Research on Teaching and Learning Practical Strategy of the Course "Subject Teaching Research and Design" from the Perspective of Teacher Education Professional Certification

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Abstract: Based on the perspective of teacher education professional certification, this paper proposes teaching and learning practice strategies for the course "Subject Teaching Research and Design": (1) adding a module on "Analysis of Middle School Mathematics Curriculum Standards and Textbooks" to enhance the ability of teacher trainees to "teaching design according to the Curriculum Standards"; (2)Clarify the logical relationship between "educational internships, educational internships, and educational studies" to enhance the professional abilities of teacher trainees; (3) Emphasize the construction of case libraries and enhance the educational information technology capabilities of teacher trainees. Provide technical support for other majors to successfully pass the teacher training certification.

1. Introduction

The course "Subject Teaching Research and Design" (hereinafter referred to as "Subject") boasts a rich history and has undergone several name changes in our school: from Mathematics Teaching Theory, to Subject Teaching Research and Design, then to Theory and Implementation of Teaching Design, and finally to Subject Teaching Design and Practice. Recently, with the revision of the 2024 talent training plan, it has been renamed once again as Mathematics Subject Teaching Design. In fact, no matter how it is renamed, it cannot change the special nature of the combination of theory and practice in this course. No writer has ever attempted to separate theory from practice. Whether it's theory before practice or practice before theory, writers always integrate classroom teaching skills into the course[1]. "Subject" is a module course in teacher education for mathematics and applied mathematics majors, and is a compulsory course for future mathematics educators. In theory, "Subject" should be highly valued by teacher trainees, but in reality, the opposite is the case. Most teacher trainees regard it as an irrelevant course until realizing the necessity of learning it well during recruitment exams.

Our school's Mathematics and Applied Mathematics major has just passed the second level certification for teacher education majors recently. Experts from the Ministry of Education visited the school and pointed out the following main outstanding problems: 1. The lack of the course "Analysis of Middle School Mathematics Curriculum Standards and Textbooks" is not conducive to cultivating the ability of teacher trainees to "design teaching according to the curriculum standards". 2. The timeline for "educational internships, educational practice, and educational research" is unreasonable and cannot reflect the cultivation of teacher trainees' teaching and research abilities. 3. The absence of artificial intelligence modules in the course design is not conducive to improving the educational information technology abilities of teacher trainees.

Therefore, based on the feedback from experts and the perspective of teacher education certification, this article proposes practical strategies for teaching and learning in the “Subject”, providing theoretical and technical support for other majors to successfully pass teacher education certification.

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2. Teaching and Learning Practice Strategies for "Subject" Courses - From the Perspective of Teacher Education Professional Certification

2.1 Add a module on "Analysis of Middle School Mathematics Curriculum Standards and Textbooks" into the teaching and learning practice of "Subject" to enhance the ability of teacher trainees to "design teaching according to curriculum standards".

Curriculum standards are the foundation for teacher trainees to design subject teaching. Our country attaches great importance to students' quality education and cultivates their core competencies. The "National Curriculum Standards for High School Mathematics (2017 Edition) 2020 Revised Edition" (hereinafter referred to as the "High School Curriculum Standards") clearly proposes to cultivate students' six core competencies: mathematical abstraction, mathematical operations, mathematical modeling, data analysis, intuitive imagination, and logical reasoning[2]; The "Compulsory Education Mathematics Curriculum Standards (2022 Edition)" (hereinafter referred to as the "Compulsory Curriculum Standards") proposes specific core competencies for primary and junior high school students, gradually cultivating students' core competencies from consciousness to ability[3]. The compulsory education stage and high school stage jointly refer to the "three skills": being able to observe the real world with a mathematical perspective, being able to think about the real world with mathematical thinking, and being able to express the real world with mathematical language. How to cultivate students' core competencies in mathematics classroom teaching in primary and secondary schools? As future prospective mathematics teachers, we should carefully study and fully understand the concepts, nature, tasks, and requirements of curriculum standards, analyze textbooks, and improve their teaching design abilities.

