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Research on the Hybrid Teaching Mode Combining MOOC and Flipped Classroom in Piano Courses in University

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Abstract: The traditional teaching model of piano courses in universities faces challenges such as insufficient teaching resources, limited class hours, and difficulty in providing personalized guidance, which hinder the effective improvement of students' learning outcomes and participation. To address these challenges, this study introduces a blended teaching model that combines massive open online course (MOOC) and flipped classrooms. This model integrates the rich resources and flexibility of MOOC with the interactivity and effectiveness of flipped classrooms, aiming to provide a new approach to piano education. The study compares the differences between the traditional and the blended teaching models in terms of knowledge acquisition, improvement in performance skills, and learning satisfaction, using surveys and data analysis for evaluation. The results indicate that the combination of MOOC and flipped classrooms significantly enhances students' learning outcomes and classroom participation. This study provides a feasible solution for the teaching reform of university piano courses and lays the foundation for improving students' musical literacy and learning experience.

Keywords: MOOC blended teaching; Flipped classroom; Innovative piano teaching

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1. Introduction

With the rapid development of music education in universities, piano courses play a crucial role in enhancing students' musical literacy, technical proficiency, and artistic cultivation. However, the traditional teaching model in university piano courses faces numerous problems, hindering the optimization of teaching effectiveness. First, there is a significant issue with the imbalance of teaching resources. The disparity in resources between different universities and teachers makes it difficult for some students to access high-quality piano teaching content. Additionally, the limited class hours in piano courses prevent students from fully mastering techniques and

consolidating basic knowledge, thereby affecting the depth and breadth of skill development. More critically, traditional classrooms are often teacher-centered and lack interaction, leading to low student engagement, which makes it difficult to ignite students' enthusiasm and autonomy for learning [1].

In this context, MOOC (Massive Open Online Course) and flipped classrooms, as innovative teaching formats, offer new ideas and methods. MOOC, with its vast online resources and flexible learning approach, introduces self-directed learning spaces into piano courses, allowing students to watch and review teaching content anytime and anywhere, effectively addressing the issue of resource imbalance [2]. On the other hand, flipped classrooms emphasize interaction both inside and outside the classroom. This model reverses the traditional teaching approach by requiring students to independently study videos or other learning materials before class, while class time is used for in-depth discussions, problem-solving, and skill practice. This shift from "teaching" to "learning" increases classroom engagement and fosters students' active learning mindset.

Based on this, this study proposes a blended teaching model that combines MOOC and flipped classrooms in university piano courses. The aim is to overcome the challenges in traditional piano teaching through the resource support of MOOC and the interactive guidance of flipped classrooms, thereby improving students' learning outcomes and classroom participation [3]. The significance of this research lies in exploring the feasibility and effectiveness of this new model, offering an innovative teaching paradigm for university piano courses, and promoting the reform and development of university music education. Ultimately, this approach aims to provide students with a more diverse, flexible, and efficient learning experience.

2. Theoretical foundations of combining MOOC and flipped classroom in piano course instruction

2.1. Concept of MOOC and its advantages

Massive Open Online Course is a new teaching model based on the internet that provides systematic course resources on a large scale. In the context of piano courses, the specific application of MOOC is reflected in offering online piano performance tutorials, music theory courses, and professional performance demonstrations [4]. Students can learn video lessons at their own pace, including content on performance techniques, basic music theory, and music appreciation. This model allows learning to extend beyond the classroom, enabling students to review teaching videos before or after class according to their needs and gradually master key piano techniques [5].

The greatest advantage of MOOC lies in its richness and flexibility of resources. Online courses include a vast array of piano textbooks, performance demonstration videos, and expert explanations, greatly expanding students' learning materials. Students can choose learning content based on their own level, progressing from basic to advanced stages. Additionally, the repeatability of these resources allows students to revisit weak areas to reinforce memory and skills. Moreover, the online learning format of MOOC breaks the limitations of time and space, meeting the personalized learning needs of students from different regions and with varying levels, allowing piano learning to no longer be constrained by the school's class schedule or resource availability. As MOOC has developed in recent years, its resources have become increasingly abundant, and more students have become users of MOOC platforms (**Figure 1**).

