Analysis of Mathematics Teaching based on HPM from the Perspective of O2O

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Abstract: In the context of scientific and technological progress and the popularity of the Internet, educational models and methods are constantly updated. Therefore, many new models have been widely used in educational practice. O2O teaching model is one of the teaching models that have attracted much attention in educational practice at this stage. This paper studies mathematics teaching based on HPM teaching mode from the perspective of O2O, explains the connotation of mathematics teaching from the perspective of O2O, analyzes the role and value of HPM in mathematics teaching, explores the strategies of mathematics online teaching, offline teaching and the combination of the two from the perspective of O2O, and gives the teaching reflection and summary from the perspective of practice, It aims to provide reference for the current teaching practice.

Keywords: O2O Horizon; HPM; Mathematics Teaching; Teaching Strategies; Application

1. Introduction

With the progress of science and technology and the popularity of the Internet, the field of education is undergoing an unprecedented change. As the core of this reform, O2O (online to offline) teaching mode has gradually emerged and become a new trend in the field of education. Its emergence not only injects new vitality into the traditional education mode, but also provides new ideas and methods for mathematics teaching. At the same time, the integration of history and mathematics curriculum (HPM) has also attracted increasing attention. HPM emphasizes the integration of history, culture and Pedagogy in mathematics education, and pays attention to the background, development process and educational value of mathematics knowledge. This concept provides a broader vision and deeper understanding for mathematics teaching. From the perspective of O2O, how to combine HPM with mathematics teaching is a problem worthy of further discussion [1]. First, teachers can use the online platform to release materials and resources related to the history of mathematics to help students understand the background and development process of mathematics knowledge. This can not only stimulate students' interest in learning mathematics, but also cultivate their inquiry spirit and innovation consciousness. Secondly, through offline classroom teaching, teachers can guide students to apply mathematical knowledge to practical problem solving, and cultivate their mathematical thinking and problem-solving ability. Finally, teachers can also use the organic combination of online and offline to carry out various forms of teaching activities, such as mathematical modeling contest, mathematical culture festival, etc., to provide students with a richer learning experience. Mathematics is one of the most concerned subjects in the teaching process. How to achieve the high efficiency and quality of teaching has always been a problem discussed by teachers. O2O based teaching mode is an effective mode to achieve high efficiency and quality in mathematics teaching. Practice shows that it has great application value and development prospects, which can provide a certain reference for the majority of mathematics teachers.

2. Mathematics teaching from the perspective of O2O

In the organization and implementation of

mathematics teaching, the full use of resources will significantly improve the actual effect of teaching. O2O teaching mode emphasizes the integration of online teaching resources and offline teaching resources. Therefore, under this teaching mode, the traditional classroom can be organically combined with modern online learning, which helps teachers play the role of remote guidance and monitoring in educational practice. Moreover, by using this teaching mode, students can actively share and communicate online, This is significant for the improvement of students' initiative and the cultivation of exploration ability.

One of the important components of O2O teaching mode is the online part. Through the network platform, that is, the use of online tools, teachers can publish teaching resources, such as video tutorials, preview assignments, etc. After releasing the resources, students can selectively learn relevant content according to their own time and learning progress, which can meet the requirements of students' flexible learning. In addition, through the online learning platform, students can have a broader discussion space. For example, students can not only discuss with students in their own class, but also use the network to discuss with students in other classes and cities. Such a discussion mode plays a significant role in broadening students' horizons and expanding their thinking. As another important part of O2O teaching mode, offline learning mainly emphasizes classroom teaching. In classroom teaching, teachers can make detailed teaching case analysis based on students' actual needs, and then guide students to complete task exploration and practical innovation. Through the interaction in the classroom, the teacher can timely understand the students' learning status, and will find the students' deficiencies in learning, which is of positive significance for the teacher to put forward targeted teaching suggestions and help students find out and fill vacancies [2].

