

Construction of Aesthetic Education System from the Perspective of Aesthetic Modernity Based on Digital Twin Technology

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Abstract: *There have been a lot of achievements in the research and practice of aesthetic education courses in colleges and universities, but there are still some negligence, especially the research on aesthetic education courses ignores the current situation of the implementation of aesthetic education in primary and secondary schools, which can easily lead to the separation of aesthetic education in colleges and universities from the foundation of students' physical and mental development and actual needs. The purpose of this paper is to discuss what is the comprehensive aesthetic education curriculum aiming at achieving the goal of aesthetic education, what construction principles should be followed in setting up the comprehensive aesthetic education curriculum, and the specific construction system of the curriculum. The article proposes to design the course content of aesthetic education, take the theory of knowledge value, advanced theory of knowledge and the level of aesthetic physical and mental experience as the screening criteria, and take the basic knowledge of aesthetics and art, professional and cross-border aesthetic laws as the main content. It forms a pyramid-like curriculum structure, the tower base is for the compensation of basic aesthetic education courses, the tower body is for the development of higher education aesthetic education courses, and the spire is for the development of aesthetic life. The experimental results show that the main type of art training college students receive is school education, followed by off-campus remedial classes and self-study. Among them, the proportion of self-study is 31.6%. The main purpose of college students' art training is to enrich their extra-curricular life and improve their aesthetic ability. 8.1% of college students received artistic training due to parental or higher education requirements.*

Keywords: *Digital Twin Technology, Aesthetic Perspective, Aesthetic Education System, Curriculum Design*

1. Introduction

Higher education is one of the most critical stages of AE. Compared with basic education, higher education pays more attention to professional education and physical education than AE. But AE plays an irreplaceable role in talent training, scientific research and cultural construction in colleges. In order to develop creative potential and encourage double-first-class building in Chinese institutions, it is currently important to focus more on the function of AE, enhance students' humanistic and aesthetic qualities, and foster lofty sentiments and plateau sensations.

Art education is a beneficial cause and a pursuit of a better life. It is neither a speculative education of beauty nor an intellectual education of art. Rather, it highlights its practicality, which means that it breaks both the existing AE's focus on art education knowledge and abilities and the AE's lack of integration with life. Establishing a systematic CAEC offers useful methodological direction for the practice of school AE from a research viewpoint, beginning with the idea of AE.

The innovations of this paper: (1) Starting from the essential needs of AE and the current situation of school AE, this paper discusses the significance and feasibility of building a CAEC, and provides a theoretical foundation for its construction. (2) This paper suggests a logical framework for building CAEC, based on the practicality and permeability of AE. It makes clear how the CAEC is positioned inside the school curriculum and how the curriculum's internal aesthetic capacity is developing.

2. Related Work

YULDASHEVA is committed to art and aesthetics and considers their relationship in personal education. Furthermore, the relative independence of art in social life depended on the existence of inheritance laws. In art, knowledge and ideology are intertwined and interrelated, and ideology is balanced in different historical stages and different aspects of art [1]. Min research aimed to strengthen the educational system and academic foundation of the field by investigating how and what are the characteristics of forms in graphic design planes as technology evolves. The research method is from the point of view of typography, discussing how to extract and display one-dimensional, two-dimensional, three-dimensional and four-dimensional and synaesthetic expressions of form in a two-dimensional graphic design plane according to technological development and technological development. The study discussed the term graphic design/symbol from the perspective of "reconstruction of symbols" and restricts the discussion to the plane on which the form lies and its perspective [2]. Contemporary challenges point to the need to change the scope of design concepts in higher education curricula, as the most dramatic shifts in society relate to education. Some have questioned the possible contribution aesthetics can make to the educational process in the field of design, and the Costa H aimed to reflect on the relationship between aesthetics, design and education to encourage discussion and bring about contributions that can support aesthetics in education in advanced courses in design. To carry out this research, he used bibliographic review as a method. The results show that it is necessary to expand the meaning of aesthetics and discuss in depth the relevant role of AE in higher education design courses [3]. Nyczka S examined architecture as a source of comprehensive education for middle school students in general, particularly AE. The building's creative qualities provide a lot of potential for training and educational activities, which is why it has an educational influence. He defined principles for the use of architectural studies in AE, on which effective educational techniques can be developed [4]. Dudka I analyzed the formation of future geography teachers' ability to evaluate landscape aesthetics. Its study looks at how important it is to train future geography instructors to evaluate landscapes aesthetically. This is verified as a prerequisite for encouraging the next generation to engage with society's cultural legacy [5]. Muzyka O's goal was to investigate the issues surrounding modern art education and further examine potential paths for its advancement. Using art as a teaching tool is the main method for addressing this issue [6]. One key component of Industry 4.0 technology is digital twin (DT) technology. Curriculum updates are crucial in engineering education. The Liljaniemi A study's primary goal was to develop a curricular idea to investigate the benefits and limitations of DT technology in engineering education. The study supports previous conclusions on the digitization of engineering education. Applying DT strategies correctly can boost motivation and enhance learning [7].

