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Research on the Curriculum Cluster Model for Preschool Education Teacher Candidates' Teaching and Research Competencies Under the "Integration and Innovation" Concept

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Abstract: To address the practical challenges in cultivating teaching and research competencies among preschool education students—namely, fragmented curricula, disconnect between theory and practice, and lack of innovation—this study proposes a three-tier, six-dimensional curriculum cluster model based on the 'Integration and Innovation' concept. Centered on interdisciplinary integration, the model establishes two dialectically unified cultivation goals at the top level: "Reflective Practitioners" and "Generative Innovators." The middle layer integrates three synergistic modules: convergent curriculum, immersive case studies, and generative practice. The foundation rests on three supporting elements: collaborative subject-centered learning, methodological innovation, and assessment reform. Through three operational mechanisms—transformation, safeguarding, and generative creation—the model achieves dynamic "integration-driven innovation." This framework aims to provide systematic theoretical guidance and practical direction for cultivating innovative early childhood educators.

Keywords: Integrative Education Philosophy; Preschool Education Teacher Candidates; Teaching and Research Competency; Curriculum Cluster Model; Teacher Education.

1. Introduction

In May 2021, the Ministry of Education issued the "Professional Competency Standards for Preschool Education Teacher Candidates (Trial)," based on teacher education accreditation standards. The framework, "one practice and three masteries" (practicing professional ethics, mastering teaching, nurturing, and development), clarifies the practical competency requirements for teacher candidates and guides the development of preschool education majors[1]. The standards name "Mastering Teaching" as a core competency. Cultivating research and teaching skills is essential for improving teaching proficiency. Concurrently, multiple empirical studies indicate that kindergartens at all levels urgently require graduates with research and teaching skills, advanced educational philosophies, and solid pedagogical foundations[2]. In summary, both policy direction and practical demands underscore the core value of research and teaching capabilities in the pre-service training of preschool education teacher candidates.

However, within China's academic circles, some research focuses on teaching reforms for individual courses, aiming to enhance pre-service teachers' foundational skills by optimizing curriculum content and training models[3]. Other studies focus on enhancing practical components, proposing the strengthening of teaching and research training pathways during educational internships and practicums[4]. Additionally, some research attempts to construct systemic frameworks, though these often remain at the level of simply combining training systems with curriculum systems[5]. While these studies offer valuable insights for cultivating teaching and research competencies, they exhibit notable limitations. First, they lack systematic models for course clusters, failing to address the core issues of horizontal connectivity and vertical integration across courses. Second, they prioritize "technique" over "innovation," overemphasizing operational skill training while neglecting the cultivation of critical thinking and innovative spirit. Third, research on mechanisms remains insufficient, with inadequate exploration of the internal logic and external conditions required for transforming knowledge into competencies. Based on this, this study, grounded in a profound analysis of current practical challenges, aims to demonstrate the inevitability and innovation of the "integration and innovation" concept as a breakthrough solution. It further develops a curriculum cluster model centered on this concept for preschool education teacher candidates, designed to enhance their teaching and research capabilities.

2. Real-World Challenges and Breakthrough Strategies: The Necessity and Innovation of Model Construction

2.1. The Reality of the Dilemma: The "Triple Disconnect" in Cultivating Teaching and Research Capabilities

The cultivation of teaching and research capabilities among preschool education teacher candidates currently faces a "triple disconnect" issue. These interconnected challenges collectively form a bottleneck hindering the professional growth of these future educators.

First, course fragmentation. Various courses are scattered and fragmented, lacking coordinated integration. The current curriculum system for early childhood education programs often exhibits characteristics of being "piecemeal" and

"compartmentalized." Courses are taught in silos by different instructors. While the curriculum spans diverse subject areas and features substantial content, it lacks effective horizontal connections and vertical continuity. Knowledge modules remain isolated from one another. As a result, teacher education students receive fragmented pieces of knowledge, making it difficult for them to construct an integrated cognitive framework equipped to tackle complex educational challenges. The knowledge structure thus lacks practical applicability. The deep-rooted cause lies in the traditional subject-centered inertia within teacher education, where curriculum design adheres to disciplinary logic rather than problem-based logic.

Second, the disconnect between knowledge and practice. Traditional training models follow a linear approach of theory before practice, severing the link between theoretical instruction and teaching-research practice. Theoretical teaching often remains confined to classroom lectures and textbook knowledge, detached from the real, unpredictable educational contexts of kindergartens. Even if teacher trainees memorize various advanced educational concepts and research methods, they remain at a loss. when confronted with diverse young learners and complex teaching situations in real settings. Meanwhile, practical components like teaching observations and internships often devolve into mere observation and mechanical imitation, lacking deep reflection guided by theory or research-oriented experimentation. The core root lies in the training orientation that prioritizes theory over practice and the limitations of the linear training model. This results in low efficiency in skill transfer, requiring graduates to undergo prolonged adaptation to their roles and creating a disconnect between pre-service training and post-service development needs.

