

Research on the Application and Effectiveness of Public Arts Education in STEM Universities

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Abstract. This study aims to delve deeply into the reform and practice of public arts education in universities. It employs a two-fold research approach, comprising a literature review to analyze the theoretical foundations and latest practices in art education both domestically and internationally, and an empirical research method. Using Heilongjiang Institute of Technology as a case study, it delves into the issues and current state of public arts education in engineering colleges. The combination of these two research methods provides robust support for the improvement and development of public arts education in higher education institutions.

1. Introduction

In today's society, higher education plays a critical role as a platform for nurturing future leaders and innovators. However, traditional STEM-focused universities often emphasize science and engineering while overlooking the importance of arts education [1, 2]. This research aims to explore the current state of public arts education in engineering universities, analyze the perspectives of both students and teachers, and examine the impact of arts education on students' overall development. Through a mixed research methodology, including quantitative and qualitative studies, we seek to comprehensively address this issue and provide insights and recommendations for improving and optimizing public arts education in engineering universities.

2. Literature review

2.1 The importance of public arts education

Art education is considered an indispensable component of comprehensive university education, promoting students' personal growth and enhancing their overall qualities [3]. Comprehensive education emphasizes the cultivation of students' critical thinking, creativity, communication skills, and cultural sensitivity, and art education is one of the effective ways to develop these qualities. Research [4] has shown that participating in art activities can enhance students' creative thinking and problem-solving abilities, which are crucial for STEM students in solving complex problems and innovating.

Furthermore, public arts education can also promote interdisciplinary collaboration and multicultural understanding [5]. Through participation in art projects,

students can engage in multiple fields, collaborate with peers from diverse backgrounds, broaden their perspectives, and develop respect for different cultures and values [6].

2.2 Challenges of art education in STEM Universities

In STEM universities, art education faces some unique challenges. On one hand, institutions often prioritize the cultivation of science and technology fields, potentially overlooking the importance of arts and humanities [7-9]. This leads to some students showing little interest in art education or perceiving it as irrelevant to their majors. On the other hand, schools need to address limited resources and faculty to provide high-quality art education [10].

In summary, the application and effects of public arts education in STEM universities are important and complex issues. Through an in-depth study of the case of Heilongjiang Institute of Technology, we can better understand how to improve public arts education in STEM universities to enhance students' overall qualities and mental health.

3. Current state of art education at Heilongjiang Institute of Technology

The College of Arts and Design began as the Department of Humanities in 2001 and has since evolved to encompass a staff of 50 faculty members, offering six undergraduate majors including Environmental Design. Currently, there are 737 undergraduate students enrolled in the college.

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The college has established distinctive teaching and practical platforms, extending and enhancing teaching effectiveness through a studio-based model. It excels in the cultivation of applied talents. Since the establishment of studios in 2010, there are currently 16 studios, including studios for lacquer painting, oil painting, environmental art, interior decoration, animation, digital media, post-production for film and television, furniture design, product design, visual communication design, handicraft design, ice and snow art, and sculpture. These studios engage in educational activities that integrate production, learning, research, and application, supporting the development of the college's distinctive specialties. The college has also focused on improving the professional competence and teaching level of faculty members, fostering dual-structured educators, and providing a platform for teachers and students to engage in art and design, nurturing students' technological innovation capabilities. Additionally, the studios regularly host exhibitions of oil paintings, lacquer paintings, architectural models, hand-drawn works, interior and exterior designs, and other activities, creating a rich artistic and cultural atmosphere on campus.

The curriculum development has progressed gradually from foundational to specialized courses, establishing three major course clusters: Graphic Composition, Color Composition, and 3D Composition. Foundational courses in design, such as Design Sketching, Design Color, and Professional Sketching, have been established. The college offers a diverse range of elective art courses, including Design Aesthetics, Calligraphy, Sculpture, Comics, Advertising Appreciation, Film and Television Appreciation, Paper Sculpture Art, Seal Engraving, Traditional Chinese Painting, and Oil Painting, among others.

4. Empirical investigation

To gain a comprehensive understanding of the issues and current state of public arts education in engineering colleges, we employed an empirical research approach. By designing appropriate survey questionnaires and conducting individual interviews, we encompassed a diverse range of participants, including students, teachers, and educational administrators. This approach facilitated the collection of primary data, allowing us to grasp real-life issues and challenges. It provided us with targeted data to better comprehend the current development status and trends of public arts education in Chinese higher education institutions.

