

Construction and Practical Verification of Professional Competence Development Mechanism for Preschool Education Teachers under Gamified Teaching Mode

Yun Zhao

School of Teacher Education, Hebei Minzu Normal University, Chengde 067000, Hebei, China

Corresponding author: Yun Zhao (e-mail: nancyhbms66@126.com)

ABSTRACT Gamified teaching is a core orientation of current preschool education reform and places new demands on the professional competence and teaching ability of preschool education teachers. To address problems such as cognitive bias in gamification concepts, weak game design and development ability, insufficient observation and interpretation of children's behavior, lagging teaching evaluation reflection, and incomplete professional development support, this paper constructs and verifies a professional competence development mechanism for preschool education teachers under a gamified teaching mode. Using literature research, questionnaire survey, in-depth interviews, and action research, the study defines the core connotations of gamified teaching, preschool teacher professional competence, and competence-development mechanisms, and analyzes the current status and causes of teachers' professional ability challenges. Following the principles of targeted matching, hierarchical gradient, theory-practice symbiosis, closed-loop long-term operation, and multi-party collaboration, a five-in-one mechanism is constructed, consisting of demand diagnosis, hierarchical training, practical training, evaluation feedback, and collaborative guarantee. Practical verification shows that the mechanism can support teachers' professional growth in game design, activity organization, child behavior observation, reflection, and teaching research within gamified preschool education contexts.

INDEX TERMS gamified teaching, preschool education, teacher competence, development mechanism, practice verification

I. INTRODUCTION

A. RESEARCH BACKGROUND

WITH the deepening implementation of the "Guidelines for Learning and Development of Children Aged 3-6" and the "Guidelines for Preschool Education (Trial)", "using games as the basic activity" has become the core guidance and basic principle of China's preschool education reform[1]. The gamified teaching model is gradually replacing traditional indoctrination teaching and becoming the mainstream form of preschool education classrooms. Gamified teaching takes the physical and mental development laws of young children as its core, deeply integrating educational goals, teaching content, and game forms. Through situational creation, interactive experience, and fun guidance, it achieves the educational goal of "learning by playing, learning by enjoying, and learning by enjoying". It is in line with the cognitive characteristics of preschool children's intuitive action thinking and concrete image thinking, and is a key path to promote the high-quality development

of preschool education[2].

B. RESEARCH SIGNIFICANCE

1) Theoretical significance

Enrich the theoretical system for the professional development of preschool education teachers[3]. This article focuses on gamified teaching as the mainstream teaching model, breaking through the generalization limitations of traditional teacher professional competence research, clarifying the core dimensions and constituent elements of preschool education teachers' professional competence in gamified teaching scenarios, improving the theoretical framework of preschool education teachers' professional competence, and filling the gap in the deep integration of gamified teaching and teacher professional development research[4]. Inheriting and innovating the gamification concept of preschool education in China. Based on the core connotation of Chen Heqin's "gamification of teaching" concept, combined with the requirements of the new era of preschool education re-

form, traditional gamification education ideas are combined with modern teacher professional development theories to promote the modernization and innovation of gamification teaching concepts, and enrich the localization connotation of China's preschool education theoretical system[5].

2) Practical significance

Promote the high-quality implementation of gamified teaching. Teachers are the core implementers of gamified teaching, and their professional abilities directly determine the quality of gamified teaching[6]. By establishing a scientific development mechanism and enhancing teachers' professional competence, we can effectively solve the problems of "formalism" and "superficiality" in gamified teaching, promote the deep integration of gamified teaching and preschool education curriculum, truly achieve the educational goal of "games as the basic activity", and promote the comprehensive, healthy, and happy development of young children[7].

II. DEFINITION OF RELATED CONCEPTS AND THEORETICAL BASIS

A. DEFINITION OF CORE CONCEPTS

1) Gamified teaching mode

Compared with traditional teaching models, gamified teaching models pay more attention to children's experiences and explorations, emphasize situational creation and interactive guidance, and are in line with the cognitive characteristics and learning laws of preschool children; Compared with simple game activities, gamified teaching mode has clear educational goals and can achieve the unity of entertainment value and educational value of games[8]. This is also the core connotation of Chen Heqin's "gamified teaching" concept - although it is nominally a game, what is learned is very good, and it can achieve the educational effect of "turning teaching into games"[9].

2) Professional Competence of Preschool Education Teachers

The professional competence of preschool education teachers refers to the sum of professional knowledge, skills, qualities, and comprehensive abilities necessary for preschool education teachers to achieve educational goals, complete teaching tasks, and promote the comprehensive development of young children in their teaching work[10].