Third, the disconnect between people and skills. Current teacher training programs emphasize skill drilling while neglecting the cultivation of critical thinking and innovative spirit. Their curriculum and training focus on explicit, quantifiable operational skills. This tendency to prioritize skills over thinking leads some teacher trainees to become proficient in "techniques" yet lack deep reflection on the logic behind skill application; they can replicate lesson plans but struggle to question their validity or creatively design superior alternatives. This stems from traditional evaluation systems that prioritize outcomes over processes and quantitative metrics over qualitative development. By focusing on visible indicators such as skill attainment rates while neglecting core competencies like critical thinking and innovation, these systems ultimately produce "skilled technicians" rather than "reflective practitioners," thereby stifling innovation within the early childhood education sector.

2.2. Innovative Concept: The Essence and Leading Value of "Integration and Innovation"

With technological advancement and globalization, education must integrate knowledge and methodologies across multiple disciplines to cultivate interdisciplinary thinking and innovative talent, giving rise to the "Integration and Innovation Education Philosophy"[6]. Confronted with the "triple disconnect" challenge, existing singular theories struggle to comprehensively explain the complex process of developing teaching and research capabilities. Situated Learning Theory overlooks the active generation of innovative thinking, while Complex Systems Theory lacks concrete, practical pathways. The "Integration and Innovation" philosophy synthesizes the core strengths of diverse theories, forming a comprehensive theoretical framework grounded in integration, oriented toward innovation, and sustained by dynamic collaboration. This framework offers a systematic solution to the challenges, providing a novel theoretical perspective and practical guidance for cultivating teaching and research competencies among pre-service teachers.

First, the essence of integration lies in breaking down the inherent barriers and boundaries of traditional training models to achieve convergence across disciplines and learning spaces. First, interdisciplinary integration. We promote deep cross-disciplinary collaboration and restructuring among education, psychology, health sciences, and other fields centered on real-world issues in early childhood education. This shifts the focus from disciplinary logic to problem-based logic, cultivating teacher candidates with a solid professional foundation and broad knowledge integration and cross-disciplinary application skills. Drawing on situated learning theory, we embed learning within authentic kindergarten settings through case-based teaching, project-based learning, design thinking, and immersive practice. This transforms theory into a "lens" for analyzing problems and a "toolkit" for solving them. Second, online-offline space integration. Online platforms offer resources and data feedback, while offline spaces focus on in-depth discussions and hands-on experiences, creating a technologically empowered environment that supports this integration.

Second, the objectives of innovation. Cultivate innovative thinking, stimulate creative abilities, and forge the capacity to generate solutions for complex educational challenges, thereby transforming the educational goal from imparting knowledge and skills to fostering innovative literacy. First, nurture innovative thinking. As the driving force behind innovation, cultivate teacher candidates to dare to question, be courageous in exploration, maintain curiosity and reflection toward educational phenomena, and break free from fixed mindsets. Second, stimulate creative abilities. This core manifestation of innovation enables teacher candidates to design personalized, teaching-research activities that enhance instructional competence based on deep observation and understanding of young learners. Finally, develop the capacity to generate solutions for complex educational challenges. This ultimate goal equips teacher candidates to dynamically create novel and effective solutions when confronting intricate educational problems.

Third, integration leads to innovation. This concept precisely reveals the dialectical unity between "integration" and "innovation": integration serves as the foundation and prerequisite for innovation, while innovation represents the sublimation and manifestation of integration, driving higher-level integration. This philosophy provides clear theoretical guidance and an action framework for reconstructing the system for cultivating teacher education students' teaching and research capabilities. The effectiveness of training activities is measured by whether they foster valuable integration and achieve genuine innovation. This principle serves as both the key to overcoming the "triple disconnect" dilemma and the compass for cultivating future innovative preschool educators.

The core theoretical contributions of this study are as follows: First, it overcomes the limitations of traditional curriculum cluster development—that prioritizes content accumulation over systematic integration—by constructing a

three-dimensional curriculum cluster model integrating "goals-structure-support," achieving deep coupling between philosophy, content, and safeguards. Second, it proposes the core mechanism of "integration leading to innovation," revealing the nonlinear process by which interdisciplinary integration, contextual immersion, and practice-based generation transform into innovative capabilities, thereby enriching theoretical frameworks in teacher education. Third, it integrates cutting-edge theories such as complex systems theory and design thinking into model construction, providing new methodological support for the systematic and innovative development of teaching and research competencies.

