Article

Research on Closed-Loop Training Strategies for Teaching Competence of New Primary and Secondary School Teachers in Regional Contexts

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Abstract: Against the backdrop of deepening reform in basic education and the trend toward a younger teaching workforce, new teachers face systemic challenges such as disconnect between theoretical learning and practical application, fragmented training resources, and homogenized training. Based on the functions of municipal teacher training institutions, this study proposes a "closed-loop training strategy" centered on the four-stage process of "classroom observation - evaluation - revision - re-teaching". By constructing a four-dimensional strategic framework (structured closed-loop mechanism, cross-school resource integration, stratified targeted guidance, and comparative teaching application), the strategy systematically addresses issues of targeting, sustainability, and collaboration in new teachers' competence development. The research clarifies the theoretical basis and practical logic of the strategy design, providing an operable path for the structured improvement of regional new teachers' teaching competence. Its innovative value lies in forming a complete strategic chain of "problem diagnosis - strategy adaptation - effect prediction", enriching the methodology system of teacher professional development.

Keywords: new teacher training; teaching competence; closed-loop strategy; training design

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1. Introduction

With the basic education curriculum reform entering a literacy-oriented deepening stage, the structural upgrading of teachers' teaching competence has become a core issue for improving regional educational quality. From 1985 to 2023, the number of full-time teachers nationwide nearly doubled. The Ministry of Education has continuously promoted the improvement of teacher education systems, such as implementing the "National Excellent Teacher Program". In this context, a large number of highly educated talents have joined the teaching workforce, enriching primary and secondary school faculty and accelerating the rejuvenation of teachers [1]. As the "basic unit" of educational reform, the teaching competence of new teachers with less than three years of teaching experience directly determines the effectiveness of classroom education. However, three contradictions exist in new teacher training practices [2]: First, the disconnect between "theoretical acquisition" and "practical transformation". Teacher education focuses more on pedagogical principles and disciplinary knowledge systems; 82% of new teachers report that they "know teaching principles but cannot design specific teaching activities", highlighting the gap between pre-service training and job requirements. Second, the conflict between "individual growth" and "resource barriers". Traditional school-based training is limited to experience sharing within a single school, and high-quality lesson examples and expert experiences are difficult to flow across schools, widening the competence gap between new teachers in urban/rural and strong/weak schools. Third, the imbalance between "uni-

fied training" and "individual needs". Existing training mostly adopts a "standardized curriculum + centralized teaching" model, ignoring the differentiated needs of new teachers from different disciplines and with varying foundations.

To address these contradictions, municipal teacher training institutions, as the "hub" of regional teacher professional development, urgently need to construct a targeted and operable training strategy system. Based on this, this study proposes the concept of "closed-loop training strategy", aiming to resolve practical obstacles in improving new teachers' teaching competence through systematic strategy design.

2. Theoretical Basis and Core Concepts of Closed-Loop Training for New Teachers' Teaching Competence

2.1. Theoretical Basis

2.1.1. Teacher Professional Development Stage Theory

Fuller's theory of teacher concern stages points out that new teachers are in the transition from the "survival concern stage" to the "task concern stage", with core needs focusing on classroom order control and recognition of teaching effectiveness [3]. The closed-loop training strategy precisely aligns with this stage: the "classroom observation - evaluation" phase alleviates new teachers' professional anxiety through immediate feedback, meeting their need for security; the "revision - re-teaching" phase strengthens professional identity through perceptible progress, helping them smoothly pass the adaptation period.

2.1.2. Action Research Theory

Lewin's plan-action-observation-reflection cycle model provides methodological support for the closed-loop strategy [4]. By treating new teachers' teaching practice as a dynamic action research field, the continuous cycle of "practice-feedback-adjustment" guides them to transform from experience-based teaching to reflective teaching, gradually forming professional habits of self-improvement.