(1) Enhance the interpretation ability of teacher trainees' curriculum standards in the teaching and learning practice of "Subject", and improve the ability in subject teaching design of teacher trainees. Firstly, clarify the concept and nature of curriculum standards, and enhance the professional identity of teacher trainees. Teacher trainees acquire the understanding of "who education cultivates, how to cultivate, and what kind of people it cultivates", and deeply realize that teaching not only requires "cultivating morality and nurturing people", but also requires "One who learns much is a teacher, and one who leads by example is a role model." Secondly, enhance the emotional education awareness of teacher trainees. The Curriculum Standards emphasize the need to enhance students' interest in learning mathematics and cultivate a correct attitude towards learning mathematics. To achieve this, it is necessary to pay attention to the "emotions, attitudes, and values" of each lesson, ways and methods to cultivate emotional communication among teacher trainees and improve their ability to write teaching objectives in instructional design. Finally, enhance the understanding of core competencies in the curriculum standards among teacher trainees. The ultimate goal of core literacy is quality education, which refers to the "four basics, four abilities, and three skills". By combining specific cases, it gradually guides teacher trainees to understand the core literacy of a certain lesson from the aspects of mathematical thinking quality and mathematical thinking methods

(2) Enhance the interpretation ability of teacher trainees' textbooks in the teaching and learning practice of "Subject", and improve the ability in subject teaching design of teacher trainees. According to the requirements of the teaching content in the Curriculum Standards, guide normal students to interpret textbooks, explore mathematical thinking methods, mathematical history, and mathematical culture in textbooks, and use the excavated mathematical thinking methods and mathematical history to design teaching.

Firstly, teacher trainees should carefully study the history and culture of mathematics in textbooks, clarify the roles of mathematics history and culture in textbooks, consider the relationship between mathematics history and mathematics education, and consider "teaching design under HPM". Teaching Methodology Teacher introduce famous domestic experts in the history of mathematics to teacher trainees, guiding them to carefully read relevant works and papers on the history of mathematics, and using mathematical history and culture to enhance students' emotions, attitudes, and values[4].

Secondly, teacher trainees should carefully explore the mathematical thinking methods in textbooks and use them in teaching design. Mathematical ideas and methods are hidden between the lines of textbooks and require careful reading to uncover. Some experts point out that the key to evaluating a math class is whether it permeates mathematical thinking methods and enables students to acquire the essence of mathematics. Zhang Jianyue proposed the "three understandings" to mathematics teachers: understanding mathematics, understanding teaching, and understanding students. Among them, understanding mathematics means understanding the essence of mathematics, and understanding the mathematical thinking methods in textbooks can lead to understanding the essence of mathematics. In the teaching and learning of the "Subject" course, the Teaching Methodology Teacher guides students to explore the mathematical thinking methods in the textbook through specific teaching content, helping them deepen their understanding of mathematical thinking methods.

2.2 Clarify the logical relationship between "educational probation, educational practice, and educational study" in the teaching and learning practice of "Subject", enhancing the professional competence of teacher trainees

“The Professional Standards for Mathematics Teachers in Primary and Secondary Schools” point out that teachers should have strong professional abilities. In practical teaching, Teaching Methodology Teacher not only need to cultivate the teaching ability of teacher trainees, but also need to cultivate their organizational management ability and interpersonal communication ability[5]. Through educational probation, educational practice, and educational study, the professional abilities of teacher trainees can be effectively improved. probation, practice, and study are collectively referred to as the "Three Practices". The logical sequence of the "Three Practices" is clear: first comes probation, then practice, and finally study. Teacher trainees gain practical knowledge of teaching and learning through educational probation, which allow them to have close contact with "teaching" in a short period of time; Then, through a semester of educational practice, Iteacher trainees will acquire practical knowledge of teaching and management, laying a solid foundation for further becoming a prospective teacher; Based on educational surveys and teaching reflections during or after educational practice, Teacher trainees carefully review materials to accumulate materials for the next step of writing a graduation thesis.

Firstly, the training practice of teaching ability for teacher trainees. In order to strengthen the teaching skills training of mathematics teacher trainees, the Mathematics Institute has carried out multiple reforms, systematically and purposefully standardizing and implementing teaching, training, and practice. It has successively constructed the "233 style" and "432 style" mathematics teaching skills training systems, and preliminarily constructed a mathematics teaching skills training system suitable for the actual teaching and education of normal universities with strong practicality and operability. The implementation of the "235" teaching model has accumulated theories on reading textbooks, teaching design, and teaching research abilities for cultivating practical knowledge and subject teaching knowledge among teacher trainees.

