Innovation and Practice of the Teaching Model of "Disciplinary Integration, Contextual Connection, and Ideological-Political Integration" in the Preschool Education Program of Teacher Education Institutions — A Case Study of the "Science Education in Kindergarten" Course

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Abstract: *At present, the teacher education curriculum in preschool education programs at teacher training institutions faces several challenges, including insufficient integration of multidisciplinary knowledge, inadequate cultivation of higher-order abilities, and the lack of consistent integration of teacher ethics education throughout the teaching process. This paper proposes a teaching model based on "disciplinary integration, contextual connection, and ideological-political integration." The model embeds teacher ethics as the main thread throughout the curriculum, emphasizes content innovation by integrating traditional and emerging technologies, constructs a blended teaching model combining online and offline learning through a "one-line, three-learning, six-support" framework based on instructional design, builds an OBE (Outcome-Based Education) project-based learning support system with learning support as the key element, and establishes a student-centered, multi-dimensional evaluation system supported by value-added assessment. It bridges theory and practice in early childhood science education and promotes learning for application, aiming to cultivate students' professional beliefs and professional competencies, and ultimately to develop high-quality, professional, and innovative early childhood educators.*

Keywords: *Technological Pedagogical Content Knowledge (TPACK); Situated Cognition Theory; Curriculum and Teaching Theory Course; Science Education in Kindergarten*

Introduction

Teacher training institutions serve as the main base for cultivating educators. Through curriculum and teaching theory courses, these institutions aim to foster the spirit of education professionals and enhance their teaching and research capabilities. However, challenges such as the insufficient integration of multidisciplinary knowledge, lack of higher-order ability development, and inadequate incorporation of teacher ethics throughout the teaching process have led to a curriculum that tends to be overly theoretical and discipline-oriented. This results in pre-service teachers being confined to a process of static knowledge transmission, isolated from real-world contexts and devoid of value engagement. Taking the teaching of this course as an example, this paper explores how the teaching model of "disciplinary integration, contextual connection, and ideological-political integration" can inform the reform of curriculum and teaching theory courses in teacher education programs at Chinese universities.

1. Construction of the Teaching Model of "Disciplinary Integration, Contextual Connection, and Ideological-Political Integration" in Preschool Education Programs at Teacher Training Institutions

1.1 Emphasizing Content Innovation and Integrating Multidisciplinary Knowledge

"Pedagogical Content Knowledge (PCK) has become the core of research on teacher knowledge"

and refers to the transformation of subject knowledge into forms that are learnable for students. Technological Pedagogical Content Knowledge (TPACK) requires the integration of CK (Content Knowledge), PK (Pedagogical Knowledge), and TK (Technological Knowledge) within specific teaching contexts. This places new demands on pre-service teachers' digital teaching competence, which includes a three-dimensional cognitive structure: cognitive literacy, instructional implementation ability, and an innovative development mindset. Based on this, the course design addresses four dimensions: content innovation, instructional process design, learning support, and value-added assessment. In the context of kindergarten education, CK, PK, and TK are dynamically and effectively integrated, bridging theory and practice in early childhood science education, and gradually enhancing pre-service teachers' instructional implementation capabilities. Furthermore, teacher ethics education is embedded throughout the entire training process of pre-service teachers, defined as "the objective process through which teachers continuously improve moral standards, develop ethical emotions, cultivate ethical beliefs, and form ethical habits." Specifically, in the content knowledge module (CK), multidisciplinary knowledge is incorporated into the early childhood science education curriculum system, with attention paid to academic frontiers and research outcomes to broaden students' academic perspectives and reflect the advanced nature of the curriculum. In the pedagogical knowledge module (PK), six thematic projects guide students to independently select appropriate forms of representation and instructional strategies aligned with subject content, reflecting pedagogical innovation. In the technological knowledge module (TK), instructional scenarios are created to guide students in applying technological pedagogical knowledge by using traditional or emerging technologies to implement instructional design, thereby demonstrating instructional challenge[1].