3. Building Foundations and Conceptual Anchors: The Logical Starting Point for Model Construction

3.1. Theoretical Underpinnings

Constructivist theory provides the core theoretical foundation for cultivating teaching and research competencies among preschool education teacher candidates under the "Integration and Innovation" philosophy. It emphasizes that learning is a process in which learners actively generate meaning and construct understanding based on prior knowledge and experience. Its principles of active knowledge construction and contextualized learning align closely with the logic of model design.

The most influential figures in preschool education are Piaget, who championed cognitive constructivism, and Vygotsky, who emphasized sociocultural factors and language as a mediating tool. Piaget's cognitive constructivism established a student-centered approach, guiding learners to actively explore the essence and practical significance of knowledge, thereby breaking away from traditional rote teaching methods[7]. Vygotsky underscores the pivotal role of sociocultural environments, linguistic mediation, and the Zone of Proximal Development in cognitive development. While differing in emphasis, both theories affirm the active and constructive nature of knowledge acquisition—resonating with the core tenets of the "Integration and Innovation" philosophy: contextual immersion, proactive inquiry, and collaborative reflection.

Specifically, Piaget's cognitive constructivism adopts a student-centered approach, emphasizing individual active exploration of knowledge. This aligns with the project-based teaching and research, innovation workshops, and "generative practice modules," guiding pre-service teachers to independently complete diagnosis, design, validation, and innovation around real-world problems. Through personalized solutions and progressive practice, they actively construct teaching and research logic. Vygotsky's sociocultural theory emphasizes the importance of social interaction and the concept of the zone of proximal development. Its collaborative philosophy permeates the "Immersive Case Module" through case discussions, collective analysis, dual-teacher guidance at the "support layer," and peer symbiosis. Through deep dialogue and experience sharing, it empowers teacher candidates to draw from exemplary paradigms, resolve practical dilemmas, and achieve competency advancement. Together, these theories provide dual theoretical underpinnings for the model from the dimensions of individual autonomous construction and social collaborative construction.

In this study, constructivist theory directly guided the design of the curriculum cluster model. The integrative curriculum module provides the content foundation for active construction through cross-disciplinary knowledge integration for preschool education. The immersive case module offers contextual support for meaning construction by creating authentic scenarios. The generative practice module furnishes diversified pathways for the construction process through project inquiry and collaborative interaction, ensuring that teaching and research competencies naturally emerge through active construction.

3.2. Conceptual Definition

3.2.1. Teaching and Research Competence

Professor Liu Zhanlan emphasizes that preschool teachers' teaching research capabilities constitute the core manifestation of professional autonomy—capabilities grounded in practice, serving practice, and enhancing practice[8]. Given this positioning of teachers as "child development researchers" and drawing upon Professor Chen Xiangming's theory of teachers' practical knowledge[9], this study operationalizes teaching research capabilities into four interconnected, progressive sub-dimensions:

Educational Insight: The ability to keenly identify, define, and analyze educational issues within practical settings. Its observation metrics include employing systematic observation methods to capture children's behavioral characteristics and identifying problems in educational activities based on objective data.

Design Research Competency: The ability to systematically plan and implement standardized teaching research activities, encompassing designing action research plans centered on early childhood development goals, conducting literature reviews using academic databases, and appropriately selecting research methods such as questionnaires and interviews based on teaching research themes.

Reflective Practice Capacity: The ability to continuously optimize teaching and research practices through a cyclical process of practice-reflection-improvement. Evaluation criteria include regularly maintaining educational reflection journals, adjusting practical observation dimensions and theoretical research approaches based on teaching research, and proposing actionable improvement strategies for specific issues arising from authentic educational phenomena.

Innovative Application Capability: The ability to effectively translate teaching and research outcomes into educational practice, along with the innovative mindset demonstrated throughout this process. This is reflected in converting teaching and research findings into scalable instructional strategies, developing specialized teaching tools for specific domains, and proposing innovative perspectives or recommendations during academic exchanges.

The above four-dimensional framework encompasses the complete teaching and research process from problem perception and solution design to practice reflection and innovation transformation, constituting the target competency system cultivated by this model.

3.2.2. Course Cluster Model

In 2018, the Ministry of Education convened the National Conference on Undergraduate Education in Higher Education Institutions for the New Era, explicitly calling for

strengthening first-class undergraduate education within the "Double First-Class" initiative and encouraging the development of new course clusters that are comprehensive, problem-oriented, and interdisciplinary[10].

