order linear differential equations, the solution of higher-order linear differential equations with constant coefficients and linear differential equations.

Secondly, on the basis of the selected textbook content, the textbook is classified according to the combination mode of "basic knowledge layer + guidance knowledge layer + practical knowledge layer". At the same time, combined with the teaching objectives and content characteristics of each knowledge layer, to find out the part suitable for online and offline mixed teaching mode to carry out mixed teaching. The "basic knowledge layer" is mainly based on basic theories and problem-solving methods; The "tutoring knowledge layer" uses the combination of online and offline to explain the important and difficult points of the ordinary differential equation course to help students quickly grasp the main points of the course; The "practical knowledge layer" builds mathematical models in combination with life content, and guides students to think deeply, analyze and solve practical problems in combination with what they have learned about ordinary differential equations.

For example, the combination mode of "basic knowledge layer + guidance knowledge layer + practical knowledge layer" is used to teach the knowledge of the introduction of ordinary differential equations:

The first step is to carry out the teaching activities of the basic knowledge layer. Teachers use online methods to collect and organize the development history of ordinary differential equations. By learning the development process of ordinary differential equations, students can understand the difficulty of the formation of ordinary differential equations from a non-mathematical level, and improve their learning mentality.

The second step is to guide the development of knowledge level teaching activities. Combined with the content of the first step, expand the relevant knowledge and content of mathematics, such as introducing the achievements of Chinese mathematicians in the field of ordinary differential equations to students, awakening students' pride, setting up a learning example, and stimulating patriotic feelings.

The third step is to carry out teaching activities at the practical knowledge level. In this step, teachers can make mathematical modeling based on current events or things happening around students. With vivid examples, both online and offline mixed teaching mode can be implemented, and students' desire for expression can be stimulated, fully mobilize students' "brain", "mouth" and "hands on", so that students can learn freely and independently in the classroom, and the classroom can be returned to students in a real sense.

(2) Science and technology change the classroom and equip students with knowledge

Mathematics knowledge itself has a strong boring and boring, and through the traditional "cramming" classroom, these two characteristics are further amplified. For college mathematics students, although they have a good mathematical knowledge base and ability, it does not mean that they can get more happiness from it. The emergence of Internet online teaching mode is a brand new experience and feeling for excellent mathematics students or ordinary mathematics students. Under the stimulation of the fresh and novel mode, students' desire for learning and initiative will be amplified infinitely, and then they will get more harvest and better experience in the classroom.

Micro-class is one of the online teaching modes, which has higher flexibility and specialization. Generally speaking, the duration of a micro-class is about ten minutes, or even shorter. The content is all the key and difficult points in teaching, and students can learn micro-lessons anytime and anywhere. For college students, learning time is relatively tight, and the emergence of micro-lessons can help them make better use of fragmented time, thus extending the time of students learning ordinary differential equations, improving learning efficiency, and greatly shortening the process of students' mathematical thinking formation.

For example, using micro-lessons, students repeatedly watch the existence and uniqueness theorem of the solution of the first order ordinary differential equation, and use the abstract derivation that has not been completely digested in class to gradually digest and absorb after class. They can also collect and sort out college students' mathematical contest in modeling questions by means of the Internet, analyze and explain them, and then teach them to students by means of micro-lessons.

In addition, during the teaching process, teachers can also use the school or online learning platform to ask students questions and assign ordinary differential equation homework. Students can also use the platform to communicate with teachers and give feedback, so as

to help teachers grasp the status of students learning ordinary differential equation courses in the first time, and adjust the teaching content reasonably and appropriately to meet the overall learning needs of students.

(3) Improve the evaluation method and enhance students' confidence

With the development of online and offline mixed mode in ordinary differential equation course, the teaching evaluation form of ordinary differential equation should also be improved and innovated. It can be comprehensively evaluated from the aspects of online learning, offline learning, process evaluation and result evaluation. In terms of evaluation content, in addition to the regular online and offline learning results and homework completion degree, students' independent access to relevant information of ordinary differential equations and active questioning during online learning should also be included. In other words, we should pay attention to students' relevant math learning behavior to some extent, and give students a more comprehensive and objective evaluation. And students' mathematical behavior is a key factor to cultivate students' ability to learn and use knowledge, as well as a catalyst to enhance students' confidence in learning ordinary differential equations, so as to promote the better achievement of curriculum objectives.

3. Concluding remarks

To sum up, it is a general trend for ordinary differential equation courses to carry out online and offline mixed teaching. In the early stage of implementation, there may be many problems and contradictions, but in the long run, it can be regarded as an opportunity to improve the overall quality and skills of teachers. Through the Internet online teaching mode, on the one hand, it can enrich the teaching content of ordinary differential equation course, mobilize students' interest and enthusiasm in learning ordinary differential equation course, and promote the two-way communication between teachers and students in class. On the other hand, it can better guide offline teaching, guide students to conduct in-depth exploration of the concepts, theories and applications in ordinary differential equations, and give full play to the scientific value and application value of ordinary differential equations course.

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