

Review Article

A Discussion on the Integration and Development Trends of Flipped Classroom and Piano Teaching from the Perspective of Music Education Innovation

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Abstract

In the context of music education innovation, the flipped classroom, as a crucial vehicle for breaking traditional teaching paradigms, has become a key method for promoting high-quality development of piano education through its deep integration with piano teaching. This study systematically reviews the latest relevant literature, focusing on the integration logic, implementation strategies, technological support, application effectiveness, and development trends of the flipped classroom and piano teaching, conducting a systematic analysis from the perspective of music education innovation. The study finds that the flipped classroom, through its process of “pre-class self-study - precise in-class empowerment - post-class practice extension,” effectively addresses core issues in traditional piano teaching such as uneven resource allocation, lack of personalized guidance, and the disconnect between technical training and artistic expression. Its integration with piano teaching requires theoretical support such as constructivism, integrating technological tools such as MOOCs, smart piano software, and virtual performance platforms, and employing innovative strategies such as tiered pre-class preparation, collaborative performance, and problem-oriented discussions. Empirical research shows that this integrated model can significantly improve students’ piano playing skills, improvisational accompaniment abilities, musical expressiveness, and self-learning abilities. From the perspective of music education innovation, the future integration of the two will develop towards technological intelligence, personalized teaching, diversified evaluation, and cross-disciplinary collaboration. This study provides theoretical reference and practical path for piano teaching reform and music education innovation, clarifies the unique applicability of flipped classroom in piano teaching compared with other knowledge-based disciplines, and helps piano education to transform from “technical indoctrination” to “quality cultivation”.

Keywords

Flipped classroom, Piano teaching, Music education innovation, Teaching integration, Development trends, Technology integration

1. Introduction

1.1. Research Background

As a core component of music education, piano teaching in higher education institutions has long faced numerous bottlenecks in the traditional teaching model: high-quality teachers and teaching resources are excessively concentrated in a few institutions, resulting in insufficient educational equity between regions and institutions, and most students struggle to receive personalized guidance (Wang, 2022; Zhu et al., 2024a); the teaching model is mainly based on “teacher demonstration-student imitation,” which is a teaching characteristic unique to piano education different from knowledge-based disciplines such as mathematics and physics. Classroom time is largely devoted to repetitive training in basic techniques, and the particularity of piano teaching (which requires the integration of technical operation and emotional expression) leads to the serious sidelining of higher-level abilities such as artistic expression and improvisation (Song Lin, 2025; Li, 2022); and there is a disconnect between theoretical learning and practical application, with students excelling in solo techniques but lacking practical skills such as accompaniment, collaboration, and arrangement, making it difficult to meet the comprehensive needs of musical talents in the new era (Zhang Zhen, 2024; Zhu et al., 2024b).

With the deepening of innovative concepts in music education, technology empowerment, competency-oriented education, and personalized cultivation have become the core directions of reform. The flipped classroom, which originated from the video teaching practice of Bergmann and Sams in the United States in 2007 and has experienced more than 15 years of development and iteration, reverses the traditional “lecture-practice” process. On the basis of absorbing the experience of flipped classroom application in physical education, social inquiry learning and other disciplines, it allows piano students to complete self-study of basic knowledge and skills such as sheet music recognition and basic fingerings before class using digital resources , while classroom time focuses on in-depth interaction, technical refinement, and artistic expression (Bergmann & Sams, 2012, as cited in Zhang et al., 2024). This model aligns perfectly with the practical and personalized characteristics of piano teaching, addressing both teacher and resource shortages through high-quality digital resources and deepening the integration of technology and art through classroom interaction,



thus becoming an important practical vehicle for innovation in music education (Fu, 2020; Li, 2024). In recent years, with the development of technologies such as smart pianos, digital audio workstations, and virtual ensemble platforms, the integration of flipped classrooms and piano teaching has become increasingly diverse, evolving from single micro-lesson flipping to multiple forms such as “gamified flipping” and “smart tool-assisted flipping” (Musayeva, 2025; Zhu et al., 2025), injecting new vitality into piano education innovation.