Secondly, the training practice of organizational management ability for teacher trainees. During the teaching period of "Subject", by leading teacher trainees to high-quality schools for educational probation, where they observed excellent teachers' classroom teaching, participated in evaluations conducted by both teachers and teacher trainees , and attended special lectures such as"Moral Education and Class Management" given by outstanding teachers, the teacher trainees not only enhanced their teaching experience but also gained indirect experience in "teacher recruitment" and educational management. Educational practice provide opportunities for teacher trainees to practice on-site teaching and educational management, accumulating direct experience in class management. During the educational study, teacher trainees reflect on their experiences with "students, parents, and colleagues" during educational probation and educational practice, forming theoretical knowledge. In this way, teacher trainees acquire class management skills through the process of "Three Practices".

Finally, cultivate the teaching evaluation ability of teacher trainees. Both the "High School

Curriculum Standards" and the "Compulsory Curriculum Standards" propose "academic quality evaluation", which has clear regulations on how to evaluate teaching and students. How to change the traditional emphasis on results over process evaluation, follow diversified evaluation, and realize "Integration of teaching, learning, and evaluation" requires teacher trainees to learn "Measurement and Evaluation of Mathematics Education", master the principles and methods of education measurement and evaluation, and acquire "SPSS measurement method" and "CIMSS measurement method".

2.3 Emphasize the construction of case libraries in the teaching and learning practice of "Disciplines" to enhance the educational information technology capabilities of teacher trainees

Our country has continuously introduced relevant policies, clarifying the specific requirements for the introduction of artificial intelligence into schools. In this context, undergraduate institutions that aim to cultivate future mathematics teachers should fully consider how to cultivate the educational information technology capabilities of teacher trainees in the era of artificial intelligence.

The advice given by the certification experts for teacher education majors is to increase classroom teaching capacity, absorb cutting-edge knowledge of disciplines, reform teaching methods, and increase the use of case teaching and inquiry teaching, and modern educational information technology in teaching. The specific path to achieving the above requirements is to fully rely on the "Rain Classroom" and "Future Learning Classroom" platforms to achieve modular teaching of knowledge. The "Rain Classroom" can provide replay of teaching materials, online testing, and random roll call for teacher trainees; The "Future Learning Classroom" platform provides teaching cases and teaching resources for teacher trainees to learn. Pedagogical teachers can upload cases and videos through the platform, guide teacher trainees to use self-study outside of class, and provide theoretical and technical support for educational practice and recruitment exams.

3. Conclusion

Cultivating the professional knowledge and abilities of teacher trainees is not only a requirement of the "Professional Standards for Mathematics Teachers in Primary and Secondary Schools", but also an assessment indicator of the "Professional Certification Standards for Teacher Candidates". As a course that combines theory and practice, the role of "Subject" should not be underestimated. The teaching practice of "Subject" follows a continuous cycle of "theory-practice-theory-re practice", which not only effectively promotes the certification of teacher education majors, but also provides theoretical and technical support during the certification process. In response to the targeted suggestions put forward by certification experts in the field of teacher education, efforts still need to be made in the construction of the "Subject" course to prepare for the upcoming annual assessment.

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References

[1] Zhang Dianzhou, Song Naiqing. Introduction to Mathematics Education (Fourth Edition) [M]. Beijing: Higher Education Press, 2009:79-81

[2] Developed by the Ministry of Education of the People's Republic of China, Mathematics Curriculum Standards for Compulsory Education (2022 Edition) [M], Beijing: Beijing Normal University Press, 2022:1-182

[3] Developed by the Ministry of Education of the People's Republic of China, Mathematics Curriculum Standards for Ordinary High Schools (2017 Edition) [M], Beijing: People's Education Press, 2017:1-180

[4] Wang Chuanli. Theoretical Research and Practical Exploration on the Cultivation of Practical Knowledge for Pre-service Teachers Based on Professional Standards for Middle School Teachers: A Case Study of Mathematics Majors. Journal of Mathematics Education, 2015, 24 (2): 71 - 74

[5] Wang Xiaoqin, Zou Jiachen Analysis of Moral Education Connotation in Mathematics Based on the History of Mathematics [J]. Mathematics Bulletin, 2020, 59 (03): 7-12+19