3. The Construction Method of Aesthetic Education System

3.1 Digital Twin Technology

Data twinning digitally replicates physical objects, simulates the behavior of objects in real-world environments, simulates virtual products, production processes, and even the entire factory in order to understand asset status and changes respond to business and improve added value [8-9]. Data twinning technology requires many processes and many basic supporting technologies to realize the interaction between physical entities and digital entities. It has also gone through many stages of development.

3.2 Digital Twin Related Algorithms

Denote the new coordinate set Q_p^i of the transformed point cloud as $\{(x_i, y_i, z_i) | 1 \leq i \leq n\}$, and calculate the distance of all ideal features $f(x, y, z) = 0$ [10-11]. For the transformed discrete points $L(x_i, y_i, z_i)$, find the point Q_p^i that is closest to a certain point on the ideal feature. The distance between Q_p^i and that point is the distance from that point to the ideal feature.

$$\min F = (x - x_i)^2 + (y - y_i)^2 + (z - z_i)^2 \text{ s. t. } f(x, y, z) = 0 \quad (1)$$

Determine the positional relationship between the discrete point Q_p^i and the ideal feature. If the discrete points represent ideal features, then record the distance between them and the ideal features as a negative value, that is:

$$D = -\sqrt{F_{\min}} = -\sqrt{(x - x_i)^2 + (y - y_i)^2 + (z - z_i)^2}, z_i < z \quad (2)$$

The measured error δ of the surface is the difference between the maximum and minimum distances between discrete points and continuous features, and it is compared with the design tolerance T to evaluate whether it meets the standard [12].

$$\begin{cases} \delta = d_{max} - d_{min} \leq T \\ \delta = d_{max} - d_{min} > T \end{cases} \quad (3)$$

According to the hierarchical model of real feature information, the actual measured discrete point cloud data of the stretched surface line features are obtained, and the least squares method is used to perform polynomial fitting on the measured points, thereby reconstructing the continuous curve function closest to the actual surface shape [13]. The discrete point cloud set obtained through surface line feature scanning is denoted as $\{Q(x_i, z_i)\}$, where $i=1, 2, \dots, n$. The fitting degree is evaluated by the two-norm of the fitted continuous function $f(x)$ and the differences between all the discrete points.

4. Investigation on the Basic Aesthetic Quality and Course Demand of College Students

This shows that college students in the new era have a strong aesthetic awareness, and the very few students with vague aesthetic awareness cannot be ignored. At the same time, the aesthetic awareness of college students of different genders, origins and educational levels is compared, and the results are shown in Table 1.