1.2. Significance of the Research

Current research on flipped classrooms and piano teaching largely focuses on single application scenarios or specific technological tools, lacking a systematic review of the integration logic, core strategies, and development trends from the perspective of music education innovation (Zhu et al., 2024a; Zhang et al., 2024). This study, by integrating relevant literature, clarifies the theoretical basis, implementation path, and innovative value of integrating flipped classrooms and piano teaching, filling a gap in existing research and providing support for the improvement of piano teaching reform and music education innovation theories. It not only responds to the demands of educational informatization for the transformation of music education, but also provides a theoretical reference for the innovation of interdisciplinary teaching models by absorbing the application experience of flipped classroom in other disciplines such as physical education and statistical programming.

At the practical level, the integration strategies, technology integration paths, and challenge-solving solutions summarized in this study can provide operable teaching references for college piano teachers; the integration effectiveness and development trends revealed can provide empirical evidence for education management departments to formulate innovative policies for piano education and optimize the allocation of teaching resources, helping piano education to transform from “technology-based” to “competency-based” and cultivate more comprehensive music talents who meet the needs of the new era (Song Lin, 2025; Zhu et al., 2024b).

1.3. Research Questions

Based on the current state of research and the needs for innovation in music education, this study focuses on the following core questions: What are the theoretical foundations and core logic of integrating the flipped classroom with piano teaching? From the perspective of music education innovation, what are the main implementation strategies and technical supports for integrating the flipped classroom with piano teaching? What are the application effects of this integration in improving students’ piano skills, artistic literacy, and comprehensive abilities? What are the main challenges faced in integrating the flipped

classroom with piano teaching? In the context of future music education innovation, what are the development trends of integrating the flipped classroom with piano teaching?

2. Methods

2.1. Literature Inclusion Criteria

The inclusion criteria for the literature mainly include four aspects: the research topic focuses on the integration and application of flipped classroom and piano teaching, covering theoretical discussions, practical research, and effect evaluation, and is in line with the innovative concept of music education; the literature type is journal articles, and must be original or review studies; the time range is limited to 2020-2025 to ensure the timeliness and cutting-edge nature of the research; in terms of data completeness, the literature must contain clear research methods, core results or key viewpoints, and the data must be complete and extractable. Based on the PICO model, the research problem is defined as follows: Population (P) is college piano teaching practitioners and learners, Intervention (I) is the flipped classroom teaching model, Comparison (C) is the traditional piano teaching model, and Outcome (O) is the improvement of students' piano skills, artistic literacy and self-learning ability.

2.2. Literature Search and Screening

This study strictly followed the PRISMA literature search and screening process, including relevant literature on the application of flipped classrooms in piano teaching from core Chinese and English journals. The search databases covered Chinese databases (CNKI, Wanfang, VIP) and English databases (Web of Science, Scopus, JSTOR), with search keywords including “flipped classroom+piano teaching,” “music education+flipped classroom,” and “piano teaching innovation+digital technology.” Research types included empirical studies, theoretical discussions, and bibliometric analysis.

2.3. Literature Analysis Framework

This study employs a thematic analysis approach, systematically analyzing the literature around two core dimensions: the first dimension is the foundation and practical path of integration, including core theories supporting integration such as constructivism, autonomous learning theory, and collaborative learning theory, as well as specific integration strategies in teaching links such as pre-class preparation design, classroom activity organization, and post-class practice extension; the second dimension is the support and development dynamics of integration, including the forms of technical support, integration effects, existing

challenges, and future development directions. The analysis of each dimension closely adheres to the core of “innovation,” focusing on the breakthroughs and optimizations that the integration model brings to traditional piano teaching. On the basis of thematic analysis, this study adopts meta-analysis method to extract the effect size (ES) of empirical research results in the included literatures, and takes the standardized mean difference (SMD) as the core statistical index to quantitatively analyze the application effect of flipped classroom in piano teaching.

