

Construction and Application of the Case Database for Master's Degree in Mathematics Education Based on the OBE Concept

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Abstract: With the continuous promotion of the reform of mathematics curriculum in basic education in China, it is urgent to improve the teaching practice ability of graduate students in mathematics education. To this end, based on the OBE education concept, in accordance with the requirements for the construction of a case library, and in combination with the requirements of the national level cases of the Education and Education Commission, by collecting case materials that are conducive to optimizing the education master's graduate courses, then writing teaching cases, and conducting case teaching in the classroom, guide students to think, analyze, and discuss, modify, and optimize the cases, and finally discuss them. Through such teaching, students can draw inferences from one example to achieve the effect of applying what they have learned. The construction and application of the case database provide a guarantee for the consolidation of teaching knowledge and the improvement of teaching ability of the Master of Mathematics Education.

Keywords: OBE concept, Professional degree case base, Construction

1. Introduction

Promoting the professional development of education masters, improving their professional level and educational and teaching literacy is the fundamental direction of case base construction. The case base construction is designed around the curriculum plan for the cultivation of a master's degree in mathematics education. Under the guidance of the project leader, under the guidance of OBE concepts and educational theories, and with the efforts of team members, extensive analysis, research, and experimental design of rich, typical, and characteristic teaching cases are carried out, which is conducive to updating graduate students' education and teaching concepts, improving their professional knowledge, and improving their teaching abilities. It is also conducive to promoting the reform of new basic education courses, further implementing quality education and developing students' core mathematical literacy.

2. Problem formulation

The learning process of graduate students in education pays attention to practicality. One of the most effective ways to learn research is to use cases as a carrier for dialogue and communication. Case studies provide graduate students with strategies and methods for integrating theory with practice in educational research^[1]. With the development of society, higher education is increasingly required. OBE concepts should be incorporated into the reform of classroom teaching models, changing the role of students, focusing on teaching outcomes, and introducing diverse assessment standards^[2]. To this end, we design the teaching cultivation program of the professional case base of Master of Mathematics Education based on the OBE concept, adopt the concept of result-oriented education, innovate the cultivation mode of teaching practice ability, enhance the practice-oriented special skills and comprehensive ability, and form a collaborative approach of university-secondary school-student.

The concept of OBE (Outcomes based Education) was proposed by American scholar Spady. This is a teaching model that follows a result oriented approach, adopts forward design, and implements backwards. Teaching based on the OBE concept must first clarify the learning outcomes of students, take students as the main body and center, formulate teaching objectives, design teaching models, and ultimately achieve learning outcomes through the teaching process^[3].

The design of the case library highlights the student as the main body, adopts a trinity model of theory, students, and knowledge, clarifies the principles and steps of the OBE concept, and constructs a model for cultivating the teaching practical ability of the Master of Education. The establishment of a case base for teaching design and case studies based on the OBE concept aims to optimize the curriculum for master's education students, organically develop the curriculum resources for master's education students, timely infiltrate modern education concepts, enrich and improve the curriculum content of master's education students, thereby constructing a path to achieve the practical ability of master's education teaching, and optimizing the reform of curriculum practice and teaching methods.

3. The thinking and process of case base construction

According to the project approval requirements of the case library, and in combination with the format requirements of the selected national cases given by the Education and Instructional Commission, team members work together to collect case materials conducive to optimizing the curriculum of education master's degree graduate students through the study of special sessions, organically integrate the curriculum resources of education master's degree graduate students, and timely infiltrate modern teaching concepts, enrich and improve the content of postgraduate education courses and effective methods and ways to cultivate students' mathematical abilities, and achieve the interconnection and integration of postgraduate curriculum content and basic education curriculum content, theory and practice, pre job education and post job training. The construction of the case database for the master's degree in mathematics education based on the OBE concept includes four stages: planning and division of labor, selection and summary, improvement and modification, and database construction and maintenance^[4].