Table 1 Comparison of college students' aesthetic awareness

	dimension	N	mean M	standard deviation SD	t	Sig.
gender	male	381	2.4	0.941	7.01**	0
	Female	671	2	0.884		
students	rural	428	2.1	0.986	-1.57	0.118
	City	624	2.2	0.881		
Education	Undergraduate	797	2.2	0.956	6.06**	0
	Postgraduate	255	1.8	0.767		

The average scores of college students of all genders, origins, and grades are generally less than 2.5, as Table 1 illustrates, further demonstrating the significant impact of attractiveness on college students' purchasing decisions. However, there are also notable distinctions in how college students of various genders and educational levels view beauty. Males score higher on average than females in the gender dimension, whereas female college students focus more on aesthetic considerations when making purchases. Undergraduates score higher on average than postgraduates in terms of educational background, while postgraduates' attention to aesthetics is more evident when they shop.

In China, relevant school art classes, like music and art, are required by national curriculum standards at the basic education level. In order to give their kids art instruction, some parents also pay for social education training services. Figures 1 and 2 depict the training types, duration, forms, and goals of the college students with creative abilities.

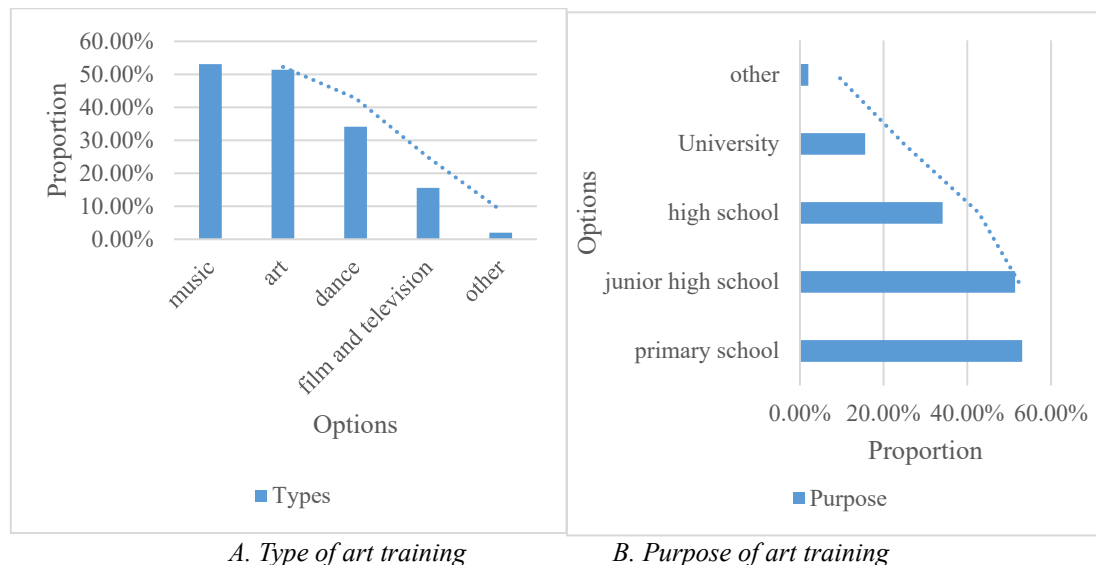


Figure 1 Training type and purpose

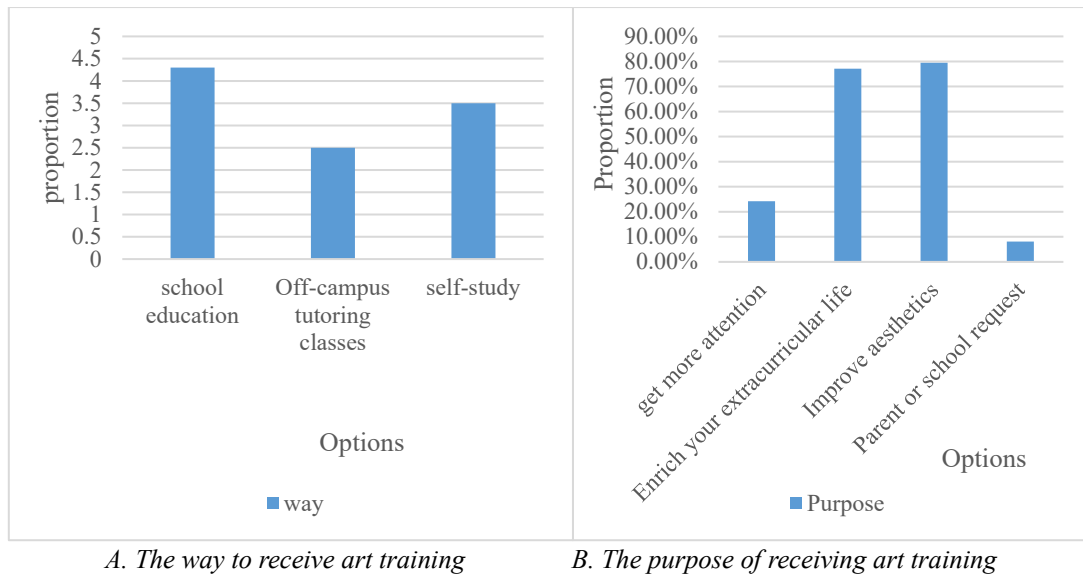


Figure 2 Training approach and purpose

The primary forms of art training that the institution accepts are dance, music, and art, as shown in Figure 1A. Figure 1B shows that college students' time distribution of art instruction is quite uniform, with over 30% of them having had art instruction in junior high school and earlier educational stages. Figure 2A illustrates that classroom instruction is the primary form of art instruction for college students, with off-campus remedial classes and self-study accounting for 31.6% of the total. Figure 2B illustrates that the primary goals of art instruction for college students are to enhance their extracurricular activities and develop their artistic skills. Because of their parents or the demands of their further education, 8.1% of college students receive art instruction.

Developing artistic abilities is a crucial component of college students' recreational artistic pursuits, and it can be broadly classified into two categories: professional performance and self-entertainment. More than 40% of college students aim to acquire numerous artistic skills, and more than 70% hope to master artistic skills for self-entertainment, according to the survey. The percentage of college students who have no aspirations for artistic abilities is just 5.7%.

