Advances in Educational Technology and Psychology (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/aetp.2025.090509
ISSN 2371-9400 Vol. 9 Num. 5

Research on the Problems and Countermeasures of the Practice Teaching of Mathematics Education Master's Professional Degree Students

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Keywords: Master of Mathematics Education; Professional Degree; Practice Teaching; Problem; Countermeasure

Abstract: This study explores the problems in the practice teaching of mathematics education master's professional degree students and their countermeasures. Through literature analysis and field investigation, the research finds that there are problems such as curriculum setting, weak practice links, and insufficient tutor guidance in the current practice teaching of mathematics education master's students. In view of these problems, this article proposes optimization of the system, strengthening of the practice base construction, and improvement of the tutor team construction. The research results have important theoretical and practical significance for improving the quality of mathematics education master's degree students.

1. Introduction

With the rapid development of China' education, the cultivation of mathematics education master's degree students has received more and more attention. As a bridge connecting mathematical theory with educational practice, the quality of mathematics education masters training directly affects the level of basic mathematics education. However, there are many problems in the practice teaching link of current mathematics education master's degree students, which affects the quality talent training. The purpose of this study is to analyze these problems and propose corresponding solutions, providing references for improving the quality of mathematics education master's degree students.

2. The Current Situation of Practical Teaching for Mathematics Education Master’s Degree Students

The goal of training for master’s degree in mathematics education is to cultivate middle school mathematics teachers with a solid foundation in mathematical knowledge, strong teaching and education abilities, and practical innovation capabilities. Practical teaching, as a key in the training process, directly affects the professional competence of graduate students.

The practical teaching for master’s degree students in mathematics education mainly includes

forms such as educational observation, internship, micro-teaching, and teaching case analysis. These practical links aim to help graduate students combine theoretical knowledge with teaching practice and enhance their teaching abilities and professional qualities. However the current implementation effect of practical teaching varies widely, and there are many problems that urgently need to be addressed.

From the implementation perspective, most universities have set up practical teaching in their training programs for mathematics education master's degree students, but they often become perfunctory in the actual implementation process [1]. The time for educational observation and internship generally too short to allow graduate students to deeply experience the real teaching environment; micro-teaching and case analysis lack systematic guidance and fail to achieve the desired effect [2].In addition, the content and form of practical teaching are relatively monotonous and fail to fully reflect the characteristics of the mathematics discipline and the training goals of master's degree students in education.

3. Issues in the Practical Teaching of Mathematics Education Master's Degree Students

3.1 Curriculum setting: Imbalance between theory practice

Currently, the majority of universities still focus on theoretical courses in their mathematics education master's programs, with practical courses accounting for a relatively low proportion [3]. curriculum system usually includes mathematics subject courses (such as mathematical thinking methods, secondary school mathematics curriculum and textbook research, etc.), education theory courses (such as educational psychology, and teaching theory, etc.), and mathematics education research methodology courses. However, practical courses (such as mathematics teaching skills training, classroom observation and diagnosis, teaching case analysis,.) often only account for 20%-30% of the total credits, and the content is relatively monotonous, lacking systematicness and pertinence.

Moreover the practical course settings in some universities are detached from the actual needs of basic education, failing to closely integrate with the requirements of the secondary school mathematics new curriculum reform. For example, practical content such as mathematical modeling, interdisciplinary integrated teaching, and integration of information technology with mathematics courses have not been fully incorporated into the curriculum system, resulting in graduate students who it difficult to adapt to the development trend of modern mathematics education when they enter actual teaching positions.

3.2 Lack of depth and variety in practical teaching forms

The forms of practical teaching for mathematics education master's students are rather monotonous lack depth, mainly including educational observation, teaching internship, micro-teaching, and graduation thesis, etc. However, these practical forms are often superficial, failing to effectively enhance the abilities of the postgraduates. Specifically, educational observation usually only arranges short-term classroom observation, leaving the postgraduates lack opportunities to participate in teaching in depth hardly forming a systematic understanding of teaching; although teaching internship requires at least one semester of practice, due to the limited number of internship bases, some students are assigned to non-corresponding or only take on teaching assistant work, failing to independently complete a complete teaching task; as a simulated classroom training, micro-teaching lacks a real classroom environment, resulting in' on-site response and classroom management abilities not being fully trained; and some topics of the graduation thesis tend to theoretical discussions, failing to closely integrate with teaching practice,

which weak the guidance value for actual teaching.