1.2 Basing Process Design on the Construction of the "One-Line, Three-Learning, Six-Support" Teaching Model

The "one-line" refers to integrating teacher ethics education throughout the entire process of teacher training. It takes the cultivation of professional knowledge and skills as the carrier, identifies ideological-political themes by exploring connections between subject teaching and ideological-political education, and implements thematic activities such as case studies, social investigations, and scenario simulations. These are closely integrated with second classroom experiences and early childhood education practice bases, embedding the value of teacher ethics cultivation—"origin, beauty, reason, and application"—into the questions of "why to learn," "how to learn," and "the mission of this course in the present era," and effectively conveying students' professional ideals and values. The "three-learning" includes "online self-learning," "in-class inquiry learning," and "practical research learning," through which course content is structured and contextualized via project-based learning. The "six-support" refers to six scaffolds constructed by teachers to guide students in discovering, proposing, and analyzing driving questions through project learning. In accordance with Bloom's three-dimensional objective theory, knowledge is built through the integration of online self-study, tutoring and special lectures, and face-to-face Q&A; abilities are developed by combining theoretical learning with skills training; and values are shaped by linking process management with multi-dimensional assessment.

1.3 Focusing on Learning Support to Construct an OBE Project-Based Learning Scaffold System

By designing authentic, comprehensive, and complex project tasks, the course promotes development toward higher-order thinking, innovation, and challenge. Through flexible and diverse project questions, students are guided into inquiry-based learning that aligns course instruction with societal needs. Resources such as frontline early childhood education practice, renowned early childhood educators' studios, science education training laboratories, and high-quality courses are fully utilized to create realistic educational scenarios. Activities such as child behavior observation, collective lesson preparation, lesson study, and hands-on practice in training labs are conducted to enhance pre-service teachers' logical thinking, expressive ability, and practical skills. Diverse formats of outcome presentation, including thematic discussions, simulated teaching, and lesson presentations, are used to stimulate students' deep thinking and autonomous learning abilities[2-5].

1.4 Supporting with Value-Added Assessment to Establish a Student-Centered, Multi-Dimensional Evaluation System

A student-centered, comprehensive evaluation system is constructed, including self-assessment, peer assessment, teacher evaluation, and platform-based evaluation. This system aims to strengthen

students' awareness of their active role in teaching and measure the initiative and depth of their learning participation. Formative and summative assessments each account for 50% of the total evaluation. Formative assessment includes online learning data and classroom performance, specifically: online learning performance (40%), consisting of assignments (post-class learning evaluation) and quizzes (pre-class learning evaluation); classroom performance (20%), consisting of class participation and ideological-political evaluation; and practical outcomes (40%), consisting of curriculum design (post-class learning evaluation), presentations (class activity evaluation), and both intra-group and inter-group peer assessments.

2. Optimized Design of the Curriculum Syllabus for Project-Based Learning

To ensure that the themes of project-based learning closely align with the confusions encountered by pre-service teachers during their learning and practice, this course centers on scientific literacy and aims to address key issues in early childhood science education, such as "why to teach," "what to teach," "how to learn," "how to teach," "how to assess," and "how to promote teaching." Accordingly, the curriculum syllabus has been comprehensively optimized.