5. The Construction of Aesthetic Education Courses in Colleges and Universities

Curriculum design is undoubtedly a very complex concept. Existing scholars have many disagreements about what kind of process it describes. Under the premise of integrating various viewpoints, the determination of course objectives, selection and organization of course content and course evaluation are all studied as course design processes. It provides a reference scheme for the construction of aesthetic education courses in colleges and universities.

5.1 System Construction of Comprehensive Aesthetic Education Course in School Curriculum

According to the practicality and permeability of AE implementation, combined with the nature and characteristics of the current school curriculum, the logical system of the CAEC in the school curriculum is constructed, that is, the three-dimensional overall relationship between other courses in the school is established. The implementation of comprehensive AE courses is based on other courses in school education, and comprehensive AE courses serve as a guide for integrating AE into other courses so that other courses in the school have the spirit of AE and may accomplish specific AE goals. Therefore, the comprehensive AE course is aimed at AE, based on the aesthetic factors in various courses and social life. The curriculum should include the characteristics of the direct form of AE and the indirect form of AE.

Among them, subject courses (permeable aesthetics) include Chinese, mathematics, English, politics, physics and other courses divided by knowledge categories. Activity courses (direct experience of creative aesthetics) include art courses, comprehensive practical activity courses, school entertainment performance activities, extracurricular practical activities, etc. Implicit curriculum (permeable aesthetics) refers to school environment, school ethos, school discipline, school

management, teacher-student relationship, etc. Subject courses, activity courses, and others are the basis of comprehensive AE courses, and students' cognitive factors and practical ability affect their aesthetic ability. The CAEC has enlightening significance for the aestheticization of its basic curriculum. The comprehensive AE course is a course to improve students' aesthetic ability. The higher the students' aesthetic ability, the more they can reflect and visualize the meaning of the subject curriculum itself, thereby promoting the learning and pursuit of subject knowledge and skills.