3.1. Planned division of labor, accurate positioning

According to the purpose of the case base, first formulate the corresponding planning division. In terms of time arrangement, strictly follow the course teaching plan, complete the cases on time, and integrate them into the case library. In order to ensure the scientific and practical use of case bases, it is necessary to consider the needs of teaching objects. The curriculum and content of the postgraduate training program for the master's degree in mathematics education have undergone significant changes, gradually adapting to the needs of the times. At the same time, the Master of Mathematics Education has a certain foundation in mathematics education, and outstanding comprehensive mathematical literacy. To this end, team members have built a case library that focuses on cultivating middle school students' core mathematical literacy, and a case library for mathematical instructional design based on mathematical educational psychology.

3.2. Collection, selection, processing and summary

After the specific division of labor, members begin to collect specific cases for selection, processing, and summary. The cases selected based on the OBE concept should originate from the mathematics classroom, come from the practice of front-line teachers, and be lively in form. Then, it is necessary to process the case to highlight its exemplary and practical nature, which is beneficial for students to imitate and practice. The case writing needs to adopt a unified format, which is convenient for building a database. At the same time, the description of the case content requires smooth sentences, clear layers, and accurate concepts.

3.3. Practical application, improvement and modification

After team members have had a certain number of cases, they begin to engage teachers in classroom practice. Teachers conduct case analysis and application based on students' mastery of the cases. For example, it is possible to report cases in groups in turn, with all members fully discussing the cases reported by the group, and the teacher making appropriate comments. In teaching, the teacher timely cites typical cases based on the teaching content, integrating theory with practice, and promoting students' in-depth exploration. At the same time, timely record the classroom feedback of each case, and make adjustments based on student classroom feedback^[5]. Perfect cases can form characteristic school-based textbooks for teachers to use in teaching and for students to read, learn, and reflect after class.

3.4. Database maintenance, promotion and improvement

In order to better build and widely apply the case library, the case library team members actively seek support from the school's graduate school, establish multiple school level graduate case libraries, and select one case from the national case library. To build a case library, the following case library construction processes are used: identifying the type of case library, collecting cases, sorting out case records, screening case materials, modifying and improving cases, testing cases for trial use, and summarizing and providing feedback. The established case library has been promoted and used in various forms in graduate courses for mathematics education majors, such as in-depth explanation by teachers and simulated practice by students.

4. Specific construction and application of case database

4.1. Specific construction of case base

The ultimate goal of building a case base for the master's degree in mathematics education based on the OBE concept is to achieve case teaching of courses. Case teaching based on the OBE concept guides students to discover, raise, analyze, and solve problems through case presentation, thereby stimulating their learning initiative. Combining the curriculum characteristics of the Master of Mathematics Education, the mode of combining teacher classroom case teaching with student reporting case teaching is mainly adopted in teaching.

4.2. Application of case base

Selected cases. The presentation of cases can take various forms, such as pure text descriptions, charts, drawings, and other means to present text cases; Dynamic presentation to students through information technology means; Students can also use the form of simulation and role-playing to restore the presentation of middle school math classes to enhance their interest in learning.

Explain the case. Explaining is the most important step in case teaching. When explaining a case, teachers should clarify the students' learning goals. Teachers should not be full of words, but should inspire and guide students to think and discuss. For example, what are the difficulties and key points of the case? How do you solve problems in the classroom? What methods and ideas were used? What is the basis for teacher decision-making? Is there a better plan?

Transformation and widening cases. A good case must be complete, covering key information such as time, location, and people; A case must be typical and represent the essential attributes of a certain type of thing or phenomenon; Cases should also be highly enlightening and exemplary, allowing students to learn the method of thinking about problems in the reading, thinking, analysis, and discussion of cases, forming rigorous rational thinking and realistic scientific spirit. Cases must be based on the existing cognitive level of students. For cases that are not suitable for students, teachers should carry out creative transformation to create a case library conducive to the development of the Master of Mathematics Education.

Case production and implementation. At this stage, students and teachers participate in a summary. In the summary, it is necessary to reveal the theories contained in the case, strengthen the content discussed previously, prompt subsequent cases, and inspire students.

Evaluate teaching. Case design and teaching should take students as the main body, integrating literacy, knowledge, and students. The evaluation can be conducted by conducting a questionnaire survey on students attending classes to understand the actual situation such as the teaching effectiveness of teachers in implementing case teaching, scientifically evaluate the effectiveness of case implementation, promptly identify problems in the implementation process, and properly address these issues.

