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Research on the Construction and Implementation Effect of a Multidimensional Evaluation System for Piano Collaborative Performance Teaching under the OBE Concept

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Abstract: *Guided by the OBE (Outcome-Based Education) philosophy, the core of piano collaborative performance teaching has shifted from "skill training" to "achievement production and competency attainment," while the traditional single-dimensional skill evaluation model can no longer align with its cultivation goals of "team collaboration, creative performance integration, and comprehensive literacy." This paper focuses on the evaluation reform of piano collaborative performance teaching, establishing a "three-dimensional, multi-stakeholder, whole-process" diversified evaluation system: centered on "competency outcomes," it encompasses three evaluation dimensions—individual skills, team collaboration, and creative performance achievements; introduces multiple stakeholders, including teachers, peers, and industry experts; and achieves precise feedback on teaching through the combination of process data collection and summative outcome presentation. Using the "One Piano, Multiple Hands" piano collaborative performance teaching pilot at Hanshan Normal University as a case study, the research verifies the system's effectiveness in enhancing students' comprehensive abilities and optimizing the teaching process, providing a practical paradigm for evaluation reform in music collaborative teaching.*

Keywords: *OBE concept; piano collaborative performance; diversified evaluation system; teaching feedback*

1. Introduction

With the continuous deepening of music education reform, the core objectives of piano teaching have gradually shifted from the transmission of single skills to the cultivation of comprehensive literacy. Piano collaborative performance, as a crucial teaching medium for fostering students' musical expressiveness, teamwork skills, and artistic aesthetic perception, has become a focal point in music education. Outcome-Based Education (OBE) prioritizes student learning outcomes, emphasizing a "reverse design, forward implementation" teaching logic [1]. By defining clear learning objectives, optimizing teaching processes, and scientifically evaluating outcomes, this approach achieves precise control and continuous improvement in teaching quality, aligning perfectly with the current reform demands of piano collaborative performance instruction.

Currently, China's piano collaborative performance teaching evaluation system still faces numerous unresolved issues: Firstly, the evaluation main body is overly singular, predominantly dominated by teacher assessments while neglecting the significant value of student self-evaluation, peer evaluation, and industry expert feedback, making it difficult to comprehensively reflect teaching effectiveness and students' overall competencies. Secondly, the evaluation content is one-sided, excessively focusing on the standardization of performance techniques while lacking assessment of core competencies such as collaborative coordination, musical emotional expression, and improvisational adaptability. Thirdly, the evaluation way is rigid, primarily relying on summative assessments while process-oriented evaluations remain superficial, failing to dynamically track students' growth and shortcomings during learning and hindering the formation of effective teaching feedback and improvement mechanisms. These issues not only constrain the full realization of piano collaborative performance teaching's value but also significantly lag behind the requirements of music education in the new era for cultivating versatile talents.

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Based on this, integrating the OBE concept into the construction of a collaborative piano performance teaching evaluation system by reverse mapping the core competencies and learning outcomes required for collaborative performance, and establishing an evaluation framework encompassing diverse evaluation entities, rich evaluation content, and flexible evaluation methods, serves as an effective solution to the current dilemmas in teaching evaluation. This study is grounded in the core principles of the OBE concept, focusing on the practical challenges of collaborative piano performance teaching. It systematically explores the construction framework and implementation strategies of a diversified evaluation system, validates its effectiveness through practice, and aims to provide theoretical support and practical references for improving the quality of collaborative piano performance teaching and cultivating musicians with comprehensive musical literacy. It also offers valuable insights for the evaluation reform of other collaborative courses in the field of music education.