2.1.3. Social Constructivism Learning Theory

Vygotsky's "zone of proximal development" theory emphasizes that learners can achieve leapfrog ability development through expert guidance and peer interaction [5]. Designs such as cross-school classroom observation and dual-track evaluation in the closed-loop strategy essentially construct a multi-interactive learning community: researchers provide professional guidance, experienced teachers share practical experiences, and peers inspire each other, building precisely adapted "scaffolds" for new teachers' competence development.

2.2. Definition of Core Concepts

New teachers' teaching competence: Refers to the comprehensive competence required by new teachers with less than 3 years of service to complete classroom teaching tasks, covering five dimensions: curriculum standard interpretation, student situation diagnosis, activity design, classroom management, and evaluation feedback, forming a complete competence chain of "goal setting - implementation - effect assessment".

Closed-loop training strategy: A systematic training strategy centered on improving new teachers' teaching competence, constructed through a four-stage cycle of "classroom observation (problem identification) - evaluation (cause diagnosis) - revision (plan optimization) - re-teaching (effect verification)". It has three characteristics: targeting (focusing on competence weaknesses), cyclicity (continuous iterative improvement), and collaboration (integrating multi-party resources).

Regional training perspective: Based on the overall planning function of municipal teacher training institutions, it emphasizes the systematicness and regional adaptability of strategy design, distinguishing it from single-school-based training models. It aims to

realize cross-school flow of high-quality resources and regional radiation of training experiences.

3. Four-Dimensional Strategy Design for Regional New Teachers' Closed-Loop Training

3.1. Construction Strategy of Structured Closed-Loop Mechanism

As the "main thread" of strategy implementation, the core of the structured closed-loop mechanism lies in forming a complete improvement chain of "problem identification - intervention implementation - effect verification" through systematic design of the four-stage process, ensuring the continuous improvement of new teachers' teaching competence through cyclic iteration.

3.1.1. Multi-Dimensional Problem Diagnosis Strategy in Classroom Observation

The core goal of classroom observation is to accurately identify new teachers' competence weaknesses in classroom teaching, providing empirical basis for subsequent improvement.

Tool design: Develop the New Teacher Classroom Competence Observation Scale, constructing a "5+18" indicator system—5 first-level indicators corresponding to the five core competencies (curriculum standard interpretation, student situation diagnosis, activity design, classroom management, evaluation feedback), with 3-4 second-level indicators under each first-level indicator (e.g., student situation diagnosis includes rationality of pre-test design, prediction of students' cognitive obstacles, and attention to differentiated needs). It adopts a recording method combining a 1-5 point quantitative scoring with qualitative descriptions, ensuring data comparability while enhancing the perceptibility of problems through specific scenario examples (e.g., "When students raised out-of-syllabus questions, the teacher failed to guide effectively").

Organization method: Form a three-level observation team of "municipal researchers + district-level key teachers + school-based mentors", with a ratio of 3 observers per new teacher. Researchers focus on diagnosing the implementation of educational concepts, key teachers analyze practical skills, and school-based mentors track individual growth trajectories. A pre-observation meeting is held to clarify the core competence dimension for the observation (e.g., focusing on evaluating the consistency between activity design and goals in the first observation) to avoid scattered perspectives.

Information processing: Immediately form an Observation Diagnosis Report after class, adopting a "problem list + evidence chain" structure. For example, regarding "insufficient classroom interaction", it must record specific data such as "teacher's one-way lecture accounted for 65% of class time, students actively asked 2 questions, and the effective response rate was 50%", rejecting vague descriptions to provide precise targeting for subsequent evaluation.

3.1.2. Dual-Track Dialogue Diagnosis Strategy in Evaluation

The evaluation phase aims to achieve the synergistic effect of "theoretical guidance - experience transfer - problem solving" through multi-dimensional interaction.

Dual-track mechanism construction: Build a "professional guidance + experience sharing" dual-track mechanism. Researchers interpret curriculum standards and core literacy implementation requirements from a macro perspective (e.g., how to integrate aesthetic appreciation literacy in teaching Winter in Jinan); key teachers share practical skills from a micro perspective (e.g., how to avoid minority dominance in group discussions), forming a complete guidance chain from concepts to methods.