Next, take "The Application of Solving Triangles" as an example to implement the classroom practice of the core literacy of mathematical modeling, and explore the specific application of the master's degree case library of mathematical education based on the OBE concept in teaching.

Solution: If you are an engineer, please design a solution and calculate the length of the tunnel.

Tools used: a tape measure capable of measuring horizontal distance, a goniometer (capable of measuring elevation, azimuth, etc.).

4.2.1. Preparation before class

According to the teaching content, the teacher provides case materials to students before class, and proposes basic questions and learning requirements for the case. Before class, students are required to familiarize themselves with the background of the case, query relevant materials, and analyze the design ideas therein to improve their instructional design skills. Cultivate students' ability to access the latest literature and follow the research progress of the discipline. After showing the examples to the students, the teacher gives them sufficient imagination time. It is recommended that the students discuss in groups and achieve the answers to the above examples through understanding the concepts when consulting the materials before class.

Taking "Solving Triangles", the second compulsory volume of high school mathematics, as the knowledge carrier, and taking tunnel measurement as the mathematical task, this paper comprehensively examines students' ability to solve problems through mathematical modeling and applying knowledge of solving triangles. Students need to extract key information from actual problems, simplify and assume conditions, and use graphics to represent the problem situation. Construct mathematical models from the context, design measurement plans, apply knowledge of solving triangles to solve problems, and then evaluate the rationality of the results.

4.2.2. Classroom teaching

After completing all the answers, ask students to compare their own solution process to find out the problems existing in the problem solving process or the influencing factors that lead to incorrect answers. Then, students will answer the analysis results in groups. Finally, the teacher reviews and summarizes the performance of each group, and uses the student's performance as the basis for performance evaluation. If other students have questions about the content of the case, the reporting group is responsible for answering them. Finally, the teacher will comment on the performance of the students. Therefore, it is also necessary for teachers to communicate with the reporting students in advance and provide some guidance on the reporting content. In the above classroom teaching, teachers and students continuously engage in dialogue and step by step guide students to explore issues. The design of problems should be open, allowing each student to develop their own ideas, explore and experience problem-solving methods and processes from different perspectives and levels, and at the same time, allow students to raise questions and solutions during this process^[6]. Thereby making the final scheme feasible. Build a model and find out the constraints of the model in the topic and the relationship between the graphics.

4.2.3. Summary after class

In case teaching of courses, teachers should focus on students and pay attention to inspiration and guidance in classroom teaching. On the one hand, it is necessary to ensure that classroom teaching meets teaching requirements while ensuring teaching progress. On the other hand, it is necessary to fully mobilize students' enthusiasm for classroom learning and ensure the teaching effect of case teaching. Teachers need to promptly sort out and improve the shortcomings and problems in the case based on students' teaching feedback and classroom teaching effects. At the same time, the structure and content of excellent cases introduced by students in the classroom are further improved and supplemented, which can be used as new teaching cases and enrich the case library of the course.

In the process of summarizing after class, teachers should play the role of organizer and collaborator in classroom teaching. Due to class time constraints, the discussion has not been conducted in depth, and there are many related issues that are worth continuing to discuss, leaving some questions for students to continue. For example, "Is there a better way to directly measure the length of a tunnel?" "After erecting a pole on the top of the mountain, construct a triangle to solve the problem".

5. Features and Innovation

5.1. Theoretical innovation

Carrying out research in practical activities of mathematics teaching and integrating the OBE concept into the cultivation model of mathematics teaching have clearly proposed the era requirements for the current reform and innovation of mathematics teaching, helping to adjust the pace and methods of teaching, optimize teaching design, and indicate the direction and goals for further promoting the cultivation of students majoring in mathematics education. Through research, we can gain a deeper understanding of the process by which students majoring in mathematics and mathematics education

acquire teaching practical abilities, explore the factors that affect the improvement of teaching practical abilities of students majoring in mathematics and mathematics education, and provide assurance for the scientific development of teaching practical abilities and the improvement of teaching practical abilities of students majoring in mathematics and mathematics education.