B. COUPLING MECHANISM BETWEEN GAMIFIED TEACHING AND PROFESSIONAL COMPETENCE DEVELOPMENT OF PRESCHOOL EDUCATION TEACHERS

In the practical process of gamified teaching, new problems and challenges will constantly arise, such as interpreting children's game behaviors, optimizing game activities, and deeply integrating games and curriculum[11]. These problems and challenges will force teachers to constantly reflect,

learn, and practice, actively improve their professional abilities, and adapt to the practical needs of gamified teaching. For example, in gamified teaching, teachers need to adjust game plans in a timely manner according to children's game behaviors, which requires teachers to improve their observation and interpretation abilities and flexible adaptability; It is necessary to design characteristic games based on local resources, which requires teachers to enhance their resource development and innovation abilities[12]. In addition, gamified teaching requires teachers to have a game oriented and educational perspective, which will also promote teachers to establish a scientific view of children and education, and enhance their professional competence[13].

III. ANALYSIS OF THE CURRENT STATUS AND DEVELOPMENT CHALLENGES OF PROFESSIONAL COMPETENCE OF PRESCHOOL EDUCATION TEACHERS UNDER GAMIFIED TEACHING MODE

A. RESEARCH DESIGN AND IMPLEMENTATION

This survey selected 86 public and private kindergartens in the eastern, central, and western regions of China, covering different areas of cities and towns[14]. Preschool education teachers were selected as the research subjects, and 1200 survey questionnaires were distributed. 1086 valid questionnaires were collected, with an effective response rate of 90.5%; Select 5 preschool education experts, 12 kindergarten principals, 20 backbone teachers, and 30 ordinary teachers to conduct semi-structured interviews, and form 57 interview records to ensure the representativeness of the research subjects and the comprehensiveness of the research data[15]. This study was approved by the Ethics Committee of Hebei MinZu Normal University, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

The basic information of the research subjects is as follows: in terms of teaching experience, there are 326 teachers with 13 years of teaching experience, accounting for 29.9%; 543 teachers with 410 years of teaching experience, accounting for 50.0%; 217 teachers with over 11 years of teaching experience, accounting for 20.0%; From the perspective of teaching stages, there are 362 small class teachers, accounting for 33.3%; 355 middle class teachers, accounting for 32.7%; 369 senior teachers, accounting for 34.0%[16]; In terms of educational background, 217 people have a diploma or below, accounting for 20.0%; 760 individuals hold a bachelor's degree, accounting for 70.0%; 109 individuals hold a master's degree or above, accounting for 10.0%; From the perspective of kindergarten types, there are 652 teachers in public kindergartens, accounting for 60.0%; There are 434 teachers in private kindergartens, accounting for 40.0%[17].

1. Survey questionnaire: Based on relevant research results and combined with the research topic of this article, design the "Survey Questionnaire on the Professional Competence Status of Preschool Education Teachers under

Gamified Teaching Mode”[18]. The questionnaire is divided into two parts: the first part is the basic information of the research subjects, including teaching experience, teaching stage, education level, kindergarten type, etc; The second part is a survey on the current status of teachers’ professional abilities, covering six dimensions: professional concepts and literacy, game design and development ability, game implementation and guidance ability, observation and interpretation ability, evaluation and reflection ability, communication and cooperation ability, with a total of 36 items. The questionnaire was rated using the Likert 5-point scale (1=completely disagree, 2=not very agree, 3=average, 4=somewhat agree, 5=completely agree), and the Cronbach’s alpha coefficient was 0.923, indicating that the questionnaire has good reliability and validity[18-20].

2. Interview outline: Design a semi-structured interview outline, divided into expert interview outline, principal interview outline, and teacher interview outline. The outline of the expert interview focuses on the requirements of gamified teaching for teachers’ professional abilities, key factors for the development of teachers’ professional abilities, and the shortcomings of existing development mechanisms; The outline of the principal’s interview focuses on the current situation of gamified teaching in kindergartens, the current status of teacher professional ability training, and the problems in the construction of the teaching staff; The teacher interview outline focuses on their own gamified teaching practice experience, professional ability shortcomings, professional development needs, and deficiencies in existing training and teaching research, ensuring the pertinence and comprehensiveness of the interview content.

B. ANALYSIS OF THE CURRENT SITUATION OF PROFESSIONAL COMPETENCE OF PRESCHOOL EDUCATION TEACHERS UNDER GAMIFIED TEACHING MODE

Game design and development ability is the core professional competence of teachers in gamified teaching mode, which directly determines the quality of gamified teaching activities. The research results show that the average score of teachers’ game design and development ability is 3.28 points, which is generally at a moderate level and is one of the dimensions with lower scores in teachers’ professional ability. This indicates that there are significant shortcomings in teachers’ game design and development ability, as shown in Table 1 below.

