




# The Impact of Symphony Orchestras in STEM Universities on Higher Education Aesthetic Education: A Case Study of Hohai University

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**Abstract.** This study conducts an in-depth analysis of the pivotal role and profound impact that symphony orchestras in STEM universities play in the realm of higher education aesthetic education, with a detailed case study of the Hohai University Symphony Orchestra. This paper clearly demonstrates the significant effects of symphony orchestras in enhancing students' artistic literacy, teamwork, and cross-cultural communication skills. The findings reveal that participation in orchestra activities not only elevates students' artistic taste but also promotes a deeper sense of team spirit and social skills, fostering mutual understanding and respect among students from diverse cultural backgrounds. Additionally, the article constructs a set of evaluation criteria and offers targeted strategic recommendations based on these standards.

**Keywords:** Aesthetic Education, Symphony Orchestra, Aesthetics, Artistic Literacy, Evaluation Indicator System, Higher Education Transformation.

## 1 Introduction

Since the implementation of the college expansion policy in 1999, higher education in China has undergone a transformation from elitism to popularization, marking the third educational transformation. This paper establishes a set of indicators for evaluating the performance of symphony orchestras in STEM institutions. Based on these criteria, a series of targeted strategic recommendations are proposed, with the anticipation that through system support, resource integration, and interdisciplinary collaboration<sup>[4]</sup>. This research provides a solid theoretical foundation and practical guide for deepening aesthetic education practices in STEM schools and promoting the development of comprehensive quality education, while also highlighting the broad application prospects and potential for in-depth exploration of symphony orchestras in the field of higher education aesthetic education.

## **2 The Role and Strategies of Symphony Orchestras in Aesthetic Education**

In 2019, the Ministry of Education issued "Opinions on Strengthening Aesthetic Education in Higher Education Institutions in the New Era," aimed at significantly enhancing students' aesthetic and humanistic literacy through reforms in aesthetic education by 2022, with a plan to develop a higher education aesthetic education system with Chinese characteristics by 2035. Symphony orchestras have become key carriers for enhancing campus culture and quality education for students<sup>[1]</sup>.

The "Notice on Fully Implementing the Aesthetic Education Saturation Action in Schools" issued by the Ministry of Education in 2023 emphasized the importance of the cooperation between symphony orchestras and engineering colleges, highlighting the integration of science and art to cultivate innovative talents with artistic accomplishments<sup>[3]</sup>. These series of policies have gradually demonstrated the importance placed on aesthetic education and provided a clear direction for the development of symphony orchestras and aesthetic education practices, promoting the comprehensive development of higher education aesthetic education<sup>[2]</sup>.

## **3 Case Study of the Hohai University Symphony Orchestra**

### **3.1 The Evolution of the Symphony Orchestra**

#### **3.1.1 Background and Development Process**

The Hohai University String Orchestra was established in 2012 and was officially recognized as a provincial-level art troupe in 2016, becoming the first provincial-level art troupe at Hohai University<sup>[5]</sup>. In 2021, the orchestra integrated and included wind instruments, gradually evolving into the current form of a symphony orchestra. This development not only showcases the orchestra's robust musical strength but also emphasizes its key role in promoting cultural and artistic dissemination and serving student development.

#### **3.1.2 Artistic Achievements of the String Orchestra**

As the first provincial-level art troupe of the school, the Hohai University String Orchestra gathered many talented students, whose outstanding performances in various art exhibitions verified the team's high level and standard. The orchestra won the special prize with Bach's Concerto in A minor for Violin at the 4th Jiangsu College Students Art Exhibition, the first prize in Group A with Concerto in G major at the 5th Jiangsu College Students Art Exhibition, and the first prize in Jiangsu with Concerto for Two Violins in D minor at the 6th Jiangsu College Students Art Exhibition. The orchestra was invited by the China 21st Century Friendship Progress Association to participate in the "2016 Hong Kong-Nanjing Midsummer Music Exchange" and the "Hong Kong Southern District Celebration of the 67th Anniversary of the Founding of the People's Republic of China Variety Show" alongside the Hong Kong Southern District Orchestra, the first prize in Jiangsu in the Hummingbird Music Award en-

semble category at the 2020 China Youth Music Competition, and the national first prize.

### 3.1.3 Social Contributions and Development of the Wind Orchestra

The Hohai University Student Wind Orchestra, adhering to the principle of "art serving the people," has provided elegant artistic enjoyment to the masses in Nanjing, Changzhou, Huai'an, Lishui and Shiquan County through various means such as grassroots outreach and cultural performances. Especially during the celebration of the 100th anniversary of the founding of the Communist Party of China, the wind orchestra actively responded to the Ministry of Education's call for "Music and Party History" series of activities. This performance not only greatly enriched the cultural lives of the community residents but also demonstrated the orchestra's spirited attitude and profound social impact through wide coverage by authoritative media such as People's Daily, Xinhua Daily.