5.2. Practical innovation

Construct an integrated training model of teaching ability training theory and practice for students majoring in mathematics education. Under the guidance of the OBE concept, form a scientific teaching and training model to improve the theoretical level of teaching design for students majoring in mathematics education master's degree; Strengthen the programmatic and guiding nature of teaching objectives in teaching design; By constructing an integrated framework of teaching ability training theory and practice for students majoring in Master of Mathematics Education, we can connect both inside and outside the classroom and outside the school, forming a joint force among university teachers, middle school teachers, and normal students, and promoting the improvement of teaching practice ability of students majoring in Master of Mathematics Education. The formed teaching practice ability training cases can better serve to improve the teaching practice ability of students majoring in mathematics education master's degree.

5.3. Method innovation

Emphasis should be placed on the situational, targeted, and effective cultivation of teaching practical abilities of students majoring in mathematics education. During the period of improving the teaching and practical abilities of students majoring in Master of Mathematics Education, track and guide normal school students throughout the process, implement a training tutorial system, and guide scientific training. Realize information exchange and interaction between normal school students and experts before, during, and after training, master the needs of normal school students, establish an information feedback mechanism, timely adjust training strategies, achieve dynamic management, and maximize training effectiveness. Through the circular training process of "researching problems - renewing concepts - improving methods - reflecting practice", a five-step circular training process has been gradually formed through self-reflection, peer assistance, and teacher guidance. This situational and targeted training method is conducive to the consolidation and improvement of the teaching practice ability of students majoring in Master of Mathematics Education, and improves the effectiveness of cultivating the teaching practice ability of students majoring in Master of Mathematics Education.

6. Summary and improvement

During the construction and application of the case library, it is necessary to continuously summarize experiences and lessons to improve the level of case library construction and application.

First, universities should establish specialized OBE education concept promotion organizations that are responsible for overall design, promotion, and coordination. The promotion and application of OBE education concepts has a significant positive effect on cultivating applied talents in universities. However, it is also a systematic project that requires sufficient investigation and research on the school itself and the external environment during promotion, and designs application models with their own characteristics based on the school's own situation and the current situation of China's education system. This is not something that a teacher, a major, or a department can accomplish. It requires the cooperation of various administrative departments and teaching departments, so a specialized promotion department is particularly important.

Secondly, before promoting the OBE teaching concept, relevant training should be provided to students and teachers. In the process of transforming educational models, it is necessary for teachers to fully understand the true meaning of the OBE concept, so as to be able to design their own classrooms according to the overall curriculum system, and encourage and guide students to exert their subjective initiative in the classroom; At the same time, it also requires students to give full play to their talents and have a strong active learning spirit. Therefore, before truly promoting the OBE teaching concept, special training for teachers and students is required. The main content of teacher training includes the connotation of the OBE education concept, the main details and key indicators in the implementation process of the OBE concept, and the control methods for uncertain factors in the implementation

process of the OBE concept. The main purpose of student training is to enable students to understand the teacher's teaching process and encourage students to fully exert their subjective initiative and actively integrate into their own centered classroom.

Third, enhance communication and cooperation between universities and achieve resource sharing. The environment in which each school is located is different, and this difference can also lead to similarities and unique characteristics between each school's teaching reform and other school reforms. The teaching reform under the OBE concept will have different performances in different schools in China, so various universities should strengthen mutual communication and exchange to achieve resource sharing, jointly complete the promotion and application of the OBE concept in various universities, and promote the development of China's education. Of course, while learning from each other, major universities should also pay attention to their own characteristics, and be able to timely adjust strategies that are not suitable for their own development, so as to achieve the reform of the education model under the OBE concept with their own characteristics.

Fourth, major universities should improve the OBE concept mechanism, dredge feedback channels, and enhance their ability to adapt to the reform of the OBE education model. A sound promotion mechanism helps to enhance coordination among relevant departments, simplify the administrative process in the reform process, and improve the efficiency of the reform; A smooth feedback channel helps to timely identify and resolve issues at various stages of the reform process, and can promote the resolution of deviating issues, thereby ensuring the realization of expected teaching effects.

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