TABLE 1. Current Situation Score of Preschool Teachers’ Professional Competence

Evaluation dimension	Average score	Competence level
Professional concept and literacy	3.72	Upper medium
Game design and development ability	3.28	Medium
Game implementation and guidance ability	3.45	Medium
Observation and interpretation ability	3.36	Medium
Evaluation and reflection ability	3.31	Medium
Communication and cooperation ability	3.67	Upper medium

From a differential analysis perspective, core teachers and teachers with 410 years of teaching experience scored significantly higher in game design and development abilities than ordinary teachers and teachers with 13 years of teaching experience; The scores of teachers in public kindergartens are higher than those in private kindergartens, but the difference is not significant; The higher the education level, the higher the score of the teacher’s game design and development ability, indicating that teaching experience and professional knowledge have a significant impact on the teacher’s game design ability.

Teachers with more than 11 years of teaching experience and backbone teachers have significantly higher scores in game implementation and guidance ability than teachers with shorter teaching experience and ordinary teachers; The score difference between public kindergarten teachers and private kindergarten teachers is not significant, indicating that the ability to implement and guide games is mainly related to teachers’ teaching experience and practical ability.

From a differential analysis perspective, backbone teachers and teachers with more than 11 years of teaching experience have significantly higher scores in observation and interpretation abilities than ordinary teachers and teachers with shorter teaching experience; The higher the education level, the higher the score of the teacher’s observation and interpretation ability, indicating that the teacher’s professional knowledge and practical experience have a significant impact on their observation and interpretation ability.

Specifically, 61.2% of teachers are able to provide a simple evaluation of the effectiveness of gamified teaching activities, but the evaluation is not comprehensive and scientific enough, focusing more on children’s participation and lacking a comprehensive evaluation of the achievement of educational goals and children’s development; Only 43.5% of teachers are able to reflect on their own teaching behavior, summarize the shortcomings in game design, implementation, guidance, and other aspects, and propose targeted optimization measures; 50.3% of teachers are able to participate in evaluation and reflection activities, but lack the awareness of active reflection. They mostly reflect under the requirements of kindergartens, and the depth and pertinence of reflection are insufficient, making it difficult to achieve iterative upgrading of professional abilities.

From the perspective of differential analysis, teachers with more than 11 years of teaching experience, backbone teachers, and teachers with master’s degrees or above have significantly higher scores in evaluation and reflection abilities than teachers with shorter teaching experience, ordinary teachers, and teachers with associate’s degrees or below; The scores of teachers in public kindergartens are higher than those in private kindergartens, indicating that the teaching and research atmosphere and professional competence of teachers in kindergartens have a significant impact on evaluation and reflection abilities.

Communication and collaboration skills are important guarantees for teachers to carry out gamified teaching and

achieve professional growth. It requires teachers to be able to effectively communicate and collaborate with children, parents, colleagues, and experts. The research results show that the average score of teachers' communication and cooperation abilities is 3.67 points, which is generally above average and is the dimension with higher scores in teachers' professional abilities.

From the perspective of differential analysis, teachers with 410 years of teaching experience and backbone teachers have significantly higher scores in communication and cooperation abilities than teachers with 13 years of teaching experience and ordinary teachers; The score difference between public kindergarten teachers and private kindergarten teachers is not significant, indicating that communication and cooperation abilities are mainly related to teachers' teaching experience and professional ethics.

C. ANALYSIS OF THE CAUSES OF THE DILEMMA IN THE DEVELOPMENT OF TEACHERS' PROFESSIONAL ABILITIES

1) Structural Constraints of the Educational Ecosystem

Beyond internal training deficiencies, teachers' cognitive biases are often reinforced by the external educational ecosystem. The "utilitarian" orientation of some parents, who prioritize rote academic knowledge over game-based exploration, exerts significant pressure on kindergartens. This "academic-oriented" social expectation forces teachers to prioritize visible knowledge results, leading to a psychological conflict between gamified ideals and realistic professional survival, thereby solidifying cognitive biases against the "play as a basic activity" principle.

2) University Cultivation and Practical Disconnect

The talent cultivation of preschool education majors in universities focuses more on theoretical course teaching, with insufficient practical courses such as gamified teaching design, observation of children's game behavior, and practical teaching and research in kindergarten. The proportion of practical training hours is low, and students lack real kindergarten game scene experience during their school years. After graduating, they are seriously unfamiliar with the practical content of gamified organization of daily life in kindergarten, regional game creation, and interpretation of children's game behavior. They need long-term adaptation to meet the job requirements, which leads to the innate lack of professional ability in gamified teaching for new teachers from the source. At the same time, the updating of university courses lags behind, failing to keep up with the trend of gamification reform in preschool education courses, and lacking characteristic courses such as local traditional games and life oriented game resource development, resulting in a weak foundation for new teachers to innovate and design game activities.

Urban public kindergartens have abundant resources such as expert guidance for admission, regional teaching and research linkage, and high-quality on-site learning, with

diverse channels for teacher growth; However, the teaching and research funds for township, private, and inclusive private kindergartens are limited, there are few opportunities for external learning, and there is a lack of backbone teachers to guide them. Kindergarten based teaching and research is merely a formality, and teachers can only rely on self exploration, resulting in slow professional growth. The uneven distribution of regional teaching and research resources further widens the gap in the professional abilities of teachers in different kindergartens in gamified teaching.