The application of O2O teaching mode in mathematics teaching has many values. First, the online platform can help provide rich teaching resources, and these resources can be presented in a variety of ways, so as to meet the actual needs of different students. For example, when learning some abstract mathematical concepts, teachers can use online teaching tools to make some vivid and vivid videos, which can help students understand concepts. For another example, when facing some relatively difficult problems, teachers can release the analysis video of the problems on the online platform, and use the video to guide and answer the problems, which has significantly improved the learning efficiency of students. Second, offline classroom teaching pays attention to the cultivation of students' practical ability and innovation ability, so in teaching practice, teachers will design some practical mathematical problems for students to complete through group cooperation. In the process of completing the topic, students on the one hand think about the application of the knowledge they have learned, and on the other hand seek team cooperation. Such a learning method is not only more interesting, but also will significantly improve students' learning initiative. Third, O2O teaching mode also has outstanding value in promoting the combination of mathematics teaching and modern science and technology. For example, in teaching practice, teachers can guide students to use teaching software to calculate or draw graphics, which will make students' learning more vivid.

3. Application analysis of HPM in Mathematics Teaching

With the gradual renewal of mathematics teaching idea, the idea of HPM has gradually attracted attention. HPM emphasizes the integration of history, culture and Pedagogy in mathematics teaching. It not only pays attention to the teaching of knowledge, but also emphasizes the background, development process and educational value behind knowledge. In mathematics teaching, organizing education and teaching with the concept of HPM can bring more rich learning experience to students, so as to stimulate students' interest in learning.

From the core of HPM concept, mathematics teaching should explore the historical, cultural and educational value of mathematics knowledge. The specific use of HPM concept in teaching practice is manifested in many aspects. First, the introduction of mathematical knowledge background. In the process of organizing and carrying out mathematics teaching work, when introducing mathematics knowledge, teachers will not only explain the knowledge, but also explain the content behind

the knowledge, such as the origin and development of mathematical concepts, the cultural stories behind mathematics knowledge, etc. The elaboration of these contents will enable students to be exposed to more "temperature" knowledge, so students' desire to explore mathematics will be significantly enhanced, and their learning initiative will be significantly increased. Second, the integration of mathematical culture. Mathematics is an important part of human civilization, and its culture is very rich. To carry out mathematics teaching based on HPM concept, teachers will naturally integrate mathematics culture into teaching practice, and guide students to understand the charm of mathematics culture, which is of great significance to cultivate students' mathematical aesthetics and humanistic quality. Third, pay attention to the educational value of mathematics. The HPM concept emphasizes the educational value of mathematics, which believes that education should not only be the teaching of knowledge, but also the inspiration of thinking and the cultivation of values. Therefore, in the process of the organization and implementation of education, teachers should pay attention to the cultivation of students' thinking, and help students improve their problem-solving ability, so as to guide students to truly understand the characteristics of mathematics, such as tool properties. Fourth, personalized teaching strategies. Teachers can formulate personalized teaching strategies according to the actual needs of students. For example, some students are full of inquiry spirit, but may have a weak foundation. Others have a solid foundation, but are often limited by thinking. In the face of different students, teachers can formulate different teaching strategies to do separate training, which can promote the students with different characteristics to change in a good direction. In other words, the personalized teaching strategy follows the basic education concept of "people-oriented", which has significant value in improving the temperature and quality of education[3].

Combined with the analysis of current education practice, the idea of HPM has a huge impact on mathematics teaching, which is embodied in four aspects. First, this concept enables more teachers to re-examine mathematics teaching, redefine the value of mathematics education, and constantly remind teachers that education is not only the teaching of knowledge, but also the inspiration of thinking and the cultivation of values. Therefore, in the practice of education, teachers' teaching work will not focus on the explanation of knowledge, but will cultivate students' mathematical aesthetics and mathematical wisdom on the basis of knowledge explanation, It will also cultivate their spirit of exploration and innovation. Second, interdisciplinary perspective. In the past, teachers' teaching work was mostly based on a separate discipline, that is, the relationship between mathematics and other disciplines would be ignored. However, under the concept of HPM, the traditional teaching perspective was broken, and more and more teachers would examine their teaching work from an interdisciplinary perspective, which would significantly improve the richness, integrity, diversity and effectiveness of teaching. Third, the improvement of teachers' professional quality. The new teaching concept puts forward new requirements for teachers' professional ability, so teachers will constantly summarize and emphasize themselves in teaching practice, so as to promote their own progress.