Table 1. Summary of Project-Based Learning Themes in the Curriculum Syllabus

Learning Unit	Project-Based Learning Theme	
	Project Scenario	Project Question
1.Overview of Early Childhood Science Education	Review and explore the developmental trajectory of early childhood science education curricula abroad, and understand the current key issues in curriculum reform and development in kindergartens.	From the perspective of developing teachers' professional competence in the field of early childhood science, write a group-based research report focusing on the implications of kindergarten curriculum reform, and present the findings.
2.Objectives and Content of Early Childhood Science Education	Questions such as "What is core scientific literacy?" and "How to design teaching activities based on core scientific literacy in accordance with children's physical and mental development characteristics?" have become widely discussed topics.	Design a questionnaire or interview outline centered on "the value of science education in kindergartens" to investigate the specific objectives and content of science education activities in kindergartens; write a research report and present the findings.
3.Methods of Early Childhood Science Education	How can information technology be utilized to optimize, integrate, or innovate teaching methods in early childhood science education?	Design a group-based themed science education activity that adopts a variety of teaching methods in combination with information technology, enabling the observation and encouragement of children's active exploration, collaborative communication, and positive expression, thereby supporting and promoting self-directed learning.
4.Organization and Implementation of Early Childhood Science Education Activities	The organization and implementation of activities can achieve the structuring and contextualization of teaching content. Teachers should skillfully employ methods such as observation, experimentation, multimedia, and games to present and explain complex scientific concepts.	Based on the project theme "Innovative Approaches to Cultivating Learning Methods for Core Scientific Literacy," identify a group project question, explore the teaching models and methods for fostering scientific literacy in kindergartens, and carry out a presentation activity.
5.Evaluation in Early Childhood Science Education	Scientific evaluation of pre-service teachers' cognitive level, value judgment ability, thinking ability, and practical ability should be conducted to comprehensively reflect the development of their core competencies in science education.	In combination with the fundamental concepts of teaching evaluation outlined in the Guidelines and Framework, explore approaches and methods for implementing an "assessment system based on the development of core competencies in science education."

3.Blended Online and Offline Instructional Design

Guided by project-based learning, the instructional design adopts a scaffolded approach that integrates the stages of "online self-study," "classroom exploration," and "practical inquiry" (see Table 2). Through online self-study, foundational knowledge is acquired and reinforced; through classroom exploration, project-based learning outcomes are presented and discussed in thematic seminars; through practical inquiry, simulated teaching is conducted to assess instructional competence while fostering scientific attitudes and innovative thinking. A value-added, outcome-oriented formative assessment method is employed to evaluate the performance of pre-service teachers[6-10].

Table 2. Course Instructional Components

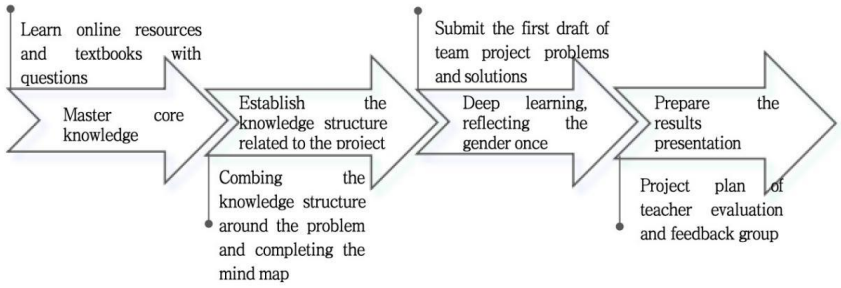
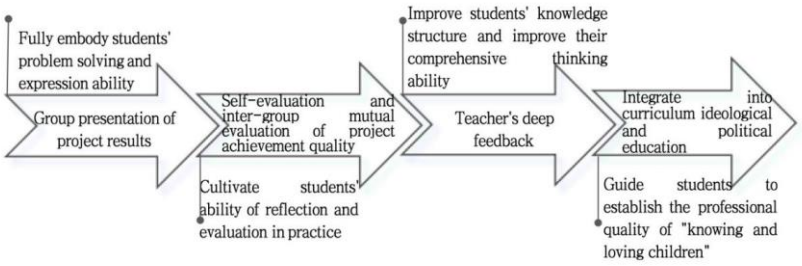
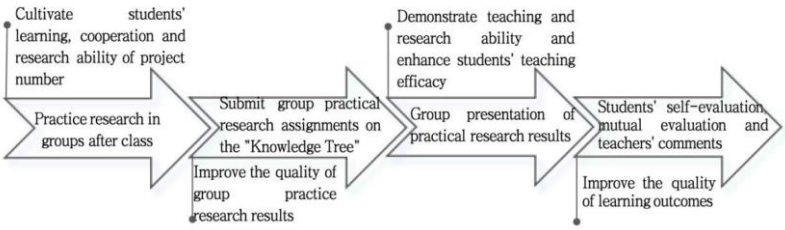
<table>
<tr><td rowspan="2">Online Self-Study 1class hour</td><td>【Online Self-Study Task Sheet】 Project Theme: Observation as the Basic Way Children Understand the World
【Problem Situation】 Teachers lack proficiency in problem-based teaching, failing to stimulate children’s interest in inquiry, resulting in superficial exploration and time inefficiency.
【Learning Tasks】 Complete the micro-lesson on “Characteristics of Children’s Inquiry into the World” through online self-study, create a mind map, and, based on the following questions, formulate the project problem; then, as a group, develop solutions to the problem.
1.What is observation? What stages does it consist of? Explain the key points of each stage with examples.
2.What are the characteristics of high-quality problem situations and problem chains? How are they created?
3.How to balance the teacher’s “teaching” and children’s “learning” in inquiry-based teaching?
4.What are the characteristics of teachers’ question design?</td></tr>
<tr><td>【Online Self-Study Process】
Pre-service teachers engage in micro-lesson and course resource study guided by the project problem, constructing a knowledge framework related to the problem; instructors review and provide revision suggestions for the group project problems to prepare for the presentation of solutions during the classroom exploration phase.
 