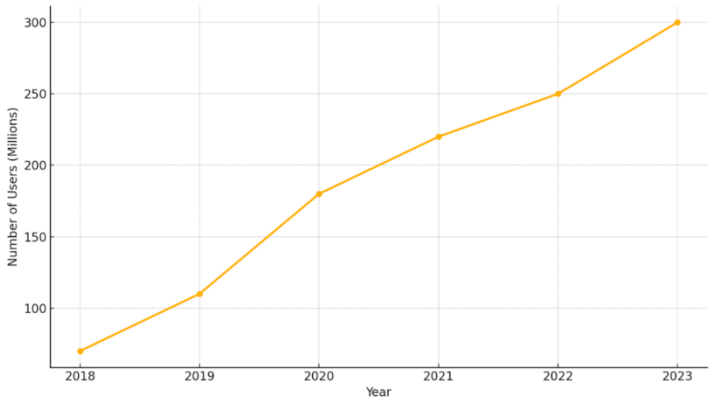

Figure 1. MOOC user growth from 2018 to 2023

2.2. Teaching philosophy of flipped classroom

Flipped classroom is an innovative teaching method that "flips" the traditional teaching process. The core idea is for students to acquire basic knowledge before class through self-study using videos, reading materials, or other resources, while class time is dedicated to teacher-guided activities, focusing on performance practice, discussion of issues, and deepening understanding. In the context of piano courses, students can complete video lessons from MOOC before class to grasp the theoretical foundation and basic techniques of performance. During class, the teacher has students engage in practical performance, offering interactive feedback to help students correct mistakes and improve their skills. This shifts the classroom from a teacher-centered knowledge transmission model to a student-centered model focused on skill practice and interactive discussion, significantly enhancing students' participation and initiative in the classroom.

Flipped classroom emphasizes the connection and interaction between activities inside and outside the classroom. Through in-class discussions and performance practice, students receive timely feedback on their self-study content, reinforcing and consolidating their learning. This model not only increases classroom interactivity but also helps students gain a deeper understanding and application of the knowledge they have learned, fostering self-directed learning skills and leading to more substantial progress in performance skills. Especially in piano courses, where practice is crucial, flipped classrooms provide an environment where students can receive guidance at any time and continually improve.

2.3. Necessity of combining MOOC and flipped classroom

In university piano courses, the combination of MOOC and flipped classroom is of significant necessity and advantage. MOOC can provide a vast amount of resources and self-study space, helping students establish a solid theoretical foundation and initially master performance techniques before class. This form of autonomous learning effectively compensates for the traditional teaching bottlenecks, such as limited class hours and scarce resources [6]. In the flipped classroom, students can further consolidate what they have learned through actual performance and feedback under the guidance of the teacher, organically combining theory with practice. This interactive learning between classroom and self-study helps students develop comprehensively, from mastering foundational theory to improving practical skills.

Through this combination, MOOC provides students with high-quality learning resources, while the flipped classroom ensures effective interaction between students and teachers, allowing students to correct mistakes and enhance expressiveness during class. The integration of MOOC and flipped classroom not only

makes piano teaching more flexible and efficient but also offers an innovative teaching approach for university piano courses.

3. Design of the teaching model combining MOOC and flipped classroom

3.1. Course structure design

To improve the effectiveness of university piano courses and students' learning efficiency, this teaching model divides the piano course content into three main modules: basic theory, technique training, and repertoire appreciation [7]. Each module is supported by MOOC courses, allowing students to engage in self-directed learning through online resources before class. The specific design is as follows:

(1) Basic theory: Students learn basic concepts of music theory and piano-related knowledge on the MOOC platform, including topics such as music theory, intervals, and harmony.

(2) Technique training: A series of graded piano technique practice videos are provided, gradually progressing from basic fingerings to advanced techniques. Students can select learning content based on their skill level and practice repeatedly after class.

(3) Repertoire appreciation: Students engage in repertoire appreciation by analyzing classic piano works, helping them understand the different styles and expressive techniques of various compositions. This module aims to cultivate students' artistic appreciation and expressive abilities.

3.2. Teaching process

In the MOOC and flipped classroom combined teaching model, the teaching process is divided into three stages: pre-class learning, in-class activities, and post-class feedback. The detailed arrangement is as follows:

Pre-class learning: Students engage in self-directed learning by watching instructional videos on the MOOC platform, focusing on understanding piano theory and basic performance techniques. After completing the video lessons, students can reinforce their knowledge through practical exercises and online assignments. The self-learning content during this stage lays the theoretical foundation for the practical activities in class, making class time more focused on technique practice and discussions.

In-class activities: In class, the teacher guides students through performance practice and feedback activities. Students are divided into groups for performance, and the teacher provides targeted guidance, correcting and optimizing details. At the same time, the teacher organizes discussions and sharing sessions among students. This stage emphasizes teacher-student interaction, and through real-time feedback and hands-on practice, students gain a deeper understanding and mastery of piano performance techniques.