### 3.1.4 Integration and Breakthroughs of the Symphony Orchestra

Since early 2021, the Hohai University Symphony Orchestra has been formally established through the integration of the wind and string orchestras. At the 2023 Jiangsu College Students Art Exhibition, the Hohai University Symphony Orchestra performed Verdi's "Nabucco Overture" with a unified lineup, winning a second prize, a testament to the orchestra's comprehensive improvement in artistic strength and social recognition. Additionally, small ensembles of the orchestra members performed Spohr's "Nonet in F Major" (violin, viola, cello, flute, clarinet, oboe, horn, bassoon) and a piano solo "Prelude by Zhang Shuai No. 3", winning first and third prizes at the provincial level, respectively. they again won national and provincial first prizes.

## 3.2 Assessment of the Symphony Orchestra's Influence

### 3.2.1 Impact on Students

① Comprehensive Enhancement of Personal Skills Participation in the symphony orchestra has provided members with a multidimensional platform for music education, achieving a comprehensive enhancement in musical performance, theoretical knowledge, and appreciation abilities. Through involvement in diverse musical performance forms, from sight-reading to chamber music, members have not only significantly improved their playing techniques but also deepened their understanding of music theory and appreciated classics from periods ranging from Baroque to Romanticism<sup>[6]</sup>.

② Social Skills and Teamwork The collective rehearsals and performances of the orchestra serve not just as a stage for showcasing musical talent but also as an important platform for fostering communication and collaboration among students, significantly strengthening team spirit<sup>[8]</sup>. Especially when facing challenges in artistic creation, the close cooperation and understanding among members are essential, nurturing indispensable communication and collaboration skills for students' future careers and social lives.

③ Cultural Literacy and Aesthetic Perspective During the orchestra's rehearsals, participants underwent a brilliant cultural baptism and aesthetic experience. They meticulously interpreted a series of Western classical pieces, such as Antonio Vivaldi's melodious "The Four Seasons," Georges Bizet's passionate "Carmen Overture," and Giuseppe Verdi's majestic "Nabucco Overture." At the same time, they were also exposed to Chinese traditional symphonic masterpieces, such as the stirring "My Motherland," the fervent "Passionate Years," the tender "First Symphony Overture," the solemn "Praise the Red Flag," and the heroic "The Red Detachment of Women Suite," among other outstanding domestic and international symphonic works.

### 3.2.2 Impact on the University

Globally renowned universities showcase their high regard for arts education and appreciation for cultural diversity by establishing their own symphony orchestras, becoming significant symbols of their international influence and academic excellence. For instance, the Yale Symphony Orchestra is acclaimed for its collaborations with globally renowned musicians; the Stanford Symphony Orchestra demonstrates its exceptional music education outcomes under the guidance of top-tier music directors.

By organizing high-quality concerts and participating in international artistic exchanges, the Hohai University Symphony Orchestra has not only elevated the university's cultural brand and international reputation but also deepened its influence on the global stage of education and culture<sup>[7]</sup>.

### 3.2.3 Impact on Society

The Hohai University Symphony Orchestra, through a series of meticulously planned and deeply engaged activities, has significantly enhanced its social impact. On November 28, 2023, the orchestra enthusiastically participated in the "Dual Hundred Co-construction Exhibition and Evaluation Activity and the Third Joint Meeting of School and Local Government" in Jiangning District. Following this, in March 2024, to celebrate the "114th Anniversary of International Women's Day," the orchestra performed brilliantly in Jintan District, using music to convey messages of gender equality and women's empowerment, promoting and advocating for positive social energy.

## 4 Strategies and Recommendations for Enhancing the Quality of Aesthetic Education in Higher Education Through Symphony Orchestras

### 4.1 Elevating Faculty Quality and Recruiting Professional Talent

To advance the development of university symphony orchestras, focus initially on building faculty strength, including actively recruiting renowned musicians and conductors from both domestic and international spheres, and hosting music lectures and

master classes<sup>[6]</sup>. It's recommended to increase financial investment to offer competitive salaries and superior working environments to attract top professional talent<sup>[4]</sup>.

#### **4.2 Developing a Comprehensive Instrumental Music Teaching System**

Advocate for the systematization and scientification of instrumental music teaching, ensuring comprehensive coverage from basic techniques to advanced performance training. Develop and refine online courses and workshops, aggregating digital media resources to enrich teaching content. Unique courses such as ethnic music performance, modern music composition, and interdisciplinary music projects are advocated to foster students' innovative thinking and practical skills.

