

Innovative Research on the Talents Cultivation Mechanism of Art and Technology Majors Based on the Concept of STEAM Education Interdisciplinary Interactive Teaching in the Background of New Liberal Arts

Xuejiao He

School of Design and Products, Jilin Animation Institute, Changchun130012, China.

277616634@qq.com

Abstract. This article is based on the STEAM education interdisciplinary interactive teaching concept, and conducts innovative research on the progressive talent cultivation mechanism of art and technology majors. It constructs a full stage interdisciplinary mentor system, interdisciplinary curriculum system, and high-level interdisciplinary teacher team as guarantees, formulates a professional adjustment and optimization reform implementation plan, and points out a new path for interdisciplinary talent cultivation of art and technology majors in the context of the new liberal arts.

Keywords: Interdisciplinary interactive teaching; art and technology majors; talent cultivation mechanism.

1. Introduction

STEAM education is a comprehensive education that integrates multiple fields of science, technology, engineering, art, and mathematics, emphasizing cross-border knowledge, diverse scenarios, problem generation, critical construction, and innovation driven. Based on the interdisciplinary interactive teaching concept of STEAM education, a progressive talent cultivation mechanism innovation is proposed for the arts and technology major, which emphasizes categories and foundation in the first year, classification and direction in the second year, integration and collaboration in the third year, and practice and quality in the fourth year. The full stage interdisciplinary supervisor system, including the class mentoring system, studio dual mentoring system, and senior mentoring system, will be implemented throughout the four years of undergraduate education, providing institutional guarantees for talent cultivation. The effectiveness of talent cultivation of art and technology majors is tested by continuously tracking the employment quality matching rate of graduates, the rate of domestic and international further education, industry recognition, and overall social evaluation feedback.

Based on the concept of new liberal arts construction, the interdisciplinary curriculum system construction of art and technology majors is guided by the concept of humanities, committed to the practice of unity in three aspects: humanistic guidance, growth and co creation, and reconstruction and integration, based on a four in one interdisciplinary interactive teaching model of "project ideological – political - four innovation - exhibition competition", the four turns of interdisciplinary interactive teaching are realized: from knowledge teaching to ability training, from doing hypothetical exercises to project-based learning to solve real problems in the real world and social development, from passive learning to active learning, and from single discipline learning to interdisciplinary learning [1].

Relying on the interdisciplinary integration characteristics of art and technology majors, optimizing interdisciplinary grassroots teaching organizations, and strengthening collaboration and communication among teachers from different departments and subject backgrounds. Led by a dual teacher teaching team and industry experts, place equal emphasis on talent introduction and teacher training [2], vigorously strengthen the construction of a echelon of disciplinary leaders, accelerate the cultivation of young and middle-aged disciplinary leaders and academic backbone, build an interdisciplinary teaching team that is suitable for professional development and teaching scale, with high professional quality, strong teaching ability, comprehensive literacy, strong scientific

research ability, and reasonable age, professional title, teacher structure, to provide teacher guarantee for professional talent cultivation, to meet the needs of interdisciplinary development and construction of art and technology major, the refinement of professional characteristics, the innovation of talent cultivation mechanisms, as well as the enhancement of teachers' scientific research capabilities and the improvement of teaching quality, and to provide teacher guarantee for professional talent cultivation.

2. Organization of the Text

2.1 STEAM Education Interdisciplinary Interactive Teaching Concept

The term "interdisciplinary" first appeared in New York, USA in the 1920s, referring to knowledge creation and dissemination activities that transcend a single disciplinary boundary and involve two or more disciplines. Its initial meaning was roughly equivalent to "collaborative exploration" by scholars with a multidisciplinary background, until 1930, when the Research Council of the American Academy of Social Sciences officially used the concept of "interdisciplinary" for the first time [3].