Post-class feedback: After class, the teacher evaluates students' learning outcomes through online surveys and quizzes, assessing students' progress in both pre-class and in-class learning, as well as identifying any difficulties encountered. Based on the feedback, the teacher can adjust the teaching plan and resource content to better meet students' needs.

3.3. Evaluation system design

This teaching model uses a multidimensional evaluation system to comprehensively assess students' learning outcomes and participation. The specific evaluation criteria include:

Completion of online courses: The completion of tasks on the MOOC platform is tracked by monitoring video views and assignment submissions, assessing students' engagement in pre-class learning.

Classroom participation: Based on classroom observation records and teacher feedback, the evaluation

measures student performance in in-class activities, including their participation in performance practice, discussions, and interactions.

Final performance assessment: Serving as a summary evaluation of students' learning throughout the semester, the final assessment includes a demonstration of piano techniques and a performance of selected works, assessing students' progress in both technical mastery and expressiveness.

This multidimensional evaluation system allows for a comprehensive reflection of students' learning progress and provides teachers with data for making adjustments to their teaching approach.

3.4. Platforms and tools used

To ensure the smooth implementation of the MOOC and flipped classroom model, this teaching design relies on several online platforms and educational tools:

MOOC platform: As the core platform for online resources, the MOOC platform provides instructional videos, assignments, and in-class quizzes. Videos must be carefully prepared or selected by the teacher to ensure the content's accuracy and applicability.

Data analytics tools: Using online teaching tools such as Rain Classroom, teachers can monitor students' learning progress and test results in real time. The data analysis features of Rain Classroom allow teachers to provide targeted guidance based on students' online learning behaviors and test performances.

Feedback collection tools: Through online surveys and feedback forms, teachers can regularly collect students' learning experiences and feedback, providing valuable information for updating teaching resources and improving classroom design.

The design of this teaching model not only brings flexibility and diversity to university piano courses but also provides personalized learning support for students, thereby improving the quality and effectiveness of piano education.

4. Teaching experiment and effect analysis

4.1. Experimental methods and subjects

This study targets university piano major students as experimental subjects, aiming to explore the application effects of the blended teaching model combining MOOC and flipped classroom in piano courses. To ensure the scientific and objective nature of the comparison, a total of 100 students were randomly and evenly assigned into two groups: the traditional classroom teaching group and the MOOC + flipped classroom blended teaching group. The traditional classroom group adopted the conventional piano teaching model, where teaching and guidance were primarily provided by the instructor in class. In contrast, the blended teaching group utilized the combined MOOC and flipped classroom model, with students engaging in self-directed learning of basic theory and techniques through the MOOC platform before class, while class time was used for skill practice and interactive discussions under the teacher's guidance.

The experimental period was set for one semester (approximately 16 weeks), during which the learning processes of both groups were tracked. At the end of the semester, performance data on students' knowledge mastery, piano skill improvement, and learning satisfaction were collected through final tests and surveys. By comparing the learning outcomes of the two groups, this study aims to verify the effectiveness of the blended teaching model in enhancing student learning outcomes, classroom participation, and satisfaction.

4.2. Data collection and analysis

For data collection, this study used a combination of quantitative assessments and survey methods:

(1) Knowledge mastery: Students' progress in knowledge and performance skills was assessed through final exam scores and skill tests, including both theoretical and performance evaluations.

(2) Classroom participation: A structured questionnaire was designed to investigate students' satisfaction with the course content, teaching model, and classroom interaction.

(3) Learning satisfaction: Feedback was gathered from daily class records and student feedback forms to gain a comprehensive understanding of students' learning experiences and participation in different teaching models.

4.3. Result analysis

The data analysis results showed that compared to the traditional classroom teaching group, the MOOC + flipped classroom blended teaching group outperformed the former across all performance metrics:

Knowledge mastery: The average scores of the blended teaching group in both theoretical and performance tests were significantly higher than those of the traditional classroom group, indicating that the MOOC + flipped classroom model is more effective in solidifying students' foundational knowledge and improving their piano skills.

Classroom participation: Classroom observations and survey results indicated that the blended teaching group had a higher frequency of classroom interaction. Students in this group were more willing to ask questions and participate in discussions, demonstrating greater participation.

Learning satisfaction: In the survey, students in the blended teaching group expressed higher satisfaction with the course model, the richness and flexibility of learning resources, and the interactive teaching approach in class. Feedback showed that they preferred this flexible learning format and the interactive nature of the classroom teaching.