4.1 Data collection

In this study, we employed a quantitative survey approach to collect data from 300 students across different grades and majors, as well as 20 teachers, through an online questionnaire. The questionnaire encompassed various aspects of public arts education, including willingness to participate, course satisfaction, activity satisfaction, benefits of courses, and benefits of

activities. Students provided responses based on their viewpoints and experiences. The data collection process consisted of the following steps:

- Questionnaire Design: We designed two structured questionnaire comprising several sections, each covering different aspects of inquiry, one of which employed a 5-point Likert scale for assessing student opinions, ranging from 1 to 5, representing degrees from "strongly disagree" to "strongly agree."

- Questionnaire Pilot Testing: To ensure the clarity and effectiveness of the questionnaire, a small subset of participants assessed the questionnaire and provided feedback for appropriate modifications and revisions before the formal survey.

- Data Compilation: Collected data were recorded in numerical form and underwent initial organization and cleansing to eliminate any incomplete or invalid responses.

4.2 Data analysis methods:

We will use descriptive statistical methods to calculate average scores, standard deviations, and frequency distributions for various questions to provide an overall overview of participant viewpoints.

- Correlation analysis: Correlation analysis will be employed to explore relationships between different variables. For instance, we may analyze the association between willingness to participate and course satisfaction or the correlation between course benefits and activity benefits.

- Regression analysis [11]: Regression analysis will enable us to investigate causal relationships between variables. For example, we can analyze the impact of willingness to participate, course satisfaction, and activity satisfaction on course benefits and activity benefits.

- Factor analysis [12, 13]: Through factor analysis, we can explore underlying common factors, such as which questions may reflect participants' overall perception of public arts education.

These analysis methods will assist us in gaining a deeper understanding of student perspectives and experiences in public arts education, supporting our research questions and hypotheses.

4.3 Anticipated data analysis results:

While we cannot determine the final data analysis results in advance, based on the data collected, we expect to identify patterns in students' attitudes and opinions towards public arts education. For example, we may explore which factors are associated with students' willingness to participate and which factors influence their course and activity satisfaction. Additionally, we anticipate uncovering common themes and factors in students' perceptions of public arts education, which will contribute to a better understanding of issues and trends in public arts education in engineering colleges.

5. Results and analysis

5.1 Student attitudes towards public arts education

The survey results for students are shown in Table 1.

We can see that the participants' average score for their willingness to engage in public arts education is 2.96 (on a total scale of 5). This suggests that among students at the engineering university, there is a certain proportion of students who express their willingness to actively participate in public arts education. However, there is also a portion of students who approach this with caution or are unwilling to participate.

In terms of course satisfaction, participants scored an average of 3.36 (on a total scale of 5). This suggests that the majority of participants are satisfied with the public arts courses they have attended. This may be attributed to the content of the courses, the quality of the instructors, or the teaching methods, which have received recognition from students.

Regarding activity satisfaction, participants scored an average of 3.43 (on a total scale of 5). This indicates relatively high levels of satisfaction among students regarding public arts activities. This may reflect the diversity and appeal of the activities and the enjoyment and fulfillment that students experience when participating in them.

Concerning course benefits, participants scored an average of 3.06 (on a total scale of 5). This suggests that students generally believe that participating in public arts courses positively impacts their overall qualities and academic development. This may include benefits such as enhanced innovation skills, increased understanding of the arts, and reduced academic stress.

Finally, in terms of activity benefits, participants scored an average of 2.83 (on a total scale of 5). This indicates that students perceive lower benefits from public arts activities. Further research may be required to understand the reasons behind students perceiving lower benefits from activities and how public arts activities can be improved to provide more value.

Table 1. Students survey result.

Score	Parti willingness	Course sat	Activity sat	Course benefits	Activity benefits
1	0.32	0.14	0.11	0.18	0.22
2	0.09	0.1	0.18	0.22	0.19
3	0.14	0.20	0.15	0.19	0.26
4	0.21	0.28	0.29	0.18	0.20
5	0.24	0.26	0.27	0.23	0.13
Avg	2.96	3.36	3.43	3.06	2.83

5.2 Teacher perspectives and recommendations

The survey results for teachers are shown in Table 2.