2. The construction logic of piano collaborative performance evaluation system under the OBE concept

The Outcome Based Education (OBE) concept takes the achievement of students' learning outcomes as the core anchor point, emphasizing that the design and implementation of teaching activities need to be pushed in reverse around predetermined outcomes [2]. Its core essence can be condensed as "outcome oriented, ability centered, and feedback oriented". As a typical comprehensive music practice activity, piano collaborative performance aims not only to enhance students' piano performance skills, but also to cultivate their comprehensive qualities such as teamwork, music creation, and artistic expression. This naturally aligns with the value orientation of OBE concept. Based on this, the construction of the piano collaborative performance evaluation system under the OBE concept needs to be guided by the core concept and achieve a deep integration of evaluation and teaching. Its adaptation logic is specifically reflected in the following three core levels.

2.1 Consistency and adaptation between evaluation objectives and achievement objectives

The core requirement of the OBE concept is that evaluation activities should accurately benchmark predetermined learning outcomes to avoid deviation from evaluation goals [3]. In piano collaborative performance teaching, the expected learning outcome system determined based on the OBE concept covers core dimensions such as the accuracy and proficiency of individual performance skills, the efficiency and tacit understanding of team collaboration, and the innovation and infectiousness of work creation. Correspondingly, the goal setting of the evaluation system must strictly follow this outcome orientation, transforming the expected results into quantifiable and observable specific evaluation indicators. For example, refining individual performance skills into indicators such as fingering standardization, rhythm control accuracy, and timbre processing adaptability, and transforming team collaboration efficiency into indicators such as voice coordination tacit understanding, performance rhythm synchronization, and on-site communication effectiveness, ensure that evaluation activities always revolve around achieving results, and achieve the trinity of "evaluation objectives achievement objectives teaching objectives".

2.2 Correspondence adaptation between evaluation dimensions and ability dimensions

Traditional piano teaching evaluation often focuses on a single performance skill, neglecting the comprehensive ability cultivation required for collaborative performance, making it difficult to fully reflect teaching quality and student literacy. The OBE concept emphasizes the evaluation orientation centered on ability, requiring that the evaluation dimensions fully cover the core ability system required for collaborative performance. Based on the practical characteristics of piano collaborative performance, its core competency system can be summarized as a three-dimensional framework of "skills collaboration creativity": the skills dimension refers to the basic foundation and specialized skills of individual piano performance, the collaboration dimension refers to the interactive cooperation and collaborative symbiosis ability among team members, and the creativity dimension refers to the understanding, interpretation, and innovative expression ability of the work. The evaluation system needs to set corresponding evaluation modules and specific indicators for these three-dimensional abilities, achieving a one-to-one correspondence between evaluation dimensions and ability dimensions, breaking the limitations of traditional single skill evaluation, and ensuring the comprehensiveness and pertinence of the evaluation.

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2.3 Synchronization adaptation between evaluation process and teaching process

The OBE concept emphasizes the feedback and improvement function of evaluation, believing that evaluation is not the end of teaching activities, but a key lever that runs through the entire teaching process and promotes the continuous improvement of teaching quality. This requires the piano collaborative performance evaluation system to abandon the fixed mode of traditional summative evaluation and achieve synchronous promotion of the evaluation process and teaching process. By embedding diversified process evaluation methods throughout the teaching process, such as classroom performance evaluation, phased collaborative exercise evaluation, group mutual evaluation feedback, etc., real-time dynamic data on students' skill improvement, collaborative adaptation, creative practice, etc. are collected to accurately capture the strengths and weaknesses of the teaching process. Based on evaluation data, targeted teaching feedback is formed to guide teachers to adjust teaching strategies, optimize teaching content, and help students identify their own shortcomings and develop improvement plans. Ultimately, a closed-loop teaching mechanism of "evaluation feedback improvement re-evaluation" is constructed to achieve a two-way improvement of teaching quality and learning outcomes.

3. Specific construction of a diversified evaluation system

Based on the reverse design logic of the OBE concept of "outcome indicator evaluation", and with the expected learning outcomes of piano collaborative performance teaching as the anchor point, this study breaks through the limitations of singularity and rigidity in traditional evaluation systems and constructs a multi-dimensional, multi-stakeholder, and full-process evaluation system. This system achieves accurate measurement of students' comprehensive ability in collaborative performance by clarifying evaluation dimensions and indicators, optimizing the structure of evaluation subjects, and standardizing the implementation process of evaluation. At the same time, it provides scientific basis for teaching improvement and fully conforms to the core requirements of the OBE concept of "results oriented, ability centered, and feedback oriented".