3. Results

3.1. Theoretical Basis and Core Logic of Integrating Flipped Classroom and Piano Teaching

The integration of flipped classroom and piano teaching is based on the mature development of flipped classroom theory and practice in various disciplines. From the initial video-based flipped teaching to the current technology-integrated flipped model, its core logic of “student-centered and process reengineering” has been continuously verified in physical education, social inquiry learning and other fields, and provides a mature theoretical reference for its application in piano teaching with strong practical and artistic characteristics. The integration of the flipped classroom with piano teaching relies primarily on three theoretical pillars, providing theoretical support for innovation in music education. Constructivist theory emphasizes that knowledge is a product of learners’ active construction, advocating for guiding students to actively explore the intrinsic connection between technique and artistic expression through creating piano performance scenarios and collaborative interactions (Song Lin, 2025; Fu, 2020). For example, Song Lin (2025) designed a flipped classroom integration model based on the essentials of constructivism: “tiered pre-study - interactive discussion - situational application.” Autonomous learning theory focuses on the student's central role; the pre-class autonomous learning component of the flipped classroom is a concrete manifestation of this theory, allowing students to autonomously learn digital resources according to their own foundation and pace (Zhang Zhen, 2024; Zhu et al., 2025). Collaborative learning theory posits that learning is a process of knowledge sharing through interpersonal interaction; flipped classroom activities often employ group discussions and collaborative performances to promote student interaction (Zhu et al., 2024a; Musayeva, 2025).

Based on a review of existing literature, the integration of flipped classrooms and piano teaching from the perspective of music education innovation can be defined as follows: Centered on music literacy cultivation, supported by information technology, and student-centered, the integration of basic piano knowledge instruction and skills training is

conducted before class, utilizing digital resources; classroom time focuses on higher-order cognitive and practical activities; and post-class learning is reinforced through personalized feedback, forming a closed-loop integrated system of “pre-class self-study – in-class precise refinement – post-class practical extension” (Wang, 2022; Zhu et al., 2024b; Song, 2025). Its core characteristics include a reversed teaching process, enhanced technological depth, prominent student participation, integration of art and technology, and a comprehensive evaluation system, fully aligning with the “literacy-oriented” and “personalized cultivation” concepts of music education innovation.

3.2. Implementation strategies, technical support, and application effects of integrating the flipped classroom with piano teaching

3.2.1. Implementation Strategy

Research shows that the integration strategy of flipped classroom and piano teaching can be divided into three stages: pre-class, in-class, and post-class. In the pre-class self-study stage, core strategies include resource integration and personalized delivery, personalized task design, and a pre-class feedback mechanism: teachers carefully select or create targeted digital resources (including piano basic skill teaching videos, sheet music interpretation micro-lessons, and performance demonstration videos shot by professional teachers) and deliver tiered resources for students of different levels: basic level (focus on sheet music recognition and finger training resources), intermediate level (focus on performance technique and musical expression resources), advanced level (focus on improvisation and collaborative performance resources). Meanwhile, tiered practice tasks are designed matching the resources, and the learning progress and technical difficulties of students are monitored through online tests (e.g., finger movement assessment, sheet music quick recognition) and learning logs on learning management systems such as Moodle... (Fu, 2020; Song, 2025; Zhu et al., 2025). In the in-class interactive stage, core strategies include problem-oriented discussions, collaborative practice activities, personalized guidance, and cross-instrument collaborative learning: exploratory questions are designed to address common technical difficulties, activities such as group performances and piece adaptations are organized, teachers provide targeted feedback, and cross-instrument collaborative learning programs are designed for students from different majors (Song, 2025; Zhang, 2024; Musayeva, 2025). In the post-class consolidation stage, the core strategies include extended practice tasks, multi-dimensional feedback evaluation, and reflection and summary mechanisms: assigning practical tasks with clear operability such as simulated concert video recording, improvisational accompaniment practice for vocal music, and cross-instrument collaborative performance; providing

comprehensive feedback in combination with multi-subject evaluation (teacher evaluation, peer evaluation, self-evaluation) and technical data analysis of smart piano software, and encouraging students to summarize their gains through learning logs and other forms (Song Lin, 2025; Zhang Zhen, 2024; Zhu et al., 2024b).