3.3 Lack of practice base construction and insufficient deep cooperation between schools and enterprises

At present, the practice teaching of mathematics education master's degree facing a dual dilemma of lack of practice base construction and insufficient deep cooperation between schools and enterprises. On the one hand, due to the limitation of resources, the number of practice in some universities is limited, resulting in insufficient internship opportunities for graduate students, and even the phenomenon of "internship clustering". On the other hand, the quality of existing bases is uneven, some bases (such as ordinary middle schools) have weak teaching staff, lack of advanced teaching concepts and methods, and it is difficult to provide effective guidance. A-level problem is that the mechanism of school-enterprise cooperation is not sound, the cooperation between universities and primary and secondary schools often remains at the level of form, lacking a longterm and stable collaborative training mechanism, some primary and secondary schools only regard the interns graduate students as "temporary helpers", and fail to truly incorporate them into the school' teaching and research system, which seriously restricts the improvement of the quality of practice teaching.

3.4 Lack of adequate guidance from supervisors and inadequate implementation of the dual-mentor system

The training of mathematics education master's students usually a "dual-mentor system" where university supervisors (theoretical guidance) and primary and secondary school practice supervisors (teaching guidance) are jointly responsible. However, in the implementation process, this system faces three main problems: First, some university supervisors lack first-hand experience in the frontline of basic education due to their long-term engagement in theoretical, resulting in ineffective guidance for graduate students' teaching practice. Second, due to the imperfect incentive mechanism, the participation of primary and secondary school supervisors is generally low, and their often remains superficial and fails to delve into the training process. Third, there is a lack of effective communication and collaboration mechanism between the two types of supervisors, leading to a disconnect between students' theoretical learning and practical training.

3.5 The evaluation system is incomplete, and the practice assessment is perfunctory

At present, the evaluation system of practice teaching for mathematics education is still dominated by terminal evaluation, lacking the integration of process evaluation and diversified assessment methods. Specifically, in terms of internship evaluation, some universities only use brief comments from the internship or internship reports as the basis for evaluation, which makes it difficult to reflect the actual teaching ability of graduate students comprehensively and objectively; in the micro-teaching evaluation the existing standards are too vague and fail to develop detailed assessment indicators in combination with the characteristics of the mathematics discipline; and in the graduation thesis evaluation link, due to the lack of requirements for the practicality of the thesis, graduate students tend to choose theoretical topics rather than research based on real teaching practice problems. This kind of single evaluation model restricts the improvement the quality of practice teaching.

3.6 Weak Practical Awareness of Postgraduates

There is a widespread phenomenon of insufficient emphasis on practical teaching among current mathematics education postgraates, showing a distinct tendency of "emphasizing theory and neglecting practice". During the internship process, some students are only satisfied with completing the basic teaching tasks stipulated lacking the awareness and initiative to actively explore teaching issues; in the micro-teaching training process, many students fail to deeply reflect on the actual issues in the teaching process, resulting limited improvement in teaching skills; in terms of the topic selection of the degree thesis, students tend to choose relatively easy literature review topics rather than empirical research based on real classroom teaching situations which directly affects the quality and effectiveness of practical teaching. This phenomenon of imbalance between theory and practice not only restricts the cultivation of teaching practice ability of postgraduates but is not conducive to the improvement of their comprehensive quality needed for their future career development.

4. Strategies to Improve the Practical Teaching of Mathematics Education Master's Degree Students

4.1 Optimize the Curriculum System

It is necessary to construct an integrated curriculum system of "Theory-Practice-Reflection". On the one hand, the proportion of practical courses should be increased, and the weight practical courses should be raised from the current 20-30% to 40-50%, adopting a "1+1+1" course model. That, after one week of theoretical course learning, arrange one week of educational observation or internship, and then summarize and reflect for one week. For example, in the "Mathe Pedagogy" course, after 16 hours of theoretical teaching, immediately arrange 16 hours of middle school classroom observation and practice, and finally use 8 hours for reflection and improvement discussion.