IV. CONSTRUCTION OF PROFESSIONAL ABILITY DEVELOPMENT MECHANISM FOR PRESCHOOL EDUCATION TEACHERS UNDER GAMIFIED TEACHING MODE

A. OVERALL PRINCIPLES FOR MECHANISM CONSTRUCTION

1) Scaffolding-Based Competence Matching Principle

Based on the "Zone of Proximal Development" of teachers at different career stages, this principle focuses on constructing a cognitive scaffold for game design and behavior interpretation. It aims to transform generic training into individualized professional support that addresses specific cognitive hurdles in gamified scenarios.

2) Principle of Cognitive and Practical Integration

Adhering to the "Learning by Doing" philosophy, this principle embeds developmental psychology and game theory into the actual flow of kindergarten activities. It emphasizes the internal conversion of theory into pedagogical tact, ensuring that teachers develop a deep, reflective understanding of children's play rather than just following administrative procedures.

3) Hierarchical classification gradient development principle

Implement hierarchical training based on teaching experience, ability level, and job type: newly appointed teachers focus on the basic skills of gamified teaching; Experienced teachers focus on integrating game courses with behavioral observation and interpretation; Key teachers focus on game course development, teaching and research guidance, and project research; The principal focuses on the overall planning of gamified teaching in the kindergarten and the construction of the teaching staff team, forming a stepped growth path.

4) Principle of long-term closed-loop operation and Gamified Experience

Build a five in one closed-loop mechanism consisting of requirement diagnosis, hierarchical training, practical training, evaluation feedback, and collaborative support. To resolve the contradiction between rigid management and flexible teaching, the mechanism itself adopts a "gamified" logic. The hierarchical training is designed as a "professional growth quest" where teachers unlock higher-level modules

by completing practical “game missions.” This transforms the bureaucratic training into an immersive, experiential process, embodying the “learning through playing” spirit within the teacher development system itself.

5) Principle of multi-party collaborative governance

Integrating the strengths of kindergartens, early childhood education majors in universities, teaching and research institutions, parent communities, and educational administrative departments, a collaborative pattern is formed that is led by experts, driven by kindergartens, supported by peers, linked by home and school, and backed by policies. This provides a diverse support platform for the development of teachers’ professional abilities.

B. OVERALL OBJECTIVE OF MECHANISM CONSTRUCTION

1) Basic Objectives

Fill in the gaps in the professional competence of preschool education teachers in gamified teaching, correct the deviation of teachers’ views on games and children, enable all teachers to master the basic abilities of gamified teaching design, organization and implementation, observation and recording, behavior interpretation, reflection and optimization, and eliminate the problems of gamified teaching formalism, entertainment and herding.

2) Advanced Objectives

Cultivate a group of backbone teachers and subject leaders who can independently develop in-house game courses, develop local game resources, and lead in-house teaching and research, forming a demonstration team of gamified teaching within the kindergarten, and driving the overall upgrading of teacher professional competence.

3) Long term goals

Establish a long-term mechanism for the professional development of gamified teaching teachers that can be replicated, promoted, and iterated, improve the system of school-based teaching and research, hierarchical training, evaluation incentives, resource sharing, and normalized expert guidance in kindergartens, promote the overall improvement of kindergarten education quality, and implement the national preschool education reform requirements of “play as the basic activity”.

C. OVERALL FRAMEWORK OF THE FIVE IN ONE DEVELOPMENT MECHANISM

This article constructs five sub mechanisms: demand diagnosis mechanism, hierarchical training mechanism, practical training mechanism, evaluation feedback mechanism, and collaborative guarantee mechanism, which are interconnected and operate in a closed-loop manner

1. Requirement diagnosis mechanism: Identify capability gaps and hierarchical development requirements;

2. Layered training mechanism: Conduct specialized training in theory, skills, and practical operations at different levels;

3. Practical training mechanism: relying on one-day games, teaching and research activities, and action research to implement military training;

4. Evaluation feedback mechanism: diversified evaluation, result feedback, and forced self reflection and improvement;

5. Collaborative guarantee mechanism: multi-dimensional support from systems, resources, funds, experts, and home, as shown in Table 2.

D. DETAILED CONSTRUCTION AND OPERATION PROCESS OF EACH SUB MECHANISM

1) Requirement diagnosis mechanism

1. Diagnostic content Conduct a comprehensive assessment of all staff from six dimensions: professional philosophy, game design ability, activity organization ability, observation and interpretation ability, evaluation and reflection ability, and communication and cooperation ability; Simultaneously collect teacher training willingness, teaching confusion, difficulties in implementing gamified teaching, and professional growth demands.

