

Integrating Informatization with the PAD Class Model: An Empirical Study on Enhancing Vocational Teacher Competency in Early Childhood Education

Xiong Huang^{1,2}, Yuanzhu Yin^{1,*}, Ying Wang¹

¹ Huainan Vocational Technical College, Huainan, Anhui, 232001 China

² Anhui University of Science and Technology, Huainan, Anhui, 232001 China

* Corresponding author: Yuanzhu Yin

Abstract: The "Double-High Plan" in China necessitates innovative pedagogical reforms to cultivate high-quality technical talent. This study addresses the pedagogical stagnation in the Montessori Education Method course within Infant and Toddler Nurturing programs by proposing an integrated "Informatization + PAD Class" instructional model. Grounded in the deep integration of theory and practice, this model synergizes digital platforms (e.g., AI assessment, Learning Pass) with the structured phases of the PAD Class (Presentation, Assimilation, Discussion). A quasi-experimental design was conducted with 74 freshmen. Results indicate that the experimental group, which adopted the integrated model, significantly outperformed the control group in academic achievement ($p < .01$) and demonstrated higher engagement levels. Notably, the integration fostered self-regulated learning and practical operational skills. This study contributes a scalable framework for leveraging educational technology to enhance instructional efficacy in vocational education.

Keywords: Double-High Plan; PAD Class; Educational Technology Integration; Vocational Education; Montessori Pedagogy.

1. Introduction

In January 2019, the State Council issued the National Vocational Education Reform Implementation Plan, explicitly proposing the launch of the "Double-High Plan" (Construction Plan for High-Level Vocational Schools and Majors with Chinese Characteristics) [1]. In April 2019, the Ministry of Education and the Ministry of Finance jointly released the Opinions on Implementing the Construction Plan for High-Level Vocational Schools and Majors with Chinese Characteristics, officially launching the "Double-High Plan." Aimed at building a cohort of high-level vocational schools and specialty clusters capable of leading reform and supporting development, this plan is regarded as the "Double First-Class" initiative within vocational education, further driving the deepening reform of vocational education [2]. In October 2022, the General Office of the CPC Central Committee and the General Office of the State Council issued the Opinions on Deepening the Reform of the Modern Vocational Education System, listing "building core curricula, high-quality textbooks, teaching teams, and practical projects" as key tasks for the first time. The Ministry of Education subsequently summarized and elevated these tasks to the "Five Golds" (Gold Majors, Gold Courses, Gold Teachers, Gold Bases, and Gold Textbooks [3]), serving as crucial levers for systematically promoting high-quality development in vocational education.

New-generation information technology is developing rapidly, providing new opportunities for the informatization transformation of vocational education [4]. Curriculum development is the core of talent cultivation activities; the quality of the curriculum directly determines the effectiveness of talent training. Therefore, curriculum reform is the core of vocational education teaching reform. Enhancing teachers' informatization teaching competency is one of the important measures for implementing the "Double-High Plan. [5]" The

organic integration of education, teaching, and information technology is not only an external manifestation of adapting to high-quality vocational education but also the "new quality productive forces" for improving the informatization teaching competency of higher vocational teachers.

Traditional teaching emphasizes teacher-centered lecturing, resulting in low student engagement. In contrast, informatized teaching places students in the primary position, guiding them to complete teaching tasks through teamwork under the teacher's guidance, thereby cultivating their spirit of independent inquiry. Based on this, this study aims to construct an "Informatization + PAD Class" teaching model. Using the "Montessori Education Method" course as a carrier, it systematically studies the implementation paths and practical effects of this model, aiming to provide references for teaching reform in higher vocational colleges offering Infant and Toddler Nurturing and Service Management programs.

2. Teaching Approach for the "Montessori Education Method" Course

The Montessori Education Method is a pedagogy course combining theory with practice, typically divided into theoretical components and operational methodologies. Due to the depth of Montessori theory and the richness of its teaching aids, the course possesses strong theoretical and practical dimensions.

In September 2020, nine departments including the Ministry of Education jointly issued the Action Plan for Improving Quality and Cultivating Excellence in Vocational Education (2020–2023), explicitly proposing the deep integration of information technology and vocational education teaching. This aims to drive the overall quality improvement and upgrading of vocational education through

digitalization, build a new "Informatization + Vocational Education" ecosystem, and cultivate high-quality technical and skilled talents adapted to the digital economy era.

Based on the current teaching status of the Montessori Education Methodcourse at our college, and combined with its characteristics of integrating theory and practice, we have constructed a new teaching model featuring online-offline interactive instruction, continuous pre-class, in-class, and post-class learning, integration of theory and practice, and diversified whole-process evaluation—namely, the "Informatization + PAD Class" model.