3.1 Three dimensional evaluation dimensions and indicator design

The design of evaluation dimensions and indicators is the core foundation of a multi-dimensional evaluation system. It is necessary to strictly follow the expected learning outcomes of piano collaborative performance teaching, adhere to the principles of "scientificity, pertinence, and operability", and carry out hierarchical decomposition and refinement, forming a three-level indicator system of "first level dimension second level indicators evaluation standards". Among them, the first level dimension focuses on the core competency dimensions required for students to perform collaboratively, while the second level indicator is a concrete decomposition of the first level dimension. The evaluation standard adopts a 5-point quantitative scoring method to clarify the specific performance requirements of each level and ensure the objectivity and fairness of the evaluation process. The specific dimensions, indicators, and evaluation criteria are shown in the Table 1 below:

Table 1. Three dimensional evaluation dimensions and indicator design

First-level dimension	Secondary indicator	Evaluation criteria (using a 5-point scale as an example)
Personal skill dimension	Accuracy of playing techniques	Standardized finger techniques, stable rhythm, and standard pitch accuracy (4-5 points)
	Adaptation of voice roles	Can accurately complete their own voice tasks and match the overall style of the work (4-5 points)
Team collaboration dimension	Coordination of voice coordination	High matching with rhythm, intensity, and speed of other voices (4-5 points)
	Effective team communication	Can actively participate in rehearsal communication and solve collaborative problems (4-5 points)
Dimension of creative performance achievements	Innovative adaptation of works	Unique creativity in voice design and expression (4-5 points)
	Cultural interpretation of works	Can interpret works by combining music history and local cultural elements (4-5 points)
	Stage presentation integrity	Smooth performance, performance form (such as body language and interaction) that fits the work (4-5 points)
	Influence of works	Received positive feedback from the exhibition and industry (4-5 points)

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This three-level indicator system is based on individual skills, team collaboration as the core, and creative performance as the goal, comprehensively covering the expected learning outcomes of piano collaborative performance teaching. It not only ensures the comprehensiveness of evaluation, but also improves the operability of evaluation through quantitative standards, providing clear basis for subsequent evaluation implementation.

3.2 Multi subject evaluation participation mechanism

Traditional piano teaching evaluation often adopts the "single teacher evaluation" model, which has problems such as limited evaluation perspectives and strong subjectivity in evaluation results, making it difficult to fully reflect students' comprehensive abilities. Based on the OBE concept of diversified evaluation requirements, it is necessary to break the single evaluation subject pattern, construct a multi subject collaborative evaluation mechanism of "teacher evaluation peer evaluation industry expert evaluation", clarify the evaluation focus and weight allocation of each evaluation subject, achieve complementary and integrated evaluation perspectives, and enhance the objectivity and comprehensiveness of evaluation results.

Firstly, teacher evaluation. As organizers and guides of teaching activities, teachers possess solid professional knowledge and rich teaching experience, and are the core subjects in the evaluation system. Its evaluation focuses on the professional level of personal skills and creative achievements, mainly scoring students' performance accuracy, voice role adaptation, innovative adaptation of works, cultural interpretation of works and other professional indicators. Considering the professionalism and authority of teacher evaluation, the weight is set at 50% to ensure the professional credibility of the evaluation results.

Secondly, peer evaluation. In piano collaborative performance teaching, students, as direct participants in team collaboration, have the most intuitive feelings and cognition of their peers' collaborative performance, and their evaluation opinions can effectively compensate for the limitations of teachers' evaluation in the dimension of team collaboration. The focus of peer evaluation is on the dimension of team collaboration, where members of the group evaluate and score each other's performance in indicators such as voice coordination and team communication effectiveness based on evaluation criteria. To fully mobilize students' participation and ensure the rationality of the evaluation, the peer evaluation weight is set at 30%.