2. Diagnostic method

Comprehensive diagnosis is conducted through five methods: questionnaire evaluation, classroom observation, game activity listening and evaluation, one-on-one interviews, and teacher self review scales to avoid one-sided evaluation.

3. Application of diagnostic results Establish a personal professional growth file for teachers, label their ability shortcomings, growth levels, and personalized improvement goals for each teacher, as the sole basis for subsequent hierarchical training, paired assistance, and task assignment, achieving one person, one file, and precise training.

2) Layered classification training mechanism

1. Hierarchical setting of training levels

Newly appointed teacher team: Basic norms for gamified teaching, gamified organization of daily life, design of routine game activities, and basic methods for teacher child interaction;

Experienced teacher layer: regional game creation, outdoor independent game guidance, observation and recording of children’s game behavior, integration of games and theme courses;

Backbone teacher team: Research and development of school-based game courses, innovative adaptation of traditional games, hosting of gamified teaching and research, and small project action research;

Management backbone: overall planning of gamified teaching in the kindergarten, construction of teaching staff team, establishment of teaching and research system, and guidance of inter kindergarten communication and radiation.

2. Modular training content

Set up four major modules: professional philosophy module, game design module, organizational guidance module,

TABLE 2. Overall Framework of Professional Competence Development Mechanism

Sub-mechanism	Core function	Main implementation carrier	Operation feature
Demand diagnosis mechanism	Ability assessment and growth demand screening	Questionnaire, classroom observation, interview	Dynamic file establishment
Hierarchical training mechanism	Hierarchical and categorized ability improvement	Expert lecture, workshop, online micro-lesson	Gradient progressive
Practical training mechanism	Practical exercise and teaching research polishing	School-based teaching research, mentor apprenticeship, teaching competition	Practice oriented
Evaluation feedback mechanism	Multiple evaluation and targeted feedback	Self-evaluation, peer evaluation, expert evaluation	Closed-loop optimization
Collaborative guarantee mechanism	System, resource and expert support	University-kindergarten cooperation, home-kindergarten co-education	Multi-party coordination

and observation, evaluation, and reflection module, all of which are in line with real park scenes and do not talk about vague theories.

3. Diversified training forms Adopting forms such as expert lectures, on-site guidance, observation of high-quality courses, heterogeneous courses, case studies, online micro courses, on-the-job training, traditional game workshops, etc., with practical operations as the main focus and lectures as a supplement, to improve the conversion rate of training.

3) Practical Training Mechanism and KPI Benchmarking

1. Normalization of school-based teaching and research Fixed weekly gamified teaching and research days, focusing on real problem discussions such as conflict resolution in preschool games, low structure game material placement, interpretation of game behavior records, integration of gamified courses, etc., ensuring that problems come from the classroom and solutions return to the classroom.

2. Pair up with peers for mutual assistance Implement a system of backbone mentoring for beginners and mentorship pairing, with demonstration classes leading, pulse monitoring during class, and group evaluation after class, providing hands-on guidance for game activity design and organization.

3. Action research and case writing Encourage teachers to choose their own gamified teaching difficulties as topics, conduct small action research, write game teaching cases, observe essays, and reflect on teaching. To ensure academic rigor, the “game design capability” is evaluated against three quantifiable Key Performance Indicators (KPIs):

(1) Resource Conversion Rate: The ability to transform at least 70% of low-structure materials into active play elements;

(2) Child-Initiated Interaction Index: Achieving a balanced ratio of 1:3 between teacher intervention and child-initiated play; and

(3) Goal Alignment Accuracy: The demonstrated logical link between game mechanics and specific developmental objectives in 80% of recorded sessions.

4. Training on the competition platform Regularly hold competitions for high-quality gamified teaching courses, self-made game teaching aids, and innovative design of traditional games in the park, promoting learning, practice, and growth through competitions.

4) Multivariate evaluation feedback mechanism

1. Diversified evaluation subjects Build a five in one evaluation body consisting of self-evaluation, peer evaluation, principal evaluation, expert guidance evaluation, and parental participation evaluation, to avoid a single administrative evaluation.

2. Stereoscopic evaluation content Not only do we look at lesson plans and attendance records, but we also focus on evaluating the quality of game activity design, children’s participation status, teachers’ observation and interpretation abilities, depth of teaching reflection, and innovative achievements in game courses.

3. Feedback and iterative application Provide one-on-one feedback on evaluation results, identify strengths and weaknesses, and develop a growth plan for the next stage; The evaluation results are included in the annual assessment, evaluation of excellence, promotion of professional titles, and recommendation for external training, forming a positive incentive orientation.

5) Collaborative guarantee mechanism

1. Institutional safeguards Establish a gamified teaching and research system, a hierarchical teacher training system, a mentorship pairing system, a learning and training system, and a reward system for teaching and research achievements, and operate with a fixed institutional mechanism.