3.2.2. Technical Support

Technology is the core support for the deep integration of flipped classrooms and piano teaching. Existing literature mainly covers the following forms of technological support: MOOC platform integration, utilizing platforms such as iCourse and Coursera to provide systematic piano course resources (Wang, 2022; Zhu et al., 2024b); micro-lesson and video technology, where teachers create short teaching videos and use tools such as Camtasia Studio to achieve technical visualization (Fu, 2020; Zhang, 2024); smart pianos and music software, including digital audio workstations and sheet music software, to assist in skills training and creative composition (Li, 2024; Song, 2025); virtual reality and remote collaboration technology, using VR to simulate the performance environment and utilizing platforms such as Zoom to achieve remote collaboration (Zhang, 2024; Musayeva, 2025); and learning management systems, such as Moodle and Chaoxing Learning Platform, to achieve systematic management of the integrated process (Zhu et al., 2025; Zhu et al., 2024b).

3.2.3. Application Effect

Multiple empirical studies have demonstrated the significant effectiveness of integrating the flipped classroom model with piano instruction. Regarding piano skills and artistic literacy, Li (2022) showed that students receiving flipped classroom instruction had significantly higher scores on piano application skills ($SMD=0.82$, $P<0.01$) and employment rates (68.2% vs 45.7%) than the traditional group; Zhu et al. (2024b)'s experiment showed that the "MOOC +flipped classroom" group had a clear advantage in improvisation and collaborative performance ($SMD=0.76$, $P<0.05$) compared with the traditional teaching group; Song Lin (2025)'s case analysis confirmed that the integrated model can improve students' grasp of musical styles and emotional expression (although Li, 2022's work has been retracted, its empirical data remains valuable). In terms of learning ability and attitude, the integrated model effectively cultivates students' self-directed learning ability, collaborative communication skills, and problem-solving abilities, while also enhancing their learning interest and classroom participation (Zhang, 2024; Li, 2024; Musayeva, 2025).

3.3. Existing Challenges and Development Trends in Integrating Flipped Classrooms with Piano Teaching

3.3.1. Existing Challenges

From a technical perspective, some universities lack adequate hardware facilities, students lack stable networks and compatible devices, and the difference in digital literacy between teachers and students affects the effectiveness of resource utilization (Zhu et al., 2024a; Wang, 2022; Musayeva, 2025). From a teaching perspective, teachers face difficulties in transitioning to their new roles, requiring more effort in course design and resource creation; the quality of existing teaching resources varies, making it difficult to meet individual needs; and the teaching evaluation system is incomplete, lacking effective tools for measuring comprehensive abilities (Zhang, 2024; Song, 2025; Zhu et al., 2024b). From a student perspective, some students lack self-learning abilities, making it difficult to complete pre-class preparation tasks, and the flipped classroom approach may increase the learning burden, leading to resistance (Zhu et al., 2024a; Li, 2022; Wang, 2022).

3.3.2. Development Trends

In the context of future music education innovation, the integration of flipped classrooms and piano teaching will focus on the following directions: deep integration of technology and intelligence, exploring the application of emerging technologies such as artificial intelligence and virtual reality, and continuously absorbing the advanced experience of flipped classroom application in other didactics such as physical education and statistical programming to optimize the piano teaching flipped model (Zhang et al., 2024; Musayeva, 2025); personalized innovation of teaching models, developing distinctive flipped classroom models such as cross-instrument collaboration and ideological and political integration (Song, 2025; Li, 2024); long-term tracking of teaching effects, conducting longitudinal research to evaluate the long-term impact of the integrated model on students (Zhu et al., 2024a; Zhu et al., 2025); improved fairness and inclusivity, narrowing the education gap through resource sharing and equipment assistance (Musayeva, 2025; Zhu et al., 2024b); and support for teacher professional development, building a specialized training system to promote the transformation of teachers' roles (Wang, 2022; Zhang et al., 2024).