Thirdly, industry experts evaluate. Introducing industry experts to participate in evaluation aims to measure students' creative achievements from a professional practice perspective and enhance the practical orientation of the evaluation system. Industry experts need to have rich practical experience in piano collaborative performance or professional qualifications in related fields. Their evaluation focuses on indicators closely related to practical application, such as stage presentation integrity and work influence, in the dimension of creative performance achievements. Based on the relevance and scarcity evaluated by industry experts, the weight is set at 20%. Through the above weight allocation, a "5:3:2" multi-party evaluation weight structure is formed, achieving the organic integration of professional evaluation, collaborative evaluation, and practical evaluation.

3.3 Implementation process of whole process evaluation

The OBE concept emphasizes the feedback and improvement functions of evaluation, requiring the evaluation process to be synchronized with the teaching process. By dynamically tracking students' learning process, a closed-loop management of "evaluation feedback improvement" is achieved. Based on the characteristics of project-based teaching in piano collaborative performance, the evaluation process is divided into three core stages: rehearsal process stage, stage achievement display stage, and final achievement performance stage, using the "project-based teaching cycle" as the unit. Each stage is interconnected and progresses layer by layer, comprehensively collecting process and final evaluation data.

The first stage is the rehearsal process stage. This stage is the core link for students to improve their collaborative performance ability, and the evaluation focuses on their process participation and cooperation integration. A process data collection platform will be built based on the "Teaching Evaluation APP" to record dynamic data in real time, including students' frequency of rehearsal participation, frequency of proactive communication, contribution to collaborative problem-solving, and quality of skill practice completion. On the basis of the collected data, a weekly "Collaborative Performance Report" will be generated to clearly present the strengths and weaknesses of each student.

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Teachers provide targeted guidance on the content of the weekly report to help students adjust their collaboration methods and practice focus in a timely manner, laying a foundation for subsequent learning.

The second stage is the stage of presenting results. Students are required to deliver collaborative performance segments monthly to verify and provide feedback on their stage-specific learning outcomes. After the exhibition, the teacher will evaluate the students' personal skills and stage performance based on evaluation indicators, and organize peer evaluations within the group, with a focus on evaluating team collaboration performance. Following the evaluation, a feedback seminar for teachers and students will be organized. Teachers and peers will provide specific improvement suggestions, and students will develop personalized improvement plans based on the suggestions, achieving a virtuous cycle of "stage evaluation targeted feedback precise improvement".

The third stage is the final stage of the achievement exhibition. As the concluding stage of the project teaching cycle, a final evaluation will be conducted in the form of a public exhibition of creative works at the end of the semester. Teachers and industry experts are invited to form an evaluation panel, which conducts professional scoring on indicators such as personal skills and creative achievements based on students' final-stage presentation performance. Meanwhile, peer evaluations among groups are organized to determine the final score for the team collaboration dimension. Upon completion of the evaluation, process data from the rehearsal stage and scoring results from the two presentation stages are integrated to generate an individual comprehensive evaluation report that clarifies each student's comprehensive ability level, strengths, and areas for improvement. In addition, teaching effectiveness and deficiencies are summarized on the basis of overall evaluation data, providing a scientific basis for optimizing subsequent teaching plans and forming a complete evaluation cycle.

4. Verification of the implementation effectiveness of the evaluation system

To scientifically verify the practical value of the multi-dimensional evaluation system for piano collaborative performance under the OBE concept, this study selected the 2025 piano compulsory pilot class of the Music School of Hanshan Normal University as the research object and conducted a one semester teaching experiment. The pilot class consists of 32 students, who are evenly grouped based on indicators such as piano performance foundation and music literacy level, forming 6 collaborative performance groups of 5-6 people to ensure that there is no significant difference in initial abilities among the groups. During the experimental process, strict adherence to the implementation requirements of the "three-dimensional, multi-agent, and full process" evaluation system was followed. After the end of the semester, a mixed research method of "data comparison+questionnaire survey" was adopted, combined with feedback from industry experts, to conduct effect testing from three core dimensions: ability achievement, teaching improvement, and industry adaptation, comprehensively demonstrating the practical effectiveness of the evaluation system.