The construction of emerging disciplinary clusters organically integrates multidisciplinary knowledge based on systems theory principles, breaking down disciplinary barriers to build a diverse, multidimensional knowledge framework for students[11]. The course cluster model in this study is a dynamic educational system centered on developing teaching and research capabilities among preschool education majors. It comprises interconnected course modules, practical platforms, and support mechanisms, with its core characteristics embodied in a "dual-loop chain dynamic empowerment" framework.

Vertically, the competency development chain corresponds to the progression of teaching and research capabilities from foundational to advanced stages: lower grades focus on cultivating educational insight, middle grades emphasize strengthening design research and reflective practice skills, while upper grades prioritize enhancing innovative application abilities. Horizontally, the curriculum support chain organizes three major course clusters—theoretical foundation, practical skills, and innovative expansion—aligned with competency development objectives. Synergistic effects are achieved through the integration of preschool education knowledge points and the connection of practical tasks across modules. The model incorporates external operational safeguards and internal feedback mechanisms to enable iterative dynamic optimization of curriculum content. This achieves a systemic function where curriculum clusters support competency generation, while competency attainment feeds back into preschool education curriculum iteration and refinement.

4. Core Deconstruction and Element Synergy: The Core Content of Model Construction

Having clarified the theoretical underpinnings, core concepts, and practical applicability of the "Integration and Innovation" philosophy, we will now focus on the core components and synergistic elements of the model. systematically deconstructing the specific content architecture of the course cluster across three dimensions: the objective layer, structural layer, and support layer. This approach not only provides a concrete implementation vehicle for the theoretical framework presented earlier but also lays a solid practical foundation for explaining the operational mechanism of "integration for innovation" in subsequent sections. This ensures that theoretical logic, model architecture, and operational logic form a complete, progressively layered, and deeply interconnected framework.

4.1. Objective Layer: The "Soul" of the Model

The value objective of this model is positioned to cultivate a unified entity of "reflective practitioners" and "generative innovators." This positioning stems from a dual response to the practical essence of preschool education and the contemporary demand for innovation. The concept of "reflective practitioners" originates from Donald Schön's classic theory, which emphasizes that human cognition is situated in action, particularly the daily work of professionals, which is predicated on recognizing implicit actions[12].As future professionals in education and teaching, teacher education students should also possess the ability to reflect on and reconstruct practical issues through action. The concept of "generative innovators" further requires them to creatively transform teaching and research outcomes and even to produce new teaching and research models and resources. These two concepts are dialectically unified, collectively embodying the "integration and innovation" philosophy in the cultivation objectives.

4.2. Structural Layer: The "Bone" of the Model

4.2.1. Flexible Course Module

William H. Shewell's theory of educational integration emphasizes that knowledge within educational systems is interconnected through integrated teaching approaches, fostering synergistic educational outcomes[13].As the theoretical foundation for teaching and research capabilities, this module centers on cross-domain integration, breaking down barriers between educational theory, research methodologies, and disciplinary knowledge. It specifically includes two types of course clusters: first, foundational core courses such as Principles of Early Childhood Education (integrating educational philosophy with preschool policy) and Research Methods in Early Childhood Education (combining quantitative and qualitative approaches); second, cross-disciplinary extension courses like Digital Research on Young Children's Behavior (merging information technology with observation techniques) and Developmental Theory-Based Curriculum Design (integrating child psychology with instructional design). This integration establishes logical connections through knowledge point correlation matrices. For instance, in "Frontiers in Early Childhood Education," the teaching-research analysis of children's play serves as an anchor point, linking Vygotsky's Zone of Proximal Development theory, participatory observation methods, and principles of play activity design to achieve deep integration among theory, methodology, and practice.

4.2.2. Infiltration Case Module

Case studies have become a common approach in teacher practice research, with the significance and value of case analysis widely recognized[14].As the vital source of early childhood educators, the cultivation of pre-service teachers' teaching and research capabilities should be grounded in authentic contextual immersion. This involves establishing tiered, categorized, and dynamically updated case repositories alongside a cluster of seminar courses to address contextual adaptability challenges. The case repository encompasses three core resource categories: First, problem-oriented cases, such as action research on separation anxiety interventions in preschool classes and teaching research diagnostic cases on zone activity material deployment. Second, method-demonstration cases, including exemplary teacher observation records, transcribed and analyzed kindergarten-based teaching research meetings, and similar materials. Third, innovative practice cases, featuring cutting-edge examples such as applications of digital teaching research tools and organizational models for cross-kindergarten collaborative teaching research. By dissecting teaching cases to understand pedagogical logic, designing teaching plans through imitation, and critically optimizing personal practice, this model aligns with pre-service teachers' cognitive progression from concrete to abstract. It strengthens their ability to identify problems and design solutions.