4. Mathematics Teaching Strategies based on HPM from the Perspective of O2O

4.1 Online Teaching Strategies

With the rapid development of Internet technology, the field of education is undergoing an unprecedented change. As a product of this reform, O2O teaching mode has attracted extensive attention. The concept of history and mathematics curriculum integration (HPM) also provides a new perspective for mathematics teaching. In practice, the advantages of online teaching are very prominent. As an important part of O2O teaching mode, it has many obvious advantages. First of all, online teaching can break through the limitations of time and space, so that students can learn at any time and anywhere. Secondly, online teaching can provide rich teaching resources, including video, audio, pictures, text, etc., making teaching methods more diversified and personalized. Finally, online teaching is also convenient for teachers to conduct data statistics and tracking, timely understand

students' learning situation, and provide strong support for offline teaching.

To analyze the teaching organization based on the advantages of online teaching, the following teaching strategies need to be implemented in practice. First, use information technology and Internet technology to build an online teaching platform. To carry out online teaching work, we first need an online platform that can implement teaching work. Combined with the needs of teaching practice at this stage, we should develop an online teaching platform with perfect functions, and use this platform to realize the release of teaching resources and the submission of teaching assignments, which can provide the basis for online teaching work. Second, emphasize the production of high-quality teaching resources, such as making courseware, PPT, etc., and integrate the resources around the knowledge points of mathematics teaching, so as to make the teaching resources full and play a more significant role in students' learning practice. Third, organize online teaching activities. The construction of online teaching platform can not only help realize the release of teaching resources, but also meet the needs of online teaching, such as allowing students to conduct online discussion, group analysis, etc. the organization and implementation of these activities can effectively enhance students' interest in learning, so as to improve their learning initiative. Fourth, use the online platform to carry out Q&A and counseling. One of its important functions is to solve the problems encountered by students in learning practice. For example, if students encounter confusion in the process of autonomous learning, they can ask for help online. The specific way is to release help information. Teachers can sort out the help information released by students, and then summarize the information for overall Q&A, so as to provide students with the correct direction of problem solving, At the same time, through this way, it can also build error warning for students in advance, which is of great significance to enhance the learning effect [4].

4.2 Offline Teaching Strategies

Under the background of the rise of O2O teaching mode, there is a new teaching trend of online and offline joint teaching in the field of education. In the process of organizing and carrying out mathematics teaching, the offline teaching strategy based on HPM can help students better understand the background of mathematics knowledge and the corresponding culture, which is of great significance for the cultivation of students' mathematical thinking and mathematical problem-solving ability.

Compared with online teaching, offline teaching has completely different characteristics. First, offline teaching emphasizes face-to-face teaching between teachers and students. In the process of using this teaching method, the outstanding feature is the direct interaction between teachers and students, which will strengthen the activity of the classroom [5]. Second, the organization and development of offline teaching work has obvious characteristics in the utilization of teaching resources. It can use textbooks, teaching aids and experimental equipment to provide a more realistic learning environment, in which students' learning efficiency will be higher. There are four main advantages in studying the objectives of offline teaching. One is to help consolidate the knowledge learned in online teaching, so as to make students' knowledge more solid. The other is to cultivate students' thinking and practical ability through case analysis, practical operation and other methods. The third is to help deepen students' understanding of mathematical knowledge through typical cases in the history of mathematics. The fourth is to create a good learning atmosphere through teacher-student interaction.

Therefore, the following four strategies need to be implemented for offline teaching. First, the integration of mathematical history is emphasized in teaching practice. In the process of teaching, teachers can not only emphasize mathematical concepts, but also penetrate the relevant history of mathematical concepts based on mathematical concepts, such as the evolution history of concepts. Through the integration of these history, students can have a clearer understanding of the origin and nature of mathematics, which is of positive significance to cultivate students' interest in mathematics learning. Second, use the advantages of offline teaching to organize students to carry out group discussion and sharing activities. Through group discussion, group cooperation and group sharing, students

can learn from others' strong points, find out their shortcomings in problem thinking in time, and learn some good habits or skilled thinking of other students in learning practice, which is of significant value to improve students' ability to solve problems. Third, in offline teaching practice, teachers have more contact with students, which makes it easier to find the characteristics of each student and its specific performance in learning [6]. Based on the exploration of students' characteristics, teachers will have more detailed and complete reference materials in carrying out personalized teaching, which is of great significance for carrying out targeted teaching work. Fourth, in offline teaching practice, we also need to pay attention to students' evaluation and feedback, understand students' difficulties in time, and give scientific guidance, so that students can optimize their learning process in time, so as to maintain a good physical and mental state.