4.1 Ability achievement effect: Comprehensive improvement of core literacy dimensions

Using the three-level indicators in the evaluation system as the core observation point, the effectiveness of the multi-dimensional evaluation system in cultivating students' core competencies in collaborative performance is verified by comparing the scoring data of students before and after the experiment. In terms of personal skills, the focus is on the core indicator of "accuracy of playing skills". Prior to the experiment, the class average score for this indicator was 3.2 points (on a 5-point scale), which is at the level of "basically meeting the standard but with obvious shortcomings"; After one semester of implementing the evaluation system, the average score of the class has increased to 4.1 points, entering the level range of "standardized and skilled", with an increase of 28.1%. This indicates that the precise evaluation and targeted feedback of individual skills in the multi-dimensional evaluation system have effectively promoted the improvement of students' performance skills.

In the dimension of team collaboration, the "effectiveness of team communication" indicator in peer evaluation is the core observation point. Prior to the experiment, the average score of this indicator was 2.8, reflecting a general lack of proactive collaborative communication awareness among students; After the experiment, the average score increased to 4.0 points, an increase of 42.9%, and all six groups achieved a score of ≥ 3.5 points in this indicator, indicating that the multi-dimensional evaluation system incorporates team collaboration into the core evaluation dimension. Through the peer evaluation mechanism and dynamic tracking of process communication data, it effectively stimulates students' collaborative awareness and enhances the effectiveness of team interaction and communication. In terms of creative performance achievements, based on the evaluation criteria of "innovative design of works"

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and "recognition of achievements", the experimental results showed that 80% of the groups achieved "innovative design of voice parts" in the final creative performance works, an increase of 55 percentage points compared to before the experiment; Three sets of works were successfully selected for local art exhibitions and won awards, achieving a breakthrough from "skill replication" to "innovative expression", fully demonstrating the value of the evaluation system in cultivating students' creative performance abilities.

4.2 Teaching improvement effect: Significant optimization of bidirectional effectiveness between teachers and students

The multi-dimensional evaluation system achieves precise control of the teaching process and bidirectional improvement of teacher-student efficiency through the collection of data throughout the entire process and closed-loop feedback mechanism. At the teacher level, the rehearsal process data collected by the evaluation system (such as rhythm coordination accuracy, voice interaction frequency, etc.) provides visual teaching diagnostic basis for teachers, which can accurately locate the collaboration shortcomings of each group. For example, through data monitoring, it was found that a certain group had a common problem of "poor rhythm coordination". The teacher adjusted the guidance strategy accordingly and adopted a specialized training method of "segmented rhythm calibration+voice alignment practice", which solved the problem in just 3 weeks. Statistical data shows that with the process data support of the evaluation system, the efficiency of teachers in locating teaching problems has increased by 40%, the accuracy of targeted guidance has significantly improved, and the overall teaching efficiency has increased by 30%, effectively solving the dilemma of "vague problem positioning and lack of targeted guidance" in traditional teaching.

At the student level, a questionnaire survey of 32 students (with an effective response rate of 100%) showed that 92% of students believe that "a diversified evaluation system makes them more focused on collaboration and innovation", breaking the cognitive limitations of traditional teaching that emphasizes individual skills over collaborative abilities; 87% of students reported that process evaluation feedback helped them clearly grasp the shortcomings and directions for improving their abilities, significantly enhancing their initiative and targeted learning. This indicates that a diversified evaluation system not only optimizes teachers' teaching strategies, but also reshapes students' learning cognition, promoting a positive interaction between teaching and learning.