4.2.3. Generative Practice Module

As the core vehicle for competency transformation, this module features project-driven, process-oriented approaches encompassing three practice formats. First, project-based teaching research, involves tasks strategically designed around real-world problems, requiring pre-service teachers to complete the entire process from problem diagnosis and solution design to practical validation. Second, action research practice is conducted within authentic educational settings under dual guidance from university mentors and frontline teachers. Third, innovation workshops, which periodically focus on cutting-edge themes for concentrated creation, produce scalable teaching and research resources. These practices are sequenced as foundational, advanced, and innovative: lower-year students emphasize project initiation, middle-year students deepen action research, and upper-year students pursue breakthroughs in innovation workshops, forming a progressive competency development chain.

4.3. Supporting Layer: The "Skeleton" of the Model

4.3.1. Collaborative Development: Building a Diverse Community

Cultivating high-caliber, capable teacher candidates requires deep engagement from universities, local education authorities, and high-quality kindergartens[15].This study established a collaborative network centered on dual-qualified teachers, fostering mutual support and symbiotic growth among peers. Within the dual-qualified faculty, university researchers focus on theoretical guidance and methodological standardization—such as teaching research design logic and reviewing the scientific rigor of teaching-research plans. Meanwhile, frontline kindergarten master teachers concentrate on practical leadership and contextual guidance—demonstrating child observation techniques and guiding the school-based adaptation of teaching-research outcomes. This synergy addresses both the disconnect between theory and practice and the deficiency of theoretical grounding in practice. The student-student collaborative community fosters learning communities where each group comprises theoretical, practical, and innovative students. Members divide tasks based on strengths, leveraging peer evaluations and intellectual exchanges to achieve complementary advantages and advance overall teaching research capabilities.

4.3.2. Methodological Innovation: The Application of Integrated Teaching Approach

Teaching methods are innovated primarily through two approaches: First, project-based learning helps cultivate students' scientific and technological innovation thinking and practical abilities, promoting the comprehensive application of multidisciplinary knowledge to creatively solve complex theoretical and real-world problems[16].Teacher education students engage in authentic teaching research projects, learning research methodologies through hands-on practice. They gain comprehensive exposure to the entire process—from designing teaching research tools and collecting data to drafting reports—enabling them to creatively address both theoretical and practical challenges in teaching research. Second, peer evaluation establishes a three-dimensional assessment framework emphasizing theoretical rigor, practical feasibility, and innovative value. Mutual critiques during proposal design and outcome presentations foster reflection and refinement through constructive feedback. Both approaches center on integrating theory with practice and driving innovation through creation, aligning closely with the model's "integration and innovation" philosophy.

4.3.3. Evaluation Reform: A Multi-Dimensional Focus on Process and Participants

Establishing a "three-dimensional, full-process" evaluation system to overcome the limitations of traditional outcome-oriented assessments. Evaluation dimensions encompass the competency dimension (corresponding to core competencies like educational insight and design research capability). - Process Dimension (project engagement and depth of reflection) - Outcomes Dimension (teaching research plans and practical implementation effectiveness). Evaluation methods employ a multi-subject approach to assess multiple objects. Subjects include university mentors, kindergarten frontline teachers, peers, and self-assessment. Evaluation objects cover learning portfolios, project outcome sharing, and practical effectiveness assessments.

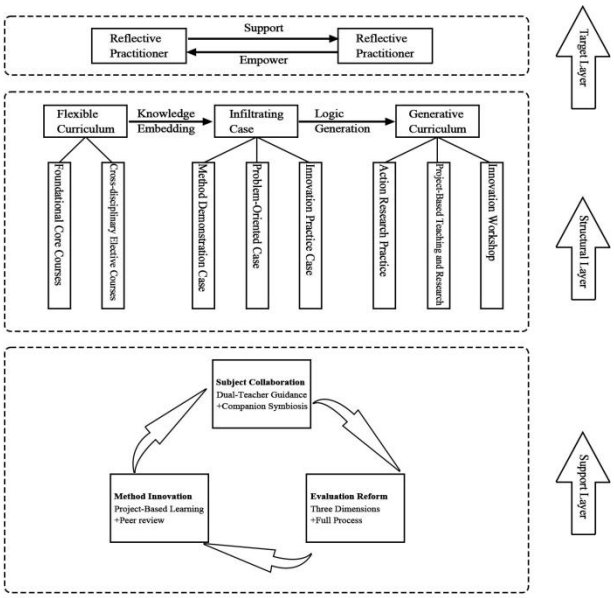


Figure 1. Schematic Diagram of the Curriculum Cluster Model for Teaching and Research Competency Development in Preschool Education Teacher Education

