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Original Paper

Design and Practice of Painting Courses for STEM Students in Chinese Universities

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Abstract

This paper explores the design and implementation of painting courses for STEM students at Chinese universities, underscoring the importance of art education for the comprehensive development of STEM students and its positive contribution to societal advancement. The article identifies current challenges in art education within STEM fields, such as the imbalance between professional knowledge and artistic cultivation, and offers a reform strategy aimed at transcending disciplinary boundaries to nurture well-rounded, interdisciplinary talents. The paper elaborates on the educational objectives and the curriculum planning of the painting courses, aiming to enhance students' capabilities in interdisciplinary knowledge, innovative thinking, and aesthetic skills through a method that integrates theory with practice. This approach is intended to cultivate students' critical thinking and diverse cognitive patterns. The anticipated outcome is to provide STEM students with a comprehensive artistic educational experience that enriches both their learning and life with the arts.

Keywords

Well-Rounded Education, Painting Course, STEM Students, Interdisciplinary Competence, Innovative Thinking, Emotional Expression

1. Introduction

A person with innovative ability in science should not only possess a deep understanding of scientific principles but also an appreciation for the arts, and this insight was shared by the distinguished scientist Qian Xuesen on the topic of education (Feng & Xia, 2018). The annals of history are replete with scientists such as Yang Zhenning, Li Zhengdao, Mao Yisheng, and Gu Yuxiu, who, in addition to their significant professional achievements, also displayed a deep appreciation for the arts and offered insights into the intersection of art and science. Li Zhengdao, for instance, discussed the symbiotic relationship between science and art, observing that they are closely connected, similar to the obverse

and reverse faces of a coin, both arising from the fountain of human creativity and the search for universal truths (Li, 1998). Gu Yuxiu led a legendary life, with expertise spanning ancient and modern aspects of Chinese and Western cultures. His scholarly pursuits included science, education, literature, drama, music, and Buddhism, epitomizing a polymath.

These examples not only highlight the value of art in individual growth but also underscore the pivotal role of art education in promoting social progress and prosperity. In the educational development of China, art education has been consistently strengthened, with the government continuously rolling out new supportive policies to foster its growth. These policies not only enhance the role of art education within the educational system but also lay a solid foundation for fostering well-rounded individuals proficient in moral, intellectual, physical, aesthetic, and practical domains. Therefore, incorporating art courses into the curricula of science and engineering programs at universities is especially important. Such courses enhance students' cultural understanding and aesthetic awareness, and promote their artistic expression as well as innovative capabilities. Art education enriches students' spiritual lives, boosts their well-being and vitality, and aids in the development of well-rounded individuals.

2. The Current State of Art Courses

In the higher education system of China, art courses have been reinforced under national educational policies and have seen rapid development. However, they continue to encounter numerous challenges in their actual implementation. With the orientation of the current job market, STEM graduates' competitiveness has become a key metric in university evaluations. To maintain high employment rates, some universities inevitably focus on professional knowledge and skill training, thereby diminishing the emphasis on art education and creating an imbalance between professional and artistic education. This trend, favoring the transmission of specialized knowledge or skill training, indicates a shortfall in educational practices addressing students' holistic development (Gao, 2023).

On the other hand, in the practice of art courses at universities, there exists a misconception that oversimplifies these courses to just skill instruction or theoretical teaching, overlooking the profound role of art education in fostering students' holistic development (Du & Ye, 2023). When art education is divested of its rich connotations and reduced to simple skill transmission, the learning experience of students becomes shallow and limited. Similarly, focusing exclusively on theory without offering ample practical opportunities for students to engage with and assimilate these concepts results in art education losing its dynamism and practical relevance. It becomes detached theoretical knowledge that fails to resonate with students or stimulate their potential.

A primary tenet of modern educational reform is the rejection of overly narrow specialization and compartmentalization of knowledge. The focus is on comprehensive and holistic education that aims to cultivate well-rounded individuals (Hang & Zhang, 2007). Such reform requires curriculum designers to not only break away from the constraints of traditional disciplinary boundaries but also for educators to weave interdisciplinary content and methods into the teaching process, thereby enhancing students'

overall competencies. Students should not only have professional abilities in their own fields but also exhibit flexibility and adaptability in cultural, artistic, and social contexts. They should be adept at effective communication and innovation in a constantly changing world.

3. Design of Painting Course Objectives

When designing painting courses for STEM students, the educational objectives should move beyond the constraints of traditional art education methods, while also leveraging the university's unique teaching resources and disciplinary characteristics to deepen and expand the curriculum (Gao & Feng, 2020). Course design should embrace a general education approach, integrating comprehensive knowledge from disciplines such as literature, history, philosophy, and art, to promote the students' holistic development in artistic understanding and innovative thinking.

In teaching, it is essential to integrate theory with practice, not only to give students a deep understanding of art theory but also to ensure that practical activities enable them to transform the knowledge gained into creative ability. The curriculum should place special emphasis on the study and analysis of masters of art history and their works, as this approach can expand students' cultural horizons and deepen their understanding and appreciation of culture. Painting practice should not be confined to students who already have a background in art; instead, the courses should encourage all students to engage in creative work and, through professional guidance, assist them in discovering and developing their artistic potential, thus enhancing their aesthetic sensibility and capacity for emotional expression.

Through art exploration and experience, students will learn to observe and think critically, and to develop diverse modes of thinking through the interplay between emotion and reason. This focus on intuitive and creative thinking is especially valuable for innovations in science and technology. In summary, the course's core goal is to enhance students' cultural literacy, stimulate their aesthetic sensibility and creative thought, enrich their inner worlds, and promote their whole-person development (Du, 2022).