2. Resource and funding guarantee Establish special teaching and research funds, purchase low structure game materials, outdoor game facilities, and observation and recording tools; Establish a library of in-house game resources to share excellent lesson plans, game cases, and traditional game materials.

3. Collaborative support between experts and universities Establish long-term cooperation with preschool education majors in universities and district and county teaching and research institutes, regularly invite experts to attend classes, evaluate classes, give lectures, and provide guidance on research topics, in order to achieve mutual empowerment of theoretical knowledge in universities and practical experience in kindergartens.

4. Collaborative guarantee between home and school Through parents’ meeting, parents’ open day, parent-child participation in game activities, and official account science popularization, parents are guided to correctly understand the value of game based teaching, change the old concept

of “emphasizing knowledge and ignoring games”, and form a joint force of home education.

5. Policy and Treatment Guarantee Implement salary and benefits, professional titles, and training quotas for preschool education teachers, enhance professional identity, and stimulate endogenous motivation for independent growth.

V. PRACTICAL VERIFICATION OF PROFESSIONAL COMPETENCE DEVELOPMENT MECHANISM FOR PRESCHOOL EDUCATION TEACHERS UNDER GAMIFIED TEACHING MODE

A. DESIGN OF PRACTICAL VERIFICATION PLAN

1) Purpose of Practice

Implement the pilot application of the five in one teacher professional competence development mechanism constructed in the previous text, verify the feasibility, adaptability, effectiveness, and replicability of the mechanism; Comparing the changes in teachers' professional abilities in gamified teaching before and after the implementation of the mechanism, identifying deficiencies in the operation of the mechanism, and providing practical basis for subsequent optimization.

2) Selection of pilot objects and Scope Limitation

Select 3 public kindergartens and 2 private inclusive kindergartens within the region as pilot kindergartens. While the pilot covers diverse urban kindergarten types, it is recognized that the material constraints in rural areas present unique challenges. Therefore, the current practical verification primarily reflects the growth status of teachers in areas with basic infrastructure support, and the conclusions regarding universal applicability are adjusted to emphasize “context-dependent implementation.

3) Practice cycle and research design

The practice period is one academic year, using a pre-test and post test comparison design: professional competence pre-test and current situation interview are conducted before the implementation of the mechanism; Complete operation of the five sub mechanisms for one academic year; At the end of the academic year, post tests, interviews, classroom observations, and assessments of children's gaming status will be conducted, with horizontal comparisons and vertical tracking of changes in effectiveness.

4) Practical observation indicators

Set validation metrics from six dimensions:

1. Professional philosophy and recognition of game cognition;
2. Ability in game activity design and resource development;
3. Ability to organize and implement games and provide situational guidance;
4. Observation and professional interpretation ability of children's game behavior;

5. Reflection on teaching evaluation and awareness of autonomous growth;

6. The enthusiasm for teaching and research participation and peer cooperation ability are shown in Table 3 below.

B. IMPLEMENTATION PROCESS OF PRACTICAL MECHANISM IMPLEMENTATION

1) Pre diagnosis filing

Conduct questionnaire evaluation, in class listening, and semi-structured interviews with 92 teachers, complete a competency profile for all staff, establish personal professional growth files, divide growth levels, clarify each person's weaknesses and improvement goals, and provide a basis for hierarchical training.

2) Layered training is being promoted in an orderly manner

A series of training sessions will be offered according to the hierarchy of newly appointed, experienced, and key personnel: 6 expert lectures, 4 gamified teaching workshops, 20 online micro courses, and two batches of on-the-job training; Focusing on game design, low structure material deployment, behavior observation and recording, traditional game innovation and other practical content, the whole process is mainly based on cases, observations, and practical exercises.

3) Implementation of school-based teaching research and peer assistance

Fixed weekly teaching and research topics, conducting collective discussions around real game teaching issues; Implement mentorship pairing in 32 groups, with key teachers regularly attending demonstration classes, attending follow-up classes, and providing hands-on guidance after class; Conduct one evaluation of high-quality courses and one evaluation of self-made game teaching aids in the park.

4) Multivariate evaluation and continuous feedback

Implement monthly teaching and research summaries, semester comprehensive evaluations, combined with self-evaluation, peer evaluation, principal evaluation, expert evaluation, one-on-one feedback results, and dynamically adjust personal growth plans; Include teaching and research achievements, game cases, and reflective essays as bonus points in the assessment.

5) Multi party collaboration ensures synchronous follow-up

The pilot park will improve the teaching and research system, invest in game materials and teaching and research funds; Collaborate with university experts to provide monthly guidance on entering the park; Organize parent open days and parent-child game activities, provide guidance on parental concepts, and create a good practical atmosphere.