The experimental results suggest that the blended teaching model combining MOOC and flipped classroom has significant advantages in enhancing students' learning outcomes, classroom participation, and learning satisfaction. This model effectively addresses the issues of limited class hours and resource scarcity in traditional piano courses through the richness and flexibility of MOOC resources, while the interactivity of the flipped classroom fosters students' self-directed learning abilities and strengthens practical exercises and feedback during class.

However, to further optimize this teaching model, the study also highlights some areas for improvement. For instance, MOOC course content should be updated regularly based on student feedback to ensure its timeliness and applicability. In the flipped classroom, more group interaction activities could be designed to enhance collaborative learning among students and improve classroom interactivity and engagement. Additionally, more data analysis techniques could be used in the integration of MOOC and flipped classroom to track students' learning progress and challenges in real time, allowing teachers to make targeted adjustments to their teaching.

Overall, the MOOC + flipped classroom blended teaching model offers a novel and effective teaching approach for university piano courses, providing valuable insights for the reform of piano course teaching and the improvement of students' learning experiences (**Figure 2**).

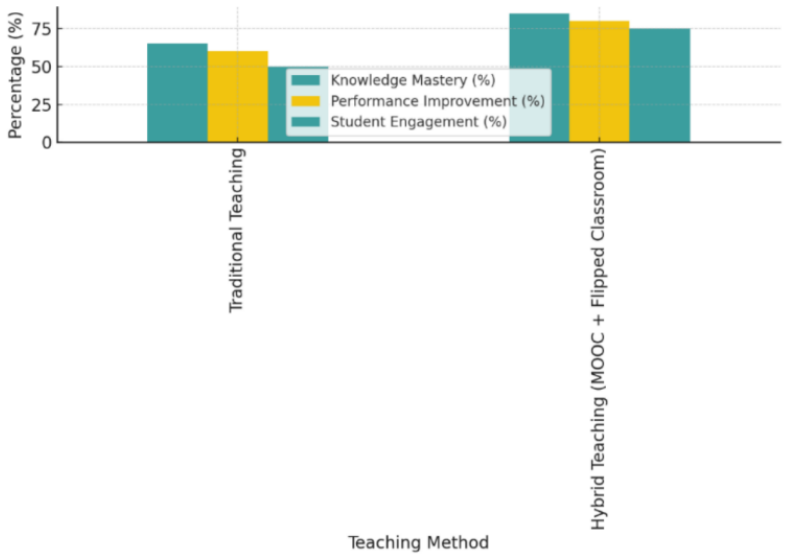

Figure 2. Comparison of traditional vs blended teaching effectiveness in piano courses

5. Analysis of advantages and limitations

5.1. Advantages

Flexibility and efficiency of self-directed learning: The teaching model combining MOOC and flipped classroom provides students with a flexible space for self-directed learning. Students can access piano course videos and resources on the MOOC platform at any time, based on their own learning pace and needs. This allows them to repeat the videos and arrange their learning schedule independently. This flexible learning approach helps students solidify their foundational knowledge of piano, effectively addressing the limitation of class hours in traditional classrooms. Students can complete pre-class preparations and come to class with questions, which allows them to focus more on improving and applying their techniques during class.

High student engagement and classroom participation: The flipped classroom model emphasizes interaction both inside and outside the classroom, shifting the knowledge delivery that typically happens in class to pre-class learning. Class time is then dedicated to performance practice and teacher guidance. Through in-class discussions and exercises, students' sense of involvement is significantly enhanced, and their interest in learning is increased. Meanwhile, teachers can offer personalized guidance during class based on students' progress, helping them correct mistakes and improve their piano techniques. This interactivity not only helps students consolidate their pre-class learning but also deepens their understanding and mastery of piano performance, fostering the development of comprehensive skills.

Rich piano tutorials and course resources: The MOOC platform offers a vast array of piano tutorials suited for different levels of students, ranging from basic playing techniques to advanced musical expression. For example, (1) Basic tutorials: These cover how to play basic scales, chords, and simple pieces. Students can watch and practice at their own pace, overcoming the time constraints that limit practice in traditional classrooms. (2) Advanced technique training: For students with foundational knowledge, MOOC provides lessons on advanced techniques such as fast playing, master-level skills, and piano expression and emotional communication. These courses are often taught by experienced pianists or music professors, ensuring the quality of the teaching. (3) Personalized learning: The flexibility of MOOC allows each student to learn at their own pace, repeating lessons or segments as needed to gradually master complex skills.