5.2 The Development Orientation of Aesthetic Ability in CAEC

Regarding the internal logic system of the CAEC, the orientation of the aesthetic ability in the development system of the CAEC can be understood with the help of the three-layer research method of "Tao-Fa-Technology" proposed by Professor Baden Nyima. It gradually deepens in the order of "outer layer (surgery) - middle layer (method) - inner layer (dao)", that is, aesthetic appreciation, aesthetic experience-aesthetic expression, aesthetic creation-the acquisition and perfection of aesthetic human nature (aesthetic value comprehension) gradually improved.

In this process, it focuses more on the accumulation of aesthetic factors, and cultivates the ability of students to perceive and experience these aesthetic factors, and can obtain a certain degree of pleasure in the aesthetic experience[14]. With the accumulation of fragmented aesthetic factors (aesthetic objects and aesthetics) and the improvement of students' aesthetic experience ability, in the middle-level stage, the CAEC emphasizes the mastery of AE principles and methods, that is, aesthetic expression and aesthetic creation. With the enhancement of the ability to perceive the essential meaning of things, it enables students to integrate and internalize fragmented aesthetic factors, and gain a sense of self-worth in the process of aesthetic experience. In practice, it shows love for the object, enthusiasm and optimism for learning and life, etc. In the stage of the inner layer, it focuses on value comprehension.

5.3 Compensation and Development Pyramid Course Content System Construction

The content of AE courses in colleges is extremely complex and huge, and it needs to be organized according to certain principles and forms in order to further form substantial courses and put them into teaching.

To sum up, the content of the AE course is based on the basic knowledge of beauty and the basic knowledge of art, with art training as compensatory AE, and professional aesthetics as developmental AE, so as to complete cross-border aesthetics and achieve the realm of aesthetic life. Generally speaking, aesthetics should start with sensibility, so AE in colleges is also based on the perceptual experience of AE in basic education. But it is precisely because of the fact that basic education lacks this kind of experience, the AE in colleges must undertake the responsibility of compensation. It builds perceptual experience on the basis of rational understanding, and uses aesthetic knowledge to guide aesthetic practice, which is also established by the stipulations of higher education.

The fundamental categories of beauty, such as "beautiful," "magnificent," "tragedy," and "comedy," as well as the basic fields of beauty, such as "artistic beauty," "natural beauty," "social beauty," "scientific beauty," etc., make up the core framework of the basic education AE experience. It organizes and arranges the basic education school AE curriculum "five circle system" based on the experience content, which reflects the process of transforming students' aesthetic practice experience into the content of school AE curriculum. When students enter higher education, the first thing they should provide is advanced knowledge about beauty, aesthetics and AE, that is, the essence and law of beauty, and then develop in the realm of professional aesthetics, cross-border aesthetics and life aesthetics.

6. Conclusion

Comprehensive AE courses are being established in order to accomplish the goals of AE on the one hand, alter the current state of AE on the other, and firmly establish AE in educational institutions. Second, this essay explains the fundamental meaning of AE and the CAEC system architecture. AE is the education of the soul; it is an education that enables people to achieve the highest level of existence, experience the purpose and worth of life, and strive for excellence. Realizing the goal of AE is the foundation upon which the CAEC, a general name for school AE curriculum, is built. While the research on the CAEC clarifies the position and function of the curriculum in schools and highlights the significance of curriculum setup, this does not imply that the curriculum has to be present in the school.

Because studying its "what" is merely a logical explanation for why the program exists. Some schools' AE work has not yet been grounded in practice due to a particular status quo study. The overall benefit of AE can only be fully appreciated when school AE is implemented normally, regardless of the impact of its implementation. Lastly, the strategic idea for putting the CAEC into practice is presented in this paper. The all-inclusive AE course is practice-based, considers the accumulation of students' aesthetic experiences, develops students' aesthetic personalities, and shapes students' solid social aesthetic psychological structure.

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