Process standardization: Strictly follow the closed-loop process of "10-minute self-reflection + 30-minute multi-dimensional evaluation + 10-minute summary suggestions". New teachers must submit a Teaching Design Idea Explanation in advance, clearly stating the basis for teaching goal setting, logic of activity design, and deviation between expected

and actual effects, ensuring reflection focuses on their own practice. The evaluation phase prohibits evaluative language (e.g., "This lesson was a failure") and advocates constructive suggestions (e.g., "Adding student peer evaluation may improve goal achievement").

Focus locking: Each evaluation focuses on 1-2 core issues. For example, in the evaluation of a math new teacher's lesson on "quadratic equations", the team conducted in-depth discussions on "how to infiltrate modeling thinking through error analysis", finally forming 2 operable suggestions (e.g., designing error attribution tables and variant training of similar problems), avoiding inefficient generalized discussions.

3.1.3. Targeted Plan Optimization Strategy in Revision

The revision phase is the key node connecting evaluation and re-teaching, aiming to promote the transformation from experiential adjustment to rational improvement.

Three-level review standards: School-level: Teaching research leaders review the matching between "problems and plans" (e.g., verifying whether "open-ended question design" in the revision plan can effectively cover students of different cognitive levels for the problem of "insufficient questioning hierarchy").District-level: District researchers review the scientificity of strategies (e.g., evaluating whether "group cooperative learning" design conforms to the principle of "heterogeneity within groups and homogeneity between groups" to avoid formalistic cooperation).Municipal-level: Municipal subject researchers review the advancement of educational concepts, focusing on whether the revision plan reflects core educational concepts such as "student-centered" and "literacy-oriented" (e.g., "whether task-driven teaching replaces teacher-led lectures").

Tool development: Design the Lesson Plan Revision Comparison Table, with the left column recording "original design problems and manifestations" (e.g., "Disconnection between situation creation and text: The introduction video did not match the emotional tone of Winter in Jinan") and the right column corresponding to "revision plans" (e.g., "Replace with life-oriented introduction of 'students sharing photos of their hometown's winter'") and their "theoretical basis" (e.g., "Building cognitive scaffolds based on students' life experiences, drawing on Vygotsky's 'zone of proximal development' theory"), strengthening the theorization and systematization of reflection.

3.1.4. Effect Verification Strategy in Re-Teaching

The re-teaching phase verifies the effectiveness of improvement measures through comparative analysis, forming a closed-loop evidence chain of "practice - reflection - optimization".

Comparison framework construction: Build a dual-dimensional comparison framework of "teacher behavior" and "student performance". The teacher behavior dimension focuses on "adjustment of teaching strategies" (e.g., the specific proportion of question types transformed from closed-ended to open-ended); the student performance dimension focuses on "changes in goal achievement" (e.g., improvement in mastery rate of core knowledge, quality of responses to high-order thinking questions), avoiding a single evaluation perspective.

Verification method: Select parallel classes of the same grade for re-teaching to control irrelevant variables such as student basis and teaching content; adopt a "triangulation verification method" combining video analysis, student interviews, and homework comparison. For example, by analyzing the number of students' active speeches in two teaching videos and combining students' subjective feelings about the class in interviews, the improvement effect is comprehensively evaluated to ensure the objectivity of conclusions. For instance, a new physics teacher changed "teacher demonstration experiments" to "student group inquiry" in re-teaching the lesson on buoyancy, and the classroom participation rate increased from 45% to 82%, verifying the effectiveness of strategy optimization.

3.2. Integration Strategy of Cross-School Teaching Research Resources

Targeting new teachers' characteristics of "insufficient experience reserve", "single reference frame", and "resource access limited to their own school", this strategy breaks school barriers and constructs a sharing ecosystem, providing them with diverse learning samples and practical materials to solve the dilemmas of "no experience to learn from" and "inability to apply what is learned".