5. Integration Leads to Innovation: The Operational Mechanism of Curriculum Clusters

5.1. Transformation Mechanism: The Leap from Knowledge to Competence

The transformation mechanism serves as the microfoundation for the operation of course clusters, focusing on the intrinsic cognitive restructuring of individual learners. The conversion of knowledge into teaching and research capabilities is not a linear process but rather a spiral ascent achieved through case immersion, project-based practice, and reflective internalization. This facilitates a leap toward practical application and personalization, aligning with educational requirements for the bidirectional development of theory and practice.

During the case immersion phase, core abstract knowledge from the interdisciplinary curriculum module is concretized by embedding it into practical scenarios within the immersive case repository. Taking the teaching research diagnosis of

science inquiry activities for senior kindergarten children as an example, teacher candidates must interpret the educational value of children's trial-and-error behaviors through Piaget's cognitive development theory and analyze deficiencies in teacher guidance strategies using observational research methods. This process leverages the problem-oriented, method-demonstrating case resources within the "immersive case module," anchoring abstract knowledge to authentic teaching and research scenarios. It thereby establishes a crucial bridge for transforming knowledge into practical skills. This teaching format, which binds knowledge to specific cases, bridges the gap between theory and practice. It enables teacher candidates to achieve a contextualized understanding of knowledge through the process of deconstructing concepts and connecting them to real-world applications, rather than relying on rote memorization.

Entering the project practice phase, contextualized knowledge undergoes a closed-loop cycle of application, evaluation, and reflection, enabling pre-service teachers to reconstruct their practical competencies. Within the generative practice module projects, students undertake specific tasks, synthesizing cross-disciplinary knowledge, designing teaching-research tools, conducting field observations, and drafting optimization strategies to enhance their instructional capabilities. The project-based teaching and research, action research practices, and other forms within the "Generative Practice Module" provide application vehicles and testing scenarios for contextualized knowledge. This drives the internalization of knowledge into core competencies — such as educational insight and design research capability — through practical application. Knowledge gaps exposed when implementing plans in kindergarten settings are addressed through a reflective process involving dual-mentor guidance, peer discussions, and practical adjustments, facilitating knowledge refinement and supplementation.

Through multiple rounds of a spiral-shaped cycle of immersion, practice, and reflection, knowledge becomes genuinely internalized. This personalized knowledge reconstruction and output enables pre-service teachers to make an essential leap from mastering knowledge to generating competencies.

5.2. Safeguard Mechanisms: Ensuring Efficient System Operation

The safeguarding mechanism functions as the foundational support for curriculum cluster operations, focusing on external environments and institutional development[17]. Curriculum cluster reform requires oversight and promotion through a long-term safeguarding mechanism. This study proposes three synergistic safeguarding mechanisms—institutional, resource-based, and cultural—that mutually reinforce each other to sustain the systemic ecology of "integration for innovation."

First is the institutional management level. In curriculum administration, establish cross-module course articulation standards and clarify knowledge transfer points. In faculty management, incorporate both university instructors' practical guidance effectiveness as well as kindergarten mentors' theoretical transmission quality into evaluation metrics to prevent imbalance caused by single-entity dominance. Additionally, establish a dynamic model adjustment mechanism, collecting feedback through multiple channels each semester to optimize course modules and teaching methods.

Second is the resource support dimension. A hybrid supply network integrating physical and virtual resources can be established. On the physical side, clusters of teaching and research practice bases should be established, covering kindergartens of varying operational models and developmental stages. These bases provide teacher trainees with diverse teaching and research scenarios, equipped with innovation labs, observation tools, data analysis software, and other supporting facilities. On the virtual side, an integrated online teaching and research platform should be developed, incorporating a case repository, a dual-instructor guidance scheduling system, and an achievement showcase module to achieve digital empowerment.

Finally, at the cultural atmosphere level. A positive cultural environment fosters knowledge spillover and sparks innovation[18]. Addressing the lack of innovation experience among teacher education students, we advocate the concept that trial and error amounts to growth. We affirm and guide innovative attempts in practice, avoiding outcome-oriented evaluation biases to cultivate a positive cultural atmosphere. Regularly organize innovation activities and achievement exchange sessions to encourage teacher education students to showcase personalized teaching research plans and tools. Invite frontline teachers to share cases of failed teaching research innovations, conveying the value that reflection is more important than success. This approach makes an innovative mindset an intrinsic pursuit within the teaching research community.