On the other hand, it is necessary to develop case courses based on real teaching situations, and strengthen the training of mathematical teaching skills. The teachers will collect and compile more than 200 typical teaching cases covering various modules such as algebra, geometry, and probability and statistics. Each case the teachers compile will include complete materials such as teaching designs, classroom recordings, feedback, and expert comments, forming a mathematics teaching case database. Our team will implement case teaching by adopting a four-step methodology: "case presentation, analysis and discussion, simulated practice, and evaluation and improvement." For example, to address the challenging topic of "monotonicity of functions", the teachers will provide 3–5 distinct teaching method cases. Students will then design their own teaching plans through comparative analysis of these cases.

4.2 Enhancing Resource Construction

To effectively improve the quality of practice teaching for mathematics education master’s degree students, universities/institutions should build a practice teaching resource system characterized by "university-school collaboration, implementation of both software and hardware components, and distinctive features." In terms of university-school cooperation, universities/institutions need to establish deep collaborative relationships with key provincial and municipal primary and secondary schools for more than 5 years. This involves signing strategic agreements and setting up special funds to support 20-30 demonstration practice bases. This approach ensures that every graduate can complete at least one semester of immersive practice in a

high-quality teaching environment. The cooperation mode can adopt "dual mentor system", where university theoretical mentors and primary and secondary school practice mentors guide together, and establish an "order-based training" mechanism to achieve a seamless connection talent cultivation and employment needs. In terms of the construction of on-campus facilities, it is necessary to focus on creating a group of intelligent micro-grid classrooms, equipped with modern such as AI teaching analysis systems and 4K panoramic recording and broadcasting equipment, and at the same time, build a mathematics education innovation laboratory, including function modules such as teaching research and development area, digital teaching experience area, and VR simulation teaching area. The construction of the digital resource platform should integrate three core resource libraries: one is a dynamic updated famous teaching case library, which includes more than 1000 national high-quality mathematics lessons; the second is an intelligent teaching tool library, which integrates professional software such GeoGebra and geometry drawing board and their teaching application cases; the third is an interactive teaching and research community, which realizes normalized online discussions among university mentors, middle school teachers, graduates. The development of characteristic resources should focus on the characteristics of the mathematics subject, and key construction should include a mathematics modeling case library (including more than 50 cases for primary and secondary schools), a teaching skills micro-video library (covering 10 core teaching skills), and a mathematics culture resource package (including materials such as history of mathematics and mathematical aesthetics). To ensure the quality of resources, a quarterly update mechanism should be established, and a review team composed of university teachers, teaching and research, and front-line famous teachers should be formed to dynamically optimize the resources, and at the same time, promote the sharing of resources among regional university alliances to avoid duplicate construction. Through this systematic resource construction plan, it can effectively solve the current problems of fragmented and low-level repetitive practice teaching resources, and provide all-round support for the practice ability of mathematics education masters.

4.3 Improving the Supervision System

Building an efficient mechanism for the joint training of in-school and off-school supervisors is to enhancing the quality of practice teaching for mathematics education postgraduates. This mechanism should include four core components: First, a "dual-supervisor" responsibility list system be established, clearly specifying that university supervisors are mainly responsible for theoretical guidance, research methods, and academic norm training, with at least one face-to-face guidance session per week practical supervisors, on the other hand, focus on teaching skills training, classroom management guidance, and career development advice, ensuring that postgraduates participate in more than two real teaching practices per week [4]. Second, a supervisor capacity improvement plan should be implemented, with universities organizing 3-5 special trainings per semester, covering topics such as dynamics of basic education reform (e.g., interpretation of new curriculum standards), the application of modern education technology (e.g., smart classroom operation), and method research (e.g., clinical guidance techniques), and establishing a learning community for supervisors to regularly carry out experience sharing activities. Third, a quota management system for supervisors be implemented, stipulating that each in-school supervisor should guide no more than five postgraduates at the same time, and no more than three for off-school practical, to ensure the quality of guidance; at the same time, a two-way selection mechanism between supervisors and students should be established, fully considering the match between research directions and guidance. Finally, the incentive system for supervisors should be improved, incorporating guidance work into the performance assessment of teachers, linking the quality of guidance with the evaluation and employment of professional titles establishing an

"excellent practical supervisor" award with material rewards; issuing appointment letters to off-school supervisors, providing access to the use of university library resources, and inviting them to in teaching reform research projects.