Addressing the deep integration of theory and practice in the Montessori Education Methodcourse at our college, we constructed the new "Informatization + PAD Class" teaching model. Supported by informatization tools and integrating PAD Class concepts, this model realizes interaction between online and offline teaching, coherence across pre-, in-, and post-class learning, and combines theoretical lecturing with practical operations, supplemented by a diversified evaluation system covering the entire learning process. The specific teaching model is illustrated in the figure below:

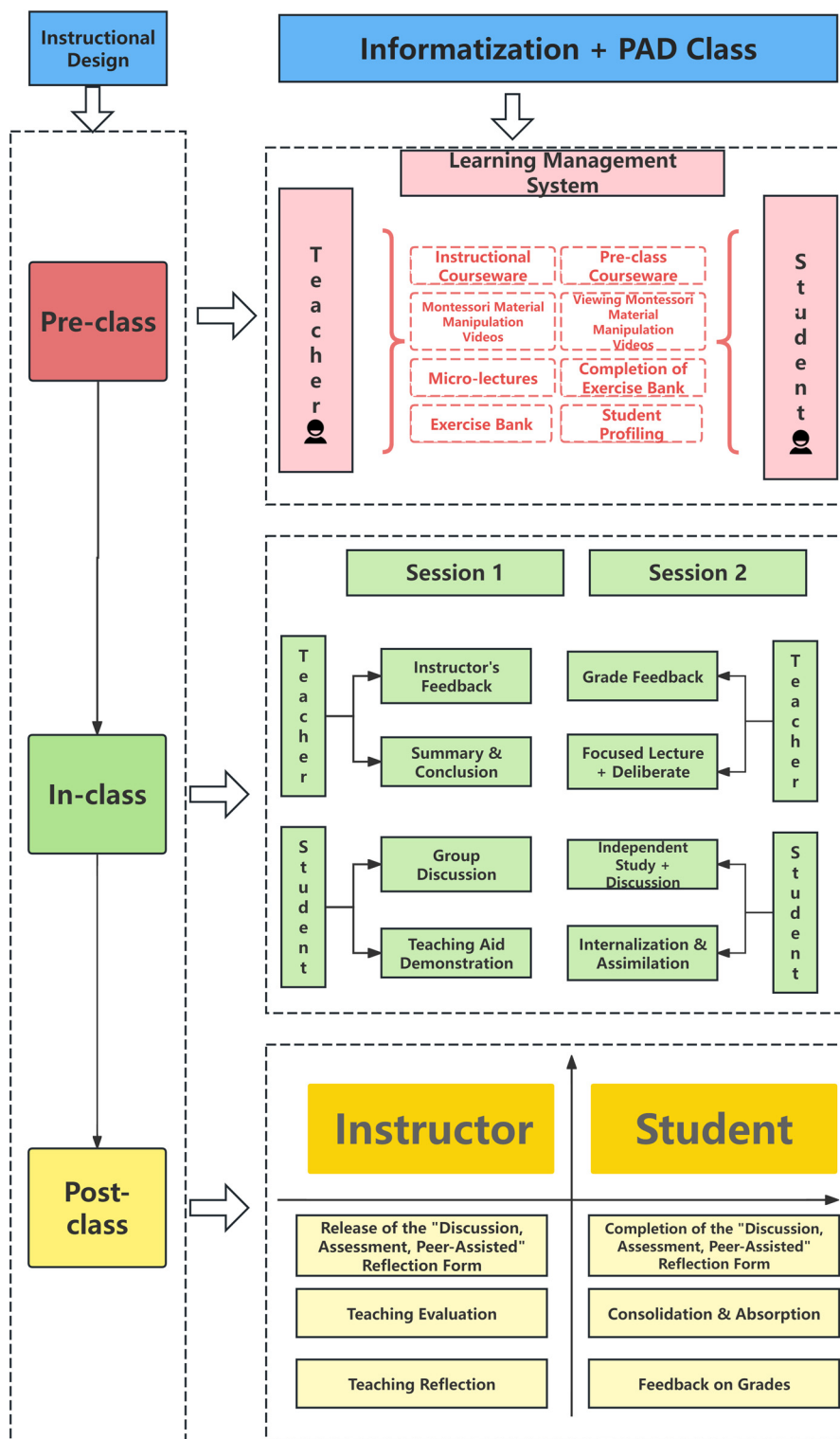


Figure 1. Schematic diagram of the "Informatization + PAD Class" Teaching Model

3. Practical Application of the "Informatization + PAD Class" Teaching Model

3.1. PAD Class

Professor Zhang Xuexin of Fudan University first proposed the "PAD Class" (Presentation, Assimilation, Discussion) teaching model in 2014. It allocates half of the class time for teachers to impart new knowledge and the other half for students to engage in interactive learning. Its innovation lies in physically separating lecture and discussion, balancing teacher-student interaction with student-student interaction, thereby enhancing the attractiveness of classroom teaching.