5.3. Generative Mechanism: Achieving the Ultimate Goal of "Integration" Leading to "Creation."

The generative mechanism represents the ultimate goal and high-level output of the model's operation. It does not exist in isolation but rather fosters the development of pre-service teachers' teaching and research innovation capabilities. This occurs within the collaborative ecosystem established by the transformation mechanism's internalization of individual competencies and the safeguarding mechanism's cultivation of supportive conditions.

First, authentic and complex research questions serve as the primary driving force for innovation. Within the generative practice module, teacher trainees cease to be mere applicators of predetermined knowledge. Instead, they confront the genuine challenges and complex demands encountered in kindergarten teaching and research settings. Upon identifying issues within pedagogical phenomena, they must transcend singular theoretical explanations. By synthesizing multidisciplinary knowledge, they independently define the essence of problems and attempt to propose novel perspectives and strategies for teaching and research observation. This process compels them to break free from fixed mindsets, shifting their focus from merely solving problems to defining and exploring them—thus establishing the logical starting point for innovation.

Secondly, in-depth dialogue and knowledge exchange among diverse stakeholders serve as catalysts for generating innovative thinking. The theoretical frontiers and methodological guidance brought by university faculty, the practical wisdom and context-bound insights of kindergarten mentors, and the multifaceted problem-solving approaches of pre-service teachers—these three elements readily spark cognitive conflicts and conceptual collisions. This prompts

learners to critically reflect on existing solutions, fostering novel and viable teaching-research designs through cross-disciplinary thinking.

Finally, innovative outcomes are refined and disseminated through a closed-loop cycle of practical validation and theoretical refinement. Innovative proposals developed by teacher education students must return to the practical field for verification, with their effectiveness assessed through multidimensional evaluation. Successful innovations not only demonstrate individual creative capabilities but also feed back into the curriculum cluster system through means such as outcome presentations and case repository updates. These become new immersive cases that inspire future learners' innovative thinking, achieving “integration” that leads to “creation.”

6. Conclusion and Outlook

6.1. Research Findings

This study presents a curriculum cluster model for developing teaching and research competencies among preschool education teacher candidates, grounded in the philosophy of integration and innovation. It serves as a structured educational solution addressing the professional development needs of preschool educators in the new era, with the following core characteristics and values:

First, the three-dimensional architecture emphasizes systemic integration. The model features reflective practitioners and generative innovators as its target layer, integrated curricula, immersive case studies, and generative practices as its content layer, and subject collaboration, methodological innovation, and assessment reform as its support layer. This framework overcomes the limitations of traditional course clusters—which prioritize content accumulation over systemic connections—achieving deep integration of philosophy, content, and safeguards.

Second, the operational logic of integration-driven innovation enhances transformative capacity. By leveraging case immersion to actualize knowledge, project practice to reconstruct knowledge, and reflection to internalize competencies, this mechanism resolves the disconnect between theory and practice. A trinity of institutional, resource, and cultural safeguards maintains the system's dynamic adaptability. The generative mechanism activates innovation momentum across multiple stakeholders. Together, these three elements propel knowledge toward a leap in research—informed teaching capabilities and innovative literacy.

Third, the competency-oriented value positioning demonstrates targeted effectiveness. The model directly addresses critical pain points in current teacher education：fragmented knowledge, superficial practice, and innovation deficits. Through contextualized course modules, project-based practical platforms, and process-oriented pedagogical reforms, it precisely targets core competency dimensions: educational insight, design-research capability, reflective practice, and innovative application. This framework not only provides universities with actionable curriculum cluster solutions but also delivers systematic support for teacher candidates’ professional and academic development.

6.2. Outlook

In the future, the construction of the teaching and research competency curriculum model for preschool education teacher candidates should shift from static to dynamic implementation effectiveness tracking, thereby deepening the model's practical value and theoretical implications.

Regarding empirical validation, quasi-experimental research will be conducted across three teacher training institutions of varying tiers. Experimental and control classes will be established, with a three-year follow-up research employing multiple methodologies to compare and analyze developmental differences in the four competency dimensions among teacher candidates in both groups. This systematic approach will validate the model's effectiveness.