4.4 Refine the Evaluation Mechanism

The reform of the practice teaching evaluation system for mathematics education master's students should establish comprehensive "four-in-one" assessment framework, achieving diversified development in terms of evaluation subjects, evaluation methods, evaluation content, and evaluation feedback. In terms of the evaluation, a "tripartite collaborative" evaluation mechanism should be constructed, with university supervisors (weight 40%), practice base instructors (weight 30%), and thirdparty experts (including curriculum researchers, special-grade teachers, etc., weight 30%) jointly constituting the evaluation group, to ensure the comprehensiveness and objectivity of evaluation. In terms of the evaluation methods, a "process result" dual-track system should be adopted [5]: process-oriented evaluation (60%) includes weekly teaching (10%), classroom observation records (15%), micro-teaching video analysis (15%), and participation in teaching and research activities (20%);-oriented evaluation (40%) focuses on teaching achievements display (15%), student academic progress data (15%), and the practical part of the graduation thesis (1%). The formulation of evaluation criteria should highlight the characteristics of the mathematics discipline, establish a four-dimensional indicator system that includes teaching design ability (25%), classroom implementation ability30%), teaching reflection ability (20%), and professional development ability (25%), with each dimension having 3-5 observable secondary indicators, such as "ively using Geometer's Sketchpad to break through teaching difficulties" and other specific behavioral indicators. The construction of the feedback mechanism should focus on timeliness and guidance, develop information-based platform for practice teaching evaluation, and achieve a rapid response mechanism of "daily recording - three-day feedback - weekly improvement", and establish a closed-loop system "evaluation - feedback - improvement - re-evaluation". In particular, the concept of value-added evaluation should be introduced, focusing on the growth and progress of graduate students in teaching practice process, rather than simple result comparison.

5. Conclusion

The improvement of practice teaching for mathematics education master's degree students is a systematic project that requires the joint efforts of universities, supervisors practice bases, and other parties. By optimizing the curriculum system, strengthening resource construction, improving the supervisor system, and perfecting the evaluation mechanism, the quality of practice teaching can be improved, and more high-quality mathematics education talents can be cultivated. Future research can further explore the effectiveness of practice teaching under different training models, as well as the application of educational technology in practice teaching for mathematics education master's degree students.

Acknowledgements

Construction of a Teaching Case Database for "Secondary School Mathematics Curriculum and Textbook Research" Based on the New Curriculum Reform. (JDYY2487)

Teaching Cases of Secondary School Mathematics Curriculum and Textbook Research Based on the New Curriculum Reform. (2025)

References

[1] Li Luolan, Liu Gang. Research on the Path of Practical Ability Training for Mathematics Education Master's Degree Graduate [J].Journal of Higher Education, 2025, 11 (09): 167-170.
[2] C Cangjin, Guo Jiahui. Problems and Solutions in the Training of Practical Ability for Full-time Education Master's Degree Students [J].Journal Shangqiu Normal University, 2024, 40 (10): 98-101.
[3] Li Xiaohong Shao Weishuang, Fang Xiaoyan. Research on the Training of Practical Ability for Full-time Mathematics Education Master's Degree Students [J].Science and Technology Wind, 2020, (23): 158-159.
[4] Kang Zhangqi, Pan Yong Research on the Training of Teaching Practice Ability for Education Master's Degree Students under the "Double Mentor System" [J].Education Teaching Forum, 202, (04): 177-180.
[5] Liu Chao, Qu Yu Rong. Research on the Construction of Comprehensive Practical Ab Evaluation Index System for Education Master's Degree in the New Era [J].Journal of the Army Education College, 2023, 33 (03), 55-61.