Precise supply of municipal resource database: Focusing on new teachers' pain points of "lacking templates, methods, and cases", construct a resource matrix by "subject classification + competence dimension": ① Model lesson example database (select 20 high-quality lessons by new teachers for each subject, with "competence highlight analysis" marking "3 directly transferable teaching links"); ② Problem solution database (collect response strategies for new teachers' frequent problems such as "classroom management" and "student situation diagnosis", with "beginner operation version" step-by-step explanations); ③ Tool template database (provide fill-in-the-blank templates for layered teaching design and student pre-tests). The resource database is updated bimonthly, with municipal subject researchers screening "practical resources usable by new teachers" to avoid information overload.

Collaborative empowerment of inter-school training communities: Form several training communities based on "geographical proximity and strength complementarity", catering to new teachers' need for "role models around them". Through the Community Charter, specify "1 joint observation per month and 1 new teacher achievement display per semester", allowing new teachers to find their own growth paths through comparing learning design practices in urban schools and their implementation adaptations in rural schools.

Targeted service of resource flow mechanism: Implement three new teacher-specific systems: ① The "classroom visiting system" requires new teachers to observe classes in other schools at least six times per semester, focusing on recording replicable tips (e.g., life-oriented introduction methods of new teachers in rural schools). ② The "lesson delivery system" arranges key teachers to teach demonstration lessons in weaker schools while simultaneously explaining "three common mistakes of new teachers". ③ The "resource sharing points system" encourages new teachers to share their improvement cases in exchange for training quotas, both supplementing the resource database and enhancing their sense of achievement.

3.3. Stratified Targeted Guidance Strategy Based on Competence Levels

Stratified targeted guidance constructs a targeted adaptation system based on new teachers' competence foundations, breaking the limitations of traditional "one-size-fits-all" training and realizing precise training based on competence stratification. New teachers are divided into three levels according to teaching age and competence development stages, with differentiated guidance.

Entry level (0-1 year of service): In the "survival adaptation period", the core goal is to meet classroom routine standards, focusing on improving the completeness of teaching links and classroom order control ability. Adopt a "1+1" mentorship system, with 1 key teacher following up throughout the process, conducting 15-minute "micro-reviews" after class daily to solve specific problems (e.g., "how to quickly focus students' attention through command design", "how to adapt blackboard layout to teaching processes"), helping new teachers quickly master basic classroom norms.

Progressive level (1-2 years of service): In the "skill improvement period", the core goal is to optimize teaching strategies, focusing on strengthening student situation analysis and activity design abilities. Promote new teachers' transformation from "able to teach" to "teach well" through thematic workshops on "layered homework design" and "questioning strategy gradient".

Advanced level (2-3 years of service): In the "style formation period", the core goal is to refine teaching characteristics, focusing on cultivating curriculum integration and evaluation innovation abilities. With project-based training as the starting point, set real tasks such as "unit overall teaching design" and "interdisciplinary theme teaching" to guide new teachers to form personalized teaching styles, laying the foundation for becoming key teachers.

3.4. Application Strategy of Comparative Teaching Method

Targeting new teachers' weaknesses in reflective practice ability and experience transfer ability, comparative thinking is integrated into the entire competence training process, strengthening their reflective practice ability through multi-dimensional comparison.

3.4.1. Design of Comparison Dimensions Adapting to New Teachers' Growth Needs

Self-longitudinal comparison: Focus on "two teachings of the same content", catering to new teachers' need to "see their growth trajectory". Create a Teaching Improvement Comparison Table from three core dimensions: accuracy of goal setting, logic of link design, and adaptability to student responses, requiring marking of "improvement measures" and "effect evidence".