4. Principles of Painting Course Design

In designing a painting course for students, one must first address the wide range of students' backgrounds. Most students lack an art-related background, with majors spanning from applied physics and industrial design to polymer materials and engineering. The course design should focus on gradually introducing specialized knowledge without requiring prerequisite skills, ensuring that students stay engaged and motivated. It's important to adjust the course difficulty to match students' learning capacities timely, balancing content richness with a positive learning attitude (Li & Shen, 2023).

In course design, teachers must carefully calibrate the level of instructional difficulty to help students achieve an optimal state of learning. The objective of teaching is not to produce professional artists but

rather to encourage a profound engagement with artistic emotional expression, cultural appreciation, and innovative thought. Most crucially, the educational approach should aim to blend artistic knowledge with aspects of students' academic and personal development, thus promoting well-rounded growth in various dimensions.

The teaching plan and content should be flexibly adjusted to meet the unique needs of non-art majors. The course should encourage students to actively engage in understanding, appreciating, discussing, and personally practicing art while also critically thinking about the connections between art and their own fields of study. This pedagogical approach is designed to deepen students' comprehension of art, foster their personal growth within the realm of art, and provide new insights into their primary areas of study from an artistic perspective.

The course should be strategically planned to blend theoretical knowledge with practical skills. The curriculum must maintain a weekly equilibrium between two main elements: theoretical exploration and hands-on practice (Song, 2019). Theoretical lectures demand the students' undivided attention to meticulously prepared material, which is then followed by thorough discussions on selected art topics. This dynamic approach not only seeks to enhance students' grasp of art knowledge but also strives to hone their critical thinking and eloquence.

5. Design and Implementation of Painting Courses

Theoretical teaching should abandon the traditional linear narrative method and instead adopt a more interactive approach. The design of the course content is aimed at selecting knowledge that is closely related to the students' daily experiences and integrating it with actual student feedback to combine knowledge with personal experience (Wang, 2011). This teaching strategy emphasizes that art education is no longer a one-way infusion of knowledge but an equal and open process of exploration and exchange. Teaching is not solely focused on the transmission of knowledge but is more concerned with sparking students' engagement and interest in the subject matter.

Group discussions within theoretical teaching should ensure depth and breadth in the discourse. First, topics should be relevant to the times, exploring how current technological advancements impact artistic practices and development. Second, topics should encompass a diversity of perspectives to guarantee the variety and comprehensiveness of the discussion content. In addition, discussions should be open-ended, avoiding preset answers and encouraging students to think and interpret freely based on their viewpoints, experiences, and professional knowledge (Zhao, 2006). Lastly, the personalization of questions, such as directly asking "What does this mean to you?", encourages students to provide individualized responses, sharing their unique feelings and insights.

Students should be guided to thoroughly read selected books and academic articles on art and other disciplines in order to systematically construct a knowledge framework. In the writing phase, the course should emphasize stimulating active participation and reflective thinking among students. They are encouraged to integrate classroom knowledge with personal contemplation, absorbing, digesting,

and critically analyzing art theories through writing assignments, rather than merely regurgitating class notes. This method not only enhances students' mastery of artistic knowledge but also strengthens their independent thinking and expression skills.

During the painting practice sessions, students are instructed to focus on observation, learning, and discovering personal emotional expression methods (Liao, 2015). They are to integrate these with the theoretical knowledge they have learned and reflect this integration in their paintings. This process not only hones their painting skills but also serves as a means for the students to visualize and creatively express their own ideas. Through this process, students not only fully experience the flow of artistic creation but also deepen their understanding and appreciation of art, incorporating it into their learning and life.

Students are encouraged to use a variety of creative materials, such as pencils, crayons, oils, etc., to experience the differences in visual effects and creative experiences that different materials offer, thereby stimulating innovative thinking. To broaden students' creative horizons and sensory experiences, the course includes various exercises such as copying, sketching, and blindfolded drawing. These are intended to challenge students to go beyond the limitations of traditional visual frameworks and encourage them to explore the boundaries of art through their senses (Dong, 2008).

By copying and studying classic artworks, students not only learn traditional painting knowledge and techniques such as light and shadow, color, and perspective. On the other hand, students are encouraged to explore different styles, including Impressionism, Expressionism, Surrealism, and other modern art forms. This enables students to discover and develop their own artistic styles and understand the supportive role of techniques in the creation process for different painting contents.

The course encourages students to deeply consider the meanings behind artistic creation and to ponder what constitutes "good art," thereby fostering their independent aesthetic judgment and creativity. In this process, students continually pose questions and explore answers, using this approach to test and develop their own ideas (Li, 2021). This method strengthens an attitude of active learning and the capacity for innovative thinking. Such teaching philosophies and methods not only promote a deeper understanding of art theory among students but also lay a solid foundation for their future creative practices.

6. Conclusion

This paper explores the significance of introducing painting courses for students in STEM majors at Chinese universities and highlights the contribution of art education to the holistic development of students. It examines the present challenges and limitations within art education and offers a tailored set of guidelines and strategies for painting courses aimed at science and engineering students. Merging theoretical concepts with hands-on practice, the course spans a range of topics from classical to contemporary art, including interdisciplinary studies, with the goal of cultivating a vibrant artistic learning environment. The course structure is designed to progressively build from foundational to

advanced concepts, deepening students' cultural understanding, honing critical thinking skills, and fostering unique artistic insights. Through the aforementioned course setup, the course endeavors to enrich students' spiritual and cultural experiences, cultivate aesthetic sensibilities, and stimulate creativity.

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