In future research directions, first, we employ social network analysis methods to explore the efficacy of knowledge flow within diverse communities and optimize interactive models for collaborative engagement among stakeholders. Second, we adopt micro-generative approaches to trace the development process of innovation application capabilities among pre-service teachers, revealing critical junctures and influencing factors in innovation capacity dynamic development. Third, we break through the boundaries of higher education institutions to establish a tripartite collaborative training and evaluation community involving universities, local governments, and kindergartens. This initiative develops a standardized evaluation system for teaching and research capability development, enabling the testing and refinement of models within broader practical settings.

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References

[1] Zhang Xiaomei. Cultivating Humanistic Literacy Based on Professional Standards for Preservice Teachers' Ethical Practice in Early Childhood Education [J]. Heilongjiang Researches on Higher Education, 2021, 39(12): 155-160.

[2] Song Zhanmei. Reflections and Explorations on Building a Curriculum System for Early Childhood Education in Technical Undergraduate Programs [J]. Education and Vocation, 2009, (26): 126-128.

[3] Zhou Yongli, Chen Jing'er. Preliminary Exploration of Teaching Reform for the Higher Vocational Preschool Course “Design and Guidance of Kindergarten Math Activities” Based on Core Experiences [J]. Technology Wind, 2025, (26): 58-60.

[4] Zhou Yongli, Chen Jing'er. Preliminary Exploration of Teaching Reform for the Higher Vocational Preschool Course “Design and Guidance of Kindergarten Math Activities” Based on Core Experiences [J]. Technology Wind, 2025, (26): 58-60.

[5] Tian Cuifen. Research on Pathways for Enhancing Educational Competence of Preschool Education Teacher Candidates in Higher Vocational Education in the New Media Era [J]. Journal of News Research, 2025, 16(13): 137-141.

[6] Zhu Zhiteng, Zhao Xiaowei, and Shen Shusheng. Integrated Innovation Education: Practical Pathways for Empowering New-Quality Talent Cultivation with Digital Intelligence Technologies [J]. Distance Education in China, 2024, 44(05): 3-14.

[7] Bai Qian, Feng Youmei, Shen Shusheng et al. Re-examining and Re-evaluating: Piaget's Genetic Constructivism and Learning Theories Within Its Framework [J]. Journal of East China Normal University (Education Sciences), 2020, 38(03): 106-116.

[8] Liu Zhanlan. Reshaping Professional Identity: Becoming a Professional Early Childhood Educator [J]. Studies In Early Childhood Education, 2007, (Z1): 85-88.

[9] Wei Ge, Chen Xiangming. The Emergence of Subjectivity: The Educational Significance of Teachers' Practical Knowledge [J]. Journal of Educational Studies, 2019, 15(04): 72-79.

[10] Tang Jingli. Review of the National Conference on Undergraduate Education in Higher Education Institutions in the New Era: Adhering to "Undergraduate Education as the Foundation" to Advance the "Four Returns" [J]. China Higher Education, 2018, (Z2): 11-12.

[11] Chen Fangfang, Chen Yupei. Research on the Construction of Emerging Major Course Clusters from an Interdisciplinary Integration Perspective [J]. Journal of Educational Theory and Practice, 2025, 45(30): 51-55.

[12] Wang Peng, Han Lizhe. Examining and Cultivating Theoretical Self-Awareness Among Primary and Secondary School Teachers from a Reflective Practice Theory Perspective [J]. Journal of Educational Theory and Practice, 2024, 44(32): 17-21.

[13] Wilson, Edward. The Great Convergence: Science and the Humanities in the 21st Century [M]. Translated by Liang Jinjun. Beijing: CITIC Publishing Group, 2016: 14.

[14] Liu, Zhanlan. Deepening Teaching Research to Achieve Unity of Knowledge and Action Among Kindergarten Teachers [J]. Early Childhood Education Journal, 2019, (13): 54.

[15] Tang Yixuan, Gan Peng. Research on the Development of Practical Courses for Preschool Education Programs in Higher Vocational Colleges Based on Outcome-Oriented Education [J]. Journal of Educational Theory and Practice, 2022, 42(21): 33-37.

[16] Sun Shiru, Yao Yun. Phases, Mechanisms, and Effects of U.S. STEM Education Policy Evolution: An Analysis Based on Historical Institutionalism [J]. Modern University Education, 2025, 41(05): 33-45.

[17] Xu Zhoubo. Research on the Reform of Computer Science and Technology Curriculum Clusters Guided by "Four Competencies" [J]. Indusrty and Information Technology Education, 2018, (04): 19-23.

[18] Yang Zhenshan, Fu Rundé. Spatiotemporal Evolution of Employment Opportunities for Chinese College Graduates [J]. Journal of Geographical Sciences, 2025, 80(10): 2757-2776.