Peer horizontal comparison: Select heterogeneous lesson examples of new teachers in training communities, fitting new teachers' need for "reference frames". Focus on analyzing the adaptability of different teaching designs to student situations, avoiding new teachers falling into the misunderstanding of blind imitation. For example, in teaching "photosynthesis", guide new teachers to compare teacher A's (urban school) "digital experiment inquiry" and teacher B's (rural school) "low-cost material simulation experiment", understanding the logic that "inquiry methods are more suitable for urban students, while question chain methods are more suitable for rural students", and learning to "design on demand" rather than "copy models".

Experience reference comparison: Compare new teachers' lesson examples with key teachers' model lessons, responding to new teachers' confusion about "where the gap lies". Establish comparison indicators from key competence dimensions such as question quality and processing of generative resources (e.g., through data comparison, find that "open-ended questions account for 58% in key teachers' classes but only 21% in new teachers' classes"), clarifying specific directions for "optimizing questioning design" and avoiding generalized "learning from excellence".

3.4.2. Development of Comparison Tools Supporting New Teachers' Reflection

Targeting new teachers' "lack of structured reflection methods", two types of visual tools are developed:

Student performance comparison table: Record students' participation distribution (e.g., proportion of active speakers), error type changes (e.g., from conceptual confusion to application deviation), and thinking depth levels (e.g., from memory repetition to transfer application) in two teaching sessions, using student behavior data to prove teaching improvement effects and avoiding new teachers' one-sided reflection focusing only on "self-performance".

Structured reflection log template: Set a three-column template of "comparison findings - cause analysis - improvement ideas", guiding new teachers to shift from phenomenon description (e.g., "low student participation") to in-depth attribution (e.g., "activity design did not match students' interests") and then to specific plans (e.g., "adding 'group competition' links"), cultivating rational "problem-countermeasure" thinking and avoiding superficial reflection.

4. Strategic Innovation and Research Limitations

4.1. Innovation Value

Methodological innovation: Break through the traditional "experience-based training" model and construct a scientific strategy system of "problem diagnosis - strategy adaptation - effect verification". Through the development of tools such as the New Teacher Classroom Competence Observation Scale and Teaching Improvement Comparison Table, new teacher training is transformed from "vague guidance" to "targeted intervention", forming a quantifiable and traceable competence improvement path.

Mechanism innovation: Relying on the closed-loop cycle design of "classroom observation - evaluation - revision - re-teaching", solve the long-standing problem of "one-time input without continuous follow-up" in traditional teacher training. Through standardized processes such as three-level review and dual-track evaluation, build a long-term mechanism of "training implementation - effect feedback - strategy optimization", ensuring the sustainability and systematicness of new teachers' competence improvement.

Practical innovation: Based on the overall planning function of municipal teacher training institutions, innovatively design strategies such as cross-school resource integration and stratified targeted guidance. Specific measures such as the resource database constructed by "subject-competence dimension" and the "1+1" mentorship system not only fit new teachers' growth characteristics of "lacking experience and needing references" but also have operability and promotion value for large-scale regional implementation, being suitable for large-scale implementation at the municipal level.

4.2. Research Limitations

Boundary of strategy universality to be verified: This study focuses on regional primary and secondary school new teachers, with strategy design premised on the overall planning capacity of municipal training institutions. Its adaptability may be affected by factors such as regional economic level and teacher foundation. For example, in remote areas with extremely scarce teaching research resources, the implementation cost of cross-school resource integration strategies may be high, requiring further exploration of lightweight adaptation schemes.

Response to differentiated needs to be refined: Although stratified guidance strategies are designed, the response to the specific needs of new teachers in different subjects (e.g., science experiment teaching vs. liberal arts text interpretation) and different school stages (e.g., lower primary grades vs. upper junior high grades) is still general. It is necessary to further decompose disciplinary competence elements to enhance the micro-adaptability of strategies.

Design of dynamic adjustment mechanism to be improved: The strategy system has not yet incorporated response mechanisms to external environmental changes, such as the impact of basic education curriculum standard revisions and educational digital transformation on new teachers' competence requirements. It is necessary to establish trigger conditions and update paths for strategy iteration.

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