#### **4.3 Optimizing Recruitment Strategies to Ensure Quality Student Intake**

Implement highly targeted recruitment plans that include optimizing policies for students with artistic talents, holding national high school music competitions to attract students with exceptional skills. Strengthen cooperation with high schools, conduct music education promotional activities, and identify and cultivate potential talents early. For students within the university, organizing orchestra experience days and open days can inspire their participation.

#### **4.4 Increasing Investment in Teaching Resources and Equipment**

Significantly increase investment in the purchase, maintenance, and renewal of musical instruments to ensure every member has access to suitable instruments. Additionally, establish and upgrade facilities such as concert halls and rehearsal rooms, equipped with high-quality sound and recording equipment, to provide students with a professional level of performance and training environment.

#### **4.5 Strengthening Fundamental Training and Scientific Rehearsals**

Systematic and standardized fundamental training is the cornerstone of enhancing the overall strength of the orchestra, covering all technical aspects of practice. Plan rehearsal times reasonably to ensure students' academics and artistic cultivation complement each other, efficiently using each rehearsal to enhance the orchestra's cohesion and performance level.

### **5 Construction of Indicator System and Evaluation Method**

In designing the indicator system for the study on the role and impact of symphony orchestras in higher education aesthetic education at STEM universities, this research is based on the main evaluation indicators of domestic and international symphony orchestras and the general indicators of non-profit organization performance evaluation. Table 1 (providing a detailed display of the main evaluation indicators and their asso-

ciated weights) is used to assess the role and impact of symphony orchestras in STEM universities. The evaluation process includes determining indicator weights, calculating indicator values, and synthesizing evaluation scores. The measurement of observable indicators employed both quantitative and qualitative methods, including direct data calculation, weighted assignment, and questionnaire-based evaluation, to ensure that each indicator's evaluation has a quantitative basis while fully considering the unique cultural and educational attributes of the orchestra. Additionally, to ensure the consistency and comparability of the evaluation results, all data were standardized before analysis.

**Table 1.** Indicator System

Primary Indicator	Secondary Indicator	Observation Indicator	Indicator Category	Weight
Leadership and Planning	Development Goals and Strategies	Clarity of objectives, effectiveness of strategy implementation	Process	10%
Participant Development	Student Participation	Student activity level within the orchestra	Outcome	15%
Participant Development	Teacher Participation and Guidance	Professionalism of teachers, number of staff (full-time/part-time) and participation	Process	15%
Resources and Input	Financial Support and Resource Allocation	Special funding allocation, complete instrumentation and various rehearsal rooms	Process	10%
Performance and Creation	Number and Quality of Performances	Annual performance count, original works ratio	Outcome	15%
Education and Social Impact	Music Education and Public Welfare	Participation in internal and external music activities	Outcome	20%
Campus Culture and Atmosphere	Contribution to Campus Culture	Impact of orchestra activities on campus atmosphere	Outcome	10%
Social Investment and Value	Efficiency of Educational Resource Utilization	Effective utilization of educational inputs and creation or impact of social value	Outcome	5%

The indicator system constructed in this study is not only based on a rigorous theoretical framework and empirical research but also fully considers the characteristics and needs of symphony orchestras at STEM universities.

## **6 Strategies and Recommendations for the Future**

### **6.1 Development Strategies**

Integrating Art Education with Professional Training Deeply through interdisciplinary courses that bridge acoustics and music technology with traditional STEM education.

### **6.2 Expanding Paths for Social Participation**

Following the Yale Symphony Orchestra's 'Music and Community' project, enhancing student engagement in community service through music, which fosters social responsibility and civic awareness.

### **6.3 Establishing Platforms for International Exchange**

Aligning with the Berklee College of Music's initiatives, developing international exchange programs that encourage global music collaborations and cultural exchange.

### **6.4 Challenge: Limited Resources and Difficulty in Integrating Disciplines**

Response Strategy: Seek external financial support, such as grants from government cultural development funds and partnerships with corporations, to facilitate interdisciplinary course development.

### **6.5 Innovative Approach: Building Digital Art Education Platforms**

Develop online learning platforms similar to MOOCs for music theory and instrument playing, utilizing virtual reality to simulate live concert experiences and enhance learning flexibility.

### **6.6 Innovative Approach: School-enterprise Joint Model**

Cooperate with local cultural enterprises and media organizations to organize large music festivals and concerts, providing practical internship opportunities for students while invigorating local cultural.

## 7 Conclusions

This study confirms the critical role of symphony orchestras in aesthetic education within STEM universities, illustrating through systematic evaluation and case analysis how orchestra activities enhance students' artistic and cross-cultural competencies. The research highlights the importance of integrating arts in STEM environments and offers specific strategies. Given global educational challenges, future research is recommended to explore the impact of symphony orchestras in various educational contexts to foster innovation in educational models.

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