Offering music theory courses for better understanding: Piano learning is not limited to performance techniques but also involves an understanding of music theory. MOOC platforms typically offer specialized music theory courses to help students understand the following: (1) Harmony: Students learn how to construct chords, understand their function, and apply these chords in music pieces. (2) Music history and repertoire analysis: By analyzing classic piano works, students not only understand the historical context behind the music but also learn how to apply theory to practical performance through expert demonstrations. (3) Music structure and rhythm: MOOC courses help students master complex music structure analysis, such as form analysis and rhythmic changes, enhancing their music comprehension. These music theory courses provide comprehensive musical literacy training, helping students apply techniques in piano performance while also improving their expressiveness through theoretical support.

Overcoming resource shortages in traditional teaching: Traditional piano teaching often faces resource constraints, particularly in regions with imbalanced educational resources. The introduction of MOOC alleviates many of these issues: (1) Breaking geographic barriers: MOOC overcomes geographical limitations, allowing students to access top-tier piano education content regardless of their location. Students in underserved regions can still benefit from high-quality piano teaching. (2) Addressing faculty shortages: In some schools or regions, there may be a shortage of qualified piano teachers. MOOC platforms provide a wealth of teaching videos and materials, ensuring that students can access quality education even without local experts. (3) Flexibility of time and space: Traditional piano courses are often limited by fixed class times and locations, making it difficult for students to secure enough practice time. MOOC allows students to learn at their own pace and schedule, enabling them to watch and review course content at any time and place, improving the continuity and autonomy of their learning. (4) Diverse learning approaches: Through MOOC, students can choose courses that fit their own pace and interests, helping to improve their engagement and participation in learning, which in turn enhances learning outcomes.

5.2. Limitations

Dependence on technology and unequal resources: The MOOC + flipped classroom model is heavily reliant on technological resources and online platforms. However, there are disparities in technological facilities and resources across different universities. Some institutions may lack the necessary hardware or internet infrastructure, which can be particularly challenging for schools with limited funding or resources. For instance, the creation of high-quality MOOC content, such as videos and educational materials, requires substantial investment. Additionally, some students may face technical barriers to online learning due to limited access to reliable internet or devices, which can affect the equity and accessibility of the learning experience.

Resistance to teaching model transformation: As an innovative teaching method, the implementation of MOOC + flipped classroom requires systematic training for teachers to adapt to new teaching approaches. Traditional teaching habits and assessment systems need to be adjusted accordingly. Some teachers may face challenges in course design, technology application, and classroom management, leading to initial resistance during the transition to this new model. Teachers need to invest additional time and effort in learning how to use the platform, design MOOC content, and conduct interactive activities. This transformation is not instantaneous, and sustained training and support may be required for teachers to gradually adapt.

Individual differences in teaching effectiveness: The self-directed learning component of MOOC places higher demands on students' self-discipline and initiative. However, some students may lack sufficient motivation or effective learning strategies during the self-study phase, leading to uneven learning outcomes.

Students with weaker self-learning abilities may fall behind in terms of progress and content mastery, which can affect their ability to engage in classroom interactions and follow up on lessons. Therefore, teachers need to develop personalized plans that cater to the needs of different students or provide additional incentives and guidance to help students better adapt to the self-paced learning process.

6. Conclusion

This study explored the application of the blended teaching model combining MOOC and flipped classroom in university piano courses. The results show that this teaching model is highly feasible and significantly improves learning outcomes in piano education. Firstly, by providing flexible and rich online resources through MOOC, students can independently arrange their learning pace and self-study basic theory and performance techniques, effectively addressing the issues of limited resources and class hours in traditional teaching methods. Secondly, the interactive design of the flipped classroom greatly enhances student participation and interest in class, allowing for personalized feedback and guidance, which further consolidates the results of self-directed learning. This model not only expands the teaching methods of piano courses but also significantly improves students' learning experiences, offering a more effective and innovative path for university piano education.

In future research, the applicability of this teaching model can be extended to other instrumental courses or different types of art education programs, such as violin, vocal music, or art appreciation. Further exploration of its suitability and effectiveness in these diverse courses would be valuable. Additionally, it is recommended to conduct studies with larger sample sizes to obtain more comprehensive data, thereby validating the effectiveness of this model across a broader student population and providing richer theoretical and practical guidance for the reform of higher education in the arts.

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Disclosure statement

The authors declare no conflict of interest.

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