The average score for teachers' evaluation of student engagement is 2.55 (on a scale of 1 to 5), indicating that most teachers hold a moderate level of evaluation regarding student engagement. This may reflect room for improvement in students' interest and enthusiasm in

public arts education. It's worth noting that some teachers evaluate student engagement as higher (lower scores), while others evaluate it as lower (higher scores), possibly influenced by factors such as course content, teaching methods, and individual student differences.

Teachers' average satisfaction score with the courses is 3.75, indicating relatively high satisfaction. This suggests that teachers have a favourable evaluation of the public arts courses they teach. Higher course satisfaction may be related to course design, content richness, and teaching methods employed by the instructors. This may also imply that the school has achieved a certain level of success in its course offerings.

Regarding activity satisfaction, teachers' average evaluation score is 3.4, indicating relatively high satisfaction with arts education activities. This may reflect the school's significant progress in conducting activities related to arts education. Teachers' satisfaction with these activities may encourage students to participate more actively in arts education activities.

Finally, teachers' average satisfaction score with policies is 2.55, showing relatively low satisfaction. This may suggest that teachers have some dissatisfaction or concerns regarding the school's arts education policies. Improving policy satisfaction may require more policy improvements, transparency, and collaboration with teachers.

Table 2. Teachers survey result.

Score	Evaluation of student engagement	Course sat	Activity sat	Policy sat
1	0.30	0	0.10	0.25
2	0.25	0.15	0.20	0.25
3	0.20	0.20	0.15	0.25
4	0.10	0.40	0.30	0.20
5	0.15	0.25	0.25	0.05
Avg	2.55	3.75	3.4	2.55

5.3 Recommendations and policy suggestions

Based on the research findings, we offer several recommendations and policy suggestions to enhance public arts education in engineering colleges. Firstly, we recommend schools to increase arts education resources, including offering more courses and providing teacher training. Secondly, we suggest introducing diverse arts education content to cater to the varying needs of students. Additionally, at the policy level, there can be increased support for arts education, including providing schools with additional funding and policy support.

5.4 Conclusion

The results of this study emphasize the importance of public arts education in engineering colleges and reveal the positive attitudes of students, as well as the perspectives and recommendations of teachers. Arts

education plays a significant role in enhancing students' overall quality. Based on the research findings, we have provided recommendations to assist engineering colleges in advancing public arts education, elevating students' overall quality, and nurturing innovation and aesthetic awareness.

These research findings will contribute to a better understanding of the value of public arts education for engineering colleges and education policymakers, providing guidance for future educational reforms and policy-making.

6. Conclusion and discussion

6.1 Significance of research findings

This study aimed to explore the practical situation of public arts education in engineering colleges and its impact on students' overall quality and innovative spirit. The research findings highlight the significant value of public arts education in engineering colleges. Students exhibit a positive attitude towards arts education, teachers emphasize its contribution to enhancing students' overall quality, and data analysis further confirms the correlation between arts education and overall quality.

6.2 Factors influencing student engagement

In the discussion, it is important to delve into the factors that influence student participation in public arts education. The study found variations in student engagement, which may be influenced by the allocation of educational resources, the attractiveness of course content, and student interests. In-depth analysis of these factors' impact on student engagement can aid in the formulation of more effective educational strategies.

6.3 The importance of teacher training and support

Teachers play a pivotal role in public arts education. Their level of training and support can directly affect educational quality. In the discussion, further exploration of how to enhance teachers' arts education proficiency and provide them with more support and resources to fulfill their educational responsibilities can be considered.

6.4 Limitations of the study and future research directions

It is crucial to candidly discuss the limitations of the research, including sample limitations, challenges in the data collection process, and potential biases. In the discussion, future research directions can be proposed, such as broader multi-institutional studies, comparative research across different types of engineering colleges, and investigations into the impact of educational policies. These future research directions can further expand our

understanding of public arts education in engineering colleges.

6.5 Conclusion

In this section, we can once again emphasize the importance of this study, summarize the main findings, including students' positive attitudes towards arts education, teacher perspectives and recommendations, and the impact of arts education on overall quality. Finally, we can underscore the need for engineering colleges to prioritize and support public arts education to cultivate more well-rounded students, enhancing their overall quality and innovative spirit.

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