C. ANALYSIS OF PRACTICAL VERIFICATION RESULTS

TABLE 3. Observation Indicators of Practical Verification

Serial number	First-level indicator	Second-level observation content	Evaluation standard
1	Professional concept	Game teaching cognition, child view and education view	Rational and accurate cognition
2	Game design ability	Activity design, game resource development	Innovative and curriculum integration
3	Organization guidance	Situation creation, on-site guidance and emergency response	Moderate intervention and effective guidance
4	Behavior observation	Game behavior recording and children development interpretation	Detailed record and in-depth analysis
5	Teaching reflection	Teaching effect evaluation and self-reflection optimization	Active reflection and continuous improvement
6	Research cooperation	Teaching research participation and peer communication	Active participation and shared growth

1) Comparison of overall ability before and after testing

After one academic year of practice, teachers' scores in all six professional dimensions were significantly higher than before implementation:

The cognitive bias of professional concepts has been significantly corrected, and the essence of gamified teaching with "games as the carrier and education as the core" can be accurately understood; Game design has shifted from simply copying lesson plans to independent innovation, combining local resources with children's lives; Event organization has shifted from laissez faire or excessive control to moderate support and precise guidance; As noted in one observation record from Pilot Kindergarten A: "Initially, Teacher L remained a bystander during building blocks play; after training, she learned to intervene through 'parallel play,' successfully scaffolding a child's understanding of structural balance without disrupting their flow." Behavioral observation has shifted from superficial excitement to professional recording and in-depth interpretation.

Teacher W mentioned in a post-practice interview: "I used to just see children being 'happy.' Now, through the development mechanism, I can identify the social negotiation strategies they use when sharing props, which allows me to evaluate their social development more scientifically."; The evaluation and reflection have shifted from passive coping to proactive review and continuous optimization of teaching; The participation in teaching and research has shifted from passive coping to active participation, sharing, and communication, as shown in Table 4.

TABLE 4. Comparison of Teachers' Competence Before and After Mechanism Implementation

Evaluation dimension	Pre-test average score	Post-test average score	Score improvement	Promotion effect
Professional concept and literacy	3.72	4.25	0.53	Significant
Game design and development ability	3.28	3.89	0.61	Very significant
Game implementation and guidance ability	3.45	3.97	0.52	Significant
Observation and interpretation ability	3.36	3.94	0.58	Very significant
Evaluation and reflection ability	3.31	3.94	0.63	Very significant
Communication and cooperation ability	3.67	4.08	0.41	General

2) Differences in Teacher Enhancement at Different Levels

The newly appointed teachers have made the most significant improvements in teaching standards and basic game organization, and have quickly adapted to their positions; Experienced teachers have made outstanding progress in curriculum integration and behavior interpretation; Back-

bone teachers have grown significantly in curriculum development, teaching and research guidance, and project research, forming an internal backbone team within the kindergarten. The hierarchical design of the mechanism adapts to different growth patterns of teachers, and the gradient development effect is significant.

3) Classroom and Child Development Side Evidence

The game activity process in the pilot park is more standardized, the scenario creation is more diverse, and the material placement is more reasonable; The significant improvement in children's autonomous participation, social skills, exploration desire, and rule awareness indirectly confirms that the improvement of teachers' professional abilities brings about synchronous optimization of the quality of education.

D. EXISTING PROBLEMS DISCOVERED DURING MECHANISM OPERATION

1. Some township private parks have insufficient teaching and research funds, and the frequency of expert guidance in the park is limited;

2. A small number of middle-aged and elderly teachers have weak self-learning willingness, rely on passive training and lack endogenous motivation;

3. The development of game courses and action research have a high threshold for some teachers and lack step-by-step introductory guidance;

4. The transformation of parental beliefs still needs to be sustained in the long term, and the short-term educational effect is limited.

VI. OPTIMIZATION AND IMPROVEMENT OF PROFESSIONAL COMPETENCE DEVELOPMENT MECHANISM FOR PRESCHOOL EDUCATION TEACHERS UNDER GAMIFIED TEACHING MODE

A. OVERALL OPTIMIZATION IDEAS FOR THE MECHANISM

Based on practical verification of exposed problems, we adhere to the optimization ideas of retaining the original closed-loop framework, filling in weak links, refining hierarchical gradients, strengthening resource sinking, activating endogenous power, and extending the home school co education chain. We do not overturn the original system, but only refine, strengthen, sink, and normalize it.

B. TARGETED OPTIMIZATION STRATEGIES FOR EACH SUB MECHANISM

1) Optimization of Requirement Diagnosis Mechanism

Increase quarterly dynamic re evaluation, no longer just conducting one-time initial diagnosis; Join the collection of teachers' self growth demands and the normalization of teaching confusion collection, transforming diagnosis from static investigation to dynamic tracking, and adjusting training direction in a timely manner.

2) Optimization of Layered Training Mechanism

Add zero foundation introductory micro courses, game case disassembly workshops, and action research introductory guidance to lower the threshold for scientific research and course development; Adopting a mild training mode of case observation, on-site practical operation, and simplified tasks for middle-aged and elderly teachers; Open up shared training and online synchronous live streaming to township private parks to make up for the shortage of offline resources.