4.3 Online and Offline Combination Strategy

Under the background that O2O education mode has gradually become a general trend, the research on the combination of online and offline teaching can provide new ideas and directions for the organization and development of teaching work. As for the combination of online and offline, it is mainly divided into two parts: one is online teaching. For the implementation of online teaching, modern information technology can be used to provide students with a variety of teaching resources and diversified learning methods. For example, in teaching, teachers can make online courses and interactive courseware based on the history of mathematics, or arrange the teaching time and schedule based on the specific needs of students. Not only that, teachers can also use the online platform to build an online discussion area, where students can discuss and communicate what they have learned through instant information release, which allows teachers to grasp the actual situation of students in time in the process of teaching. The second is the implementation of offline teaching, mainly teachers use offline teaching opportunities to guide students to explore and think. For example, in mathematics teaching, teachers can organize mathematics history sharing activities, requiring each student to explore and understand the history and background of mathematics concepts or mathematics related knowledge, and share them in class or in special discussion classes. In this way, students can deepen their understanding and memory of mathematical knowledge, and change the boring learning method of traditional mathematics.

It should be noted that the combination of online and offline teaching is not a simple superposition of two methods, but requires teachers to give full consideration to the teaching process, such as the situation of students, and the teaching content suitable for different teaching methods in teaching practice. Only in this way can teachers make unified planning and arrangement, so that online teaching and offline teaching can be completed efficiently. For example, during the teaching process, some contents are relatively simple and can be arranged to be carried out online, while some contents are practical and need to be experienced by students to have a good learning effect, so these contents need to be arranged to be carried out in offline classes. In this way, online teaching and offline teaching should have their own emphasis, and the division of labor should be done well, so that the effect of online and offline comprehensive development will be more prominent [7].

It is worth mentioning that the online and offline teaching form based on HPM also needs teachers to constantly improve their professional quality and teaching technology level, so that the teaching value of HPM will be more prominent in teaching practice. For example, in teaching practice, the organization and development of online and offline teaching work not only requires teachers to have the ability to select and allocate online teaching resources, but also the ability to design and apply offline teaching resources, and teachers also need to emphasize the coordination of online and offline, which requires teachers to have the ability to organize and analyze online and offline, as well as the ability to integrate and design resources. Based on this requirement, teachers actively carry out professional learning and constantly exercise their abilities, so that in teaching practice, they can fully consider the current situation of teaching and the actual needs of students, so as to realize the reasonable arrangement of

teaching activities. In general, through the implementation of such strategies, teachers can provide students with a more comprehensive and in-depth learning experience and cultivate their mathematical thinking and practical ability [8].

5. Teaching Reflection under O2O Mode

With the rapid development of science and technology, O2O teaching mode has become the new normal in the field of education. This combination of online and offline teaching method has brought new opportunities and challenges to the traditional mathematics teaching. At the same time, the idea of history and mathematics curriculum integration (HPM) has also been paid more and more attention [9]. HPM mathematics teaching based on O2O perspective can not only enhance the interest and inquiry of mathematics teaching, but also cultivate students' mathematical thinking and problem-solving ability. But in this process, there are also some problems that need to be reflected and improved.

5.1 Implementation of Teaching Strategies

In order to integrate HPM strategy into mathematics teaching practice, a series of online courses on the history of mathematics need to be carefully prepared in the teaching process. These courses not only introduced the development of mathematics, but also discussed the mathematical thoughts and classical problems in various periods. In order to ensure the effect of online teaching, the interactive function is used in teaching, learning tasks, online tests and discussion topics are regularly published, and students are encouraged to conduct autonomous learning and communication online.