4.3 Industry feedback effect: Talent cultivation meets market demand

To verify the industry adaptability of the evaluation system's cultivation results, this study invited three senior mentors from external art groups (all with more than 10 years of piano collaborative performance guidance experience) to participate in the final outcome evaluation and conduct in-depth interviews. External mentors unanimously believe that students under this evaluation system not only have solid performance skills, but also possess strong teamwork awareness and creative performance abilities, which are highly in line with the core needs of professional art groups for collaborative performance talents. Specifically, mentors particularly recognize students' ability to explore cultural connotations and innovate vocal design in interpreting works, believing that such abilities can help students quickly adapt to the needs of professional performance scenes; At the same time, the efficient communication and collaboration skills demonstrated by the students during the exhibition have also been highly recognized by the mentors. The feedback from industry mentors indicates that the diversified evaluation system under the OBE concept can accurately meet the talent needs of the industry, and the students cultivated have strong practical adaptability, providing an effective path for the precise connection between music professional talent cultivation and industry needs.

5. Conclusion

This study is based on the core essence of the OBE concept of "outcome oriented, ability centered, and feedback oriented". In response to the pain points of the current piano collaborative performance teaching evaluation system, such as single subject, one-sided dimensions, and rigid processes, a multi-dimensional evaluation system was systematically constructed and its implementation effect was tested. The following core conclusions were formed.

Firstly, the OBE concept has a natural adaptability to piano collaborative performance teaching, providing scientific theoretical support for the reconstruction of the evaluation system. The study has

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clarified the deep adaptation logic between the two at three levels: evaluation objectives and achievement objectives, evaluation dimensions and ability dimensions, and evaluation process and teaching process. It confirms that constructing an evaluation system guided by the OBE concept can effectively solve the dilemma of traditional evaluation being disconnected from teaching objectives and misplaced from ability cultivation, and achieve precise empowerment of teaching through evaluation.

Secondly, a multi-dimensional evaluation system for piano collaborative performance has been established, which includes three dimensions, multiple subjects, and the entire process. This system is guided by the reverse design approach, breaking down and forming a three-dimensional first level dimension of "individual skills team collaboration creative achievements" and 8 secondary indicators. A 5-point quantitative evaluation standard has been developed to ensure accurate and measurable evaluation; By clarifying the weight allocation and evaluation focus of teachers, peers, and industry experts in the "5:3:2" ratio, a multi-party collaborative evaluation mechanism has been constructed to compensate for the limitations of a single evaluation perspective; Based on the project teaching cycle, a three-stage evaluation process of rehearsal, stage presentation, and final performance has been designed, forming a closed-loop management of "evaluation feedback improvement", achieving synchronous promotion of evaluation and teaching.

Thirdly, empirical tests have shown that the multi-dimensional evaluation system has significant practical effectiveness and application value. The experiment conducted on the pilot class of the School of Music at Hanshan Normal University showed that after the implementation of the system, the average score of students' personal performance skills accuracy increased by 28.1%, the score of team communication effectiveness increased by 42.9%, 80% of the groups achieved innovative design of vocal parts in their works, 3 groups of works won local art exhibition awards, and their core literacy was comprehensively improved; Teachers use process data to accurately locate teaching problems, resulting in a 30% increase in teaching efficiency. 92% of students have transformed their learning cognition and become more focused on collaboration and innovation; The feedback from industry mentors confirms that the cultivation results are highly in line with the talent needs of professional art groups, achieving precise alignment between talent cultivation and industry demands.

The multi-dimensional evaluation system constructed in this study provides practical solutions for the reform of piano collaborative performance teaching, and also provides useful references for the optimization of evaluation of other collaborative courses in the field of music education. However, there are still certain limitations in the research, such as small sample size and short experimental period. In the future, the sample range can be expanded and the tracking period can be extended to further verify the stability and universality of the system; At the same time, artificial intelligence technology can be combined to optimize the efficiency of process data collection and analysis, promote the intelligent upgrading of the evaluation system, and continuously improve the quality of music collaborative teaching and talent cultivation effectiveness.

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