4. Discussion

4.1. The Core Value of Integrating Flipped Classroom and Piano Teaching for Innovation in Music Education

The integration of the flipped classroom with piano teaching provides a systematic solution for innovation in piano education through process restructuring, technological empowerment, and strategic innovation. Its core value lies in three aspects: First, it enables personalized piano education by addressing the “one-size-fits-all” problem of traditional

teaching through tiered tasks and personalized feedback (Zhang, 2024; Song, 2025). Second, it promotes the deep integration of technology and art, constructing a closed loop of “technology learning-artistic understanding-practical application- reflection and improvement,” thus solving the problem of the disconnect between technology and art (Zhang, 2024; Song, 2025). Third, it promotes equity and resource sharing in piano education by breaking down time, space, and teacher limitations through digital resources, thereby promoting educational equity (Østerlie & Mehus, 2020). This core value is formed on the basis of absorbing the experience of flipped classroom in other disciplines, and at the same time conforms to the unique teaching law of piano education that combines technical operation and artistic expression (Wang, 2022; Zhu et al., 2024b). (Wang, 2022; Zhu et al., 2024b).

4.2. The key role, boundaries, and challenge-solving paths of technology integration

Technology is the core support for the integration of flipped classroom and piano teaching, but effective technological support needs to meet three conditions: it must match the teaching objectives and serve the core needs such as technical training and artistic expression; it must be easy to operate and lower the application threshold; and it must emphasize artistic and humanistic care and not replace the teacher’s personalized guidance and emotional communication (Musayeva, 2025; Song Lin, 2025; Fu, 2020).

To address the challenges encountered during the integration process, and combining literature review perspectives with innovative concepts in music education, the following solutions are proposed: Improve technological infrastructure, increase hardware investment, and provide resource support for students (Zhu et al., 2024a; Zhu et al., 2024b); Strengthen teacher professional development by enhancing teachers’ comprehensive abilities through training (Wang, 2022; Zhang et al., 2024); Optimize the construction of teaching resources, establish a resource-sharing platform, and encourage personalized customization (Wang, 2022; Zhu et al., 2024b); Cultivate students’ self-learning abilities by providing learning guidance and setting up incentive mechanisms (Zhu et al., 2024a; Zhu et al., 2025); Construct a diversified evaluation system by designing multi-dimensional evaluation indicators and multi-subject evaluation methods (Song Lin, 2025; Zhang Zhen, 2024).

4.3. Consistency and Discrepancy in Research

Existing literature shows a high degree of consistency in the application value and core strategies of the integrated learning model, acknowledging its positive role in enhancing students’ self-learning ability, piano skills, and artistic literacy, and emphasizing the importance of technology integration and the student’s central role (Zhang, 2024; Wang, 2022;

Zhu et al., 2024b). The main differences lie in the fact that some literature focuses on technology application and resource construction (Wang, 2022; Li, 2024), while others emphasize the core role of teaching philosophy and artistic inspiration (Song, 2025; Zhu et al., 2025). Regarding evaluation system design, some literature focuses on quantitative evaluation (Zhu et al., 2024b; Zhu et al., 2025), while others place greater emphasis on qualitative evaluation and artistic literacy feedback (Zhang, 2024; Musayeva, 2025). These differences reflect the diversity of integrated learning model applications and provide different directions for exploration in music education innovation.

5. Conclusion

This study, through a systematic review of relevant literature, comprehensively analyzes the theoretical foundation, implementation strategies, application effects, existing challenges, and development trends of integrating the flipped classroom with piano teaching from the perspective of music education innovation. The study finds that the integration of the flipped classroom and piano teaching, as an important practical vehicle for music education innovation, effectively solves the core problems of traditional piano teaching through process restructuring. This integration requires support from three major theories and the integration of diverse technological tools and innovative strategies. Empirical research shows that this integrated model can significantly improve students' comprehensive abilities, but it still faces challenges such as inadequate technological infrastructure, difficulties in teachers' role transformation, and differences in students' self-learning abilities.

In the context of future music education innovation, the integration of the flipped classroom and piano teaching should focus on areas such as technological intelligence, personalized teaching, long-term effect tracking, improved fairness and inclusivity, and support for teacher professional development. Overall, this integration provides an effective path for piano education reform and music education innovation. Its application and optimization will help piano education transform from “technology transmission” to “quality cultivation,” and provide a reference for the application of flipped classroom in other music education disciplines such as vocal music and instrumental music, fostering more well-rounded musical talents who meet the needs of the new era.

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