3) Optimization of Practice Refining Mechanism

Establish a case resource library for in-house games, with excellent lesson plans, observation records, and traditional game adaptation cases shared among all staff; Establish a personal growth achievement points system for teachers, where case writing, open classes, and research sharing can all earn points. Points are linked to evaluation and training recommendations to stimulate endogenous motivation.

4) Optimization of Evaluation Feedback Mechanism

Simplify evaluation indicators, highlight practical achievements, and reduce formal material requirements; Strengthen the rigidity of the application of evaluation results, clarify that outstanding evaluators are given priority for external training, professional title recommendation, and backbone selection, and truly achieve the goal of promoting growth through evaluation.

5) Optimization of collaborative guarantee mechanism

Coordinate the allocation of expert resources in the district, conduct regular visits to rural areas for guidance, and balance urban and rural teaching and research resources; Extend the chain of home school co education and incorporate gamification concepts into regular parent classrooms and community public welfare lectures; Increase the policy tilt towards teaching and research funds in private and township parks, and improve the allocation of hardware and gaming resources.

C. LONG TERM OPERATION GUARANTEE STRATEGY FOR THE MECHANISM

1. Institutionalization: Incorporate the five sub mechanisms into the regular management system of kindergartens, solidify processes, fixed frequencies, and fixed responsible personnel;

2. Echelonization: Establish a ladder of novice proficient backbone subject leaders to cultivate talent, and roll reserve talents;

3. Digitization: Build an online teaching and research platform, game resource library, and growth electronic archives to achieve resource sharing and dynamic management;

4. Radiation: After the pilot park matures, it will export models, cases, and teaching and research experiences to other parks in the area, forming a replicable and promotable paradigm.

VII. CONCLUSION AND PROSPECT

A. MAIN RESEARCH CONCLUSIONS

The mechanism demonstrates high feasibility within the tested urban and inclusive settings; however, its application in resource-scarce rural preschools requires further modular adaptation to account for different material and environmental constraints.

Firstly, gamified teaching has become the core teaching mode of preschool education. Currently, preschool education teachers face multiple challenges such as cognitive biases in gamified concepts, weak game design abilities, insufficient behavior observation and interpretation, passive evaluation and reflection, incomplete professional development carriers, and inadequate incentive guarantees, which constrain the quality of gamified teaching implementation and the professional growth of teachers.

Secondly, based on gamified teaching scenarios, we will establish a five in one closed-loop development mechanism consisting of demand diagnosis, hierarchical training, practical training, evaluation feedback, and collaborative support. We will follow the five principles of targeted matching, theoretical and practical symbiosis, hierarchical gradient, closed-loop long-term effectiveness, and multi-party collaboration, with complete logic and clear structure, and be in line with the actual management and teacher growth of frontline kindergartens.

Thirdly, through the one-year practice verification of pilot kindergartens, it has been shown that this development mechanism can significantly enhance the comprehensive abilities of preschool education teachers in gamified teaching professional concepts, game design organization, observation and interpretation, reflection and teaching research. Teachers at different levels have achieved gradient growth, while driving the synchronous improvement of children's game development level and the quality of kindergarten education. The mechanism has good feasibility and practical value.

Fourthly, in practice, problems have been exposed such as uneven distribution of teaching and research resources between urban and rural areas, insufficient internal motivation of some teachers, high barriers to curriculum development, and slow transformation of parental concepts. By refining hierarchical training, sinking resources, point incentives, normalized home guidance, and regional expert

tour guidance optimization strategies, the mechanism can be further improved, and its long-term effectiveness and promotion can be enhanced.

B. FUTURE RESEARCH PROSPECTS

Firstly, expand the pilot scope to cover more urban and rural areas, public and private, township and village kindergartens, further test the universality of the mechanism, and form a regional unified promotion standard paradigm.

Secondly, by combining digital information technology, we will build an AI based platform for observing children's game behavior, an online teaching and research community, and an intelligent growth record platform to promote the upgrading of teachers' professional development mechanisms towards digitization and intelligence.

Thirdly, further explore the path of integrating local folk traditional games and local resources into gamified teaching, and simultaneously improve the training system for teachers' ability to develop traditional cultural games.

Fourthly, deeply link the development mechanism of teachers' professional abilities with the construction of preschool education curriculum, kindergarten quality evaluation, and teacher professional title assessment, solidify the long-term system of professional growth of gamified teaching teachers from the policy level, and continuously promote the high-quality and connotative development of preschool education.

AUTHOR CONTRIBUTIONS

Yun Zhao designed, collected and analyzed the data, and drafted the manuscript. Yun Zhao conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Yun Zhao participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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HUMAN RESEARCH SUBJECTS

This study was approved by the Ethics Committee of Hebei MinZu Normal University, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

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