Figure 1. Advanced link of "online self-study"</td></tr>
</table>

Classroom Exploration 2class hours	【Principles and Methods for Creating Problem Situations】 Group members present project outcomes and conduct self- and peer evaluations, then post the evaluation content in the “Q&A Discussion Area” on Zhihuishu, facilitating mutual learning among groups; instructors provide in-depth teaching feedback based on case studies, enabling pre-service teachers to deeply understand the essence of problem-based teaching through embodied learning, enhancing their critical thinking and problem-solving abilities; through case analysis and simulated teaching, students engage in deep reflection and learn to respect children’s physical and mental development characteristics, designing and organizing child-centered observational science education activities, thereby cultivating the professional qualities of “knowing children and loving children.”  Figure 2. Advanced link of "classroom exploration"
Practical Research Study 2class hours	【Simulated Teaching Competition—Based on Core Competency Development】 Groups design simulated teaching activities for the kindergarten science domain outside of class. Each group member completes activity design and lesson material preparation independently, conducts trial teaching within the group, and uploads the teaching design documents and preliminary lesson materials to the Zhihuishu platform for teacher review and revision suggestions; based on the teaching design and internal trial teaching, each group selects representatives to participate in the simulated teaching competition.  Figure 3. Advanced links of "practical research"
Assessment and Feedback	【Learning Evaluation System】The evaluation system integrates formative and summative assessments, as well as online and diversified offline evaluations, in order to assess the teaching competence of preschool education pre-service teachers. Three evaluation stages are implemented: initial online evaluation, peer evaluation in class, and final online evaluation[11-13]. 【Feedback Mechanism】Immediate feedback: First, reminders are given to students whose mind maps are insufficiently detailed or complete, and exemplary mind maps are showcased as models; second, issues found in the preliminary drafts of group project outcomes are identified, along with suggestions for revision; third, objective and constructive evaluations are provided for each group’s project outcomes. Delayed feedback: Based on the “learn first, then teach; teaching guided by learning” principle, targeted lesson planning is conducted after class. Through themed lectures, in-depth explanations are provided to clarify complex issues. Teachers use case discussions and lesson analysis to help students develop the awareness and ability to apply problem-based teaching methods, grounded in the cultivation of core competencies in kindergarten science education.

Conclusion

The “disciplinary integration, contextual coherence, and ideological-political integration” teaching model for preschool education majors at teachers' colleges ensures a high degree of alignment between course content and the professional requirements outlined in the second-level accreditation standards for teacher education and the Professional Standards for Kindergarten Teachers. Applying this model to the teaching of curriculum and pedagogy courses effectively enhances pre-service teachers’ awareness of and enthusiasm for active, full-process engagement in learning.

Funded Projects

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