In offline teaching, we should pay attention to guiding students to combine the history of mathematics with practical mathematical problems, and help students understand the essence and thought of mathematics from a historical perspective. For example, teachers organize students to share the history of mathematics and let them draw inspiration and learning experience from the stories of historical figures. In addition, teachers can also guide students to explore some practical projects, for example, let them use mathematical models to solve ancient mathematical problems, or find content related to modern mathematical knowledge from historical documents.

Practice has found that the mathematics teaching strategy based on HPM from the perspective of O2O can indeed achieve obvious results [10]. First of all, students' interest in mathematics has increased significantly, and they are more active in classroom discussion and learning. Secondly, through the combination of online and offline, students' autonomous learning ability and collaborative ability have been trained, and gradually develop good learning habits. In addition, judging from the final exam results, most students have made significant progress.

5.2 Reflection and Summary

From the results, the implementation of teaching strategies has indeed achieved good results, but there are also some problems and challenges in the process of practice. For example, some students lack self-discipline in online learning and are easily distracted. Some students do not adapt to this new teaching mode and feel confused and confused. In view of these problems, teachers need to further improve teaching strategies, constantly reflect and summarize, and further optimize teaching.

As far as self-discipline is concerned, we can strengthen the supervision and guidance of students' online learning in the process of organizing and carrying out the next teaching work, and regularly check the students' learning progress. In the process of inspection, it is found that there are contents that are not suitable for students and need to be adjusted in time. Once students are found to be unable to keep up with the progress, they need to communicate with them in time to understand the specific difficulties they face and give corresponding help. Teachers should encourage every student to actively participate in the online and offline learning mode, and make full use of this teaching mode. In order to better adapt to the development trend of O2O education, teachers need to constantly improve their professional quality and modern educational technology ability to ensure the effective implementation of HPM mathematics teaching strategy based on O2O.

Based on the analysis of mathematics teaching under the concept of HPM from the perspective of O2O, it is undeniable that some remarkable achievements have been made, but

the problems existing in the teaching process will not be reduced. On the contrary, based on the new concept and new model, new teaching problems may also be faced, so we need to continue to explore and make progress as usual [11-13]. At present, the construction of online teaching resources needs to be further improved. Although some video tutorials and courseware have been made, there are still some problems of low quality and incomplete content. Secondly, the organic combination of online and offline teaching needs to be further strengthened. Sometimes the connection between online teaching and offline teaching is not close enough, leading to the teaching effect is not ideal. In the future, we need to pay more attention to the organic combination of online and offline teaching, strengthen teaching design and classroom management, and ensure teaching quality and effect. Finally, the evaluation and feedback mechanism of teaching effect needs to be further improved. Although online operation, online testing and other methods have been used for evaluation and feedback, there are still some problems, such as unscientific evaluation standards, untimely feedback and so on [14].

6. Conclusion

From the perspective of O2O, mathematics teaching based on HPM provides a new perspective for teachers to re-examine the essence and value of mathematics teaching. In this process, teachers should not only pay attention to the teaching of knowledge, but also pay more attention to the cultivation of ability and the inheritance of culture. Through the online learning platform, students can choose their own learning content and realize personalized learning; Through offline classroom teaching, teachers can better guide students' thinking and cultivate their mathematical thinking. This teaching mode puts forward higher requirements for teachers. In order to better adapt to this change, we need to constantly update our educational idea and teaching skills, actively explore the online and offline teaching mode in practice, and try to find the best combination point. At the same time, it is also necessary to establish a more perfect teaching evaluation and feedback mechanism in order to adjust teaching strategies in time. In a word, the article analyzes and discusses the specific teaching work based on HPM from the perspective of O2O teaching mode, identifies the teaching strategies and methods that need to be paid attention to in teaching practice, and requires teachers to think about the specific content of teaching optimization, strengthen the organic integration of online and offline teaching, and improve the teaching evaluation and feedback mechanism. In this way, the final teaching work will achieve remarkable results. It is believed that through continuous efforts and exploration, mathematics teaching based on HPM from the perspective of O2O will inject new vitality into mathematics education and provide strong support for cultivating students' mathematical thinking and problem-solving ability.

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