3.2. Continuous Pre-class, In-class, and Post-class Learning

Based on typical teaching cases in the Montessori Education Method, teachers set up scenarios related to Montessori daily life before class and release learning tasks via the "Xuetong" (Learning Pass) platform. During the first session, students discuss the previous week's learning experiences in groups, adopting a three-dimensional approach of "Discussion, Testing, and Helping." During the second session, teachers systematically explain the key and difficult points of the course, constructing a knowledge graph for students. After class, teachers and students utilize AI intelligent assessment systems and "Discussion-Testing-Helping" reflection forms to resolve difficulties.

3.2.1. Pre-class Preparation

Teachers set up scenarios related to Montessori daily life and release operation videos of Montessori teaching aids via the "Xuetong" platform. Several student groups are organized to enter the Montessori training room for practice, record their operations, and upload the videos to "Xuetong." Teachers analyze the videos and summarize the key and difficult points

of the lesson.

3.2.2. In-class Implementation

During the first session, students discuss the previous week's learning experiences in groups using the "Discussion, Testing, and Helping" approach. "Discussion" refers to groups presenting their insights on issues in the course; "Testing" involves mutual questioning between groups; and "Helping" means advanced groups actively assist struggling groups. During the second session, teachers systematically explain the key and difficult points, constructing a knowledge graph for students. The "PAD Class" emphasizes a student-centered approach to comprehensively improve students' comprehensive qualities.

3.2.3. Post-class Activities

Teachers design "Discussion-Testing-Helping" reflection forms and use AI intelligent assessment systems to track students' difficulties, pushing review materials to individuals via "Xuetong." Students actively complete the reflection tasks, internalizing the key and difficult points explained by the teacher, summarizing doubts about knowledge and operational difficulties, and feeding this information back to "Xuetong."

3.3. Analysis of the "Informatization + PAD Class" Teaching Model

The research sample data were sourced from Classes 1 and 2 of the 2024 cohort majoring in Infant and Toddler Nurturing and Service Management at our college. Class 1 (37 students) served as the experimental group, adopting the "Informatization + PAD Class" model, while Class 2 (37 students) served as the control group, continuing the traditional teacher-centered lecture model. Both classes shared identical teaching resources, including faculty, textbooks, syllabi, and curriculum standards. The final exam used the same test paper, and data were statistically analyzed using the "Xuetong" platform and SPSS 26.0 software.

Table 1. Comparison of Academic Performance Between Control Group and Experimental Group

Group	n	Passing Number (≥60 score)	Excellent Number (≥90 score)	Passing Rate (%)	Excellent Rate (%)	Final Exam Score	Pre-test Baseline Score
Control Group	27	20	7	74.07	25.93	74.29±15.215	58.37±10.361
Experimental Group	27	25	17	92.59	62.96	85.73±10.215	62.19±7.372
χ^2	-	3.330	7.500	-	-	3.325	1.350
P	-	0.068	0.006	-	-	0.002	0.180

A one-way ANCOVA was conducted to compare the final scores between the experimental group (EG) and the control group (CG), using the pre-test scores as a covariate. Levene's test confirmed homogeneity of variance ($F=1.24$, $p=.269$). After adjusting for pre-test differences, the EG ($M=85.73$, $SD=10.22$) demonstrated a statistically significant higher mean score than the CG ($M=74.29$, $SD=15.22$), $F(1, 71)=11.63$, $p=.001$, $\eta^2=.14$. This indicates a large effect size, suggesting the intervention effectively facilitated knowledge internalization.

4. Conclusion

Enhancing teachers' informatization teaching competency is one of the important measures for implementing the "Double-High Plan." The organic integration of education, teaching, and information technology is not only an external

manifestation of adapting to high-quality vocational education but also the "new quality productive forces" for improving the informatization teaching competency of higher vocational teachers. Addressing the characteristic of deep integration of theory and practice in the Montessori Education Methodcourse at our college, we constructed the new "Informatization + PAD Class" teaching model. Supported by informatization tools and integrating PAD Class concepts, this model enhances the attractiveness of classroom teaching. In the practical application of the Montessori Education Methodcourse, the "Informatization + PAD Class" model improved students' enthusiasm and initiative in classroom participation, promoted the internalization and absorption of Montessori educational theory, and honed students' "real skills" in practical operations, laying a solid foundation for becoming excellent Montessori teachers.

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