STEAM education is an interdisciplinary education concept that emphasizes practice, with its core concept emphasizing the interdisciplinary integration of science, technology, engineering, art, and mathematics [4], advocates the use of integrated methods to develop students' knowledge and skills, and applies them to solve real-world problems through transfer. At the same time, cultivate students' critical thinking and complex problem-solving ability, communication and exchange ability, collaboration and cooperation ability, innovation and entrepreneurship ability.

The new liberal arts will drive profound changes in all traditional disciplines, interdisciplinary interactive teaching is aimed at correcting the traditional overly refined and separated thinking mode of subject teaching, integrating knowledge systems, conceptual theories, and technical data from different disciplines, leveraging the interaction and collaborative effects between multiple disciplines, promoting students' deep understanding of subject content from multiple perspectives, stimulating learning interest and improving learning effectiveness, solve complex problems that cannot obtain correct answers solely by promoting basic understanding and applying single disciplinary knowledge.

Different disciplines have formed unique teaching methods in their long-term development, interdisciplinary interactive teaching means in-depth research on thinking methods while retaining the characteristics of different disciplines, research problems by integrating interdisciplinary teaching thinking patterns and analytical frameworks. For example, X represents the design discipline and Y represents other interdisciplinary disciplines, deconstructing X and Y respectively, then merging the deconstructed two, based on the needs of social development and guided by problems, analyze the relationship between design and humanities, social sciences, and natural sciences.

Essentially, interdisciplinary interactive teaching is a problem-based teaching approach that integrates expertise and creativity. Understanding and mastering the core concepts of a single discipline is the foundation, and without a disciplinary foundation, it is difficult to conduct interdisciplinary research [5]. Faced with the trend of increasingly integrating design issues with science and technology, it is necessary to apply interdisciplinary thinking to view complex design problems from different perspectives. Frequent participation in interdisciplinary research can help improve individual cognitive abilities, understand challenging design propositions, and formulate feasible solutions.

2.2 Innovation in the talent cultivation mechanism for art and technology majors based on the interdisciplinary interactive teaching concept of STEAM education

The art and technology major was designated by the Ministry of Education in 2012, the goal is to cultivate high-quality application-oriented talents who possess the ability to create and develop

digital products in fields such as digital space, information exchange, and new media, and are capable of holding positions such as digital creativity, cultural innovation, and communication. They are engaged in design and development work through the integration of art and science. Taking moral education as the foundation, cultivate students to have a solid theoretical foundation of design, technology and aesthetics, profound artistic design literacy and innovative Internet plus thinking, have the ability of interdisciplinary collaborative innovation of design, culture and technology, and the ability to analyze, integrate and practice complex problems, as well as good ideological and moral quality and humanistic quality, A talent cultivation concept that the trinity of knowledge, ability, quality, and coordinates the development of art education, science and technology education, and humanities education has been formed.

In order to overcome the tendency of homogenizing the construction concept and characteristics of the same major as the upper and lower sister universities, relying on the top-level educational philosophy of the school's "learning-research-production-innovation" integration and the core culture of "innovation, creation, excellence, and entrepreneurship", and based on a four in one interdisciplinary interactive teaching model of "project ideological – political - four innovation - exhibition competition", a three-dimensional coordinate talent training system for X, Y, and Z has been constructed. In addition to focusing on the Y-axis vertical exploration of single subject knowledge in traditional subject based teaching concepts, also emphasize the horizontal expansion of knowledge on the X-axis, while paying high attention to the correct value guidance pointed by the Z-axis [6]. Political education and innovation and entrepreneurship education throughout interdisciplinary interactive teaching, optimizing the cultivation mode of art and technology professionals within the X-Y-Z three-dimensional teaching space system, and achieving multi-dimensional promotion. The talent cultivation goals have been formulated in a gradient manner, with each grade from freshman to senior year oriented towards solving advanced problems, gradually formed a progressive talent training mechanism, which emphasizes categories and foundation in the first year, classification and direction in the second year, integration and collaboration in the third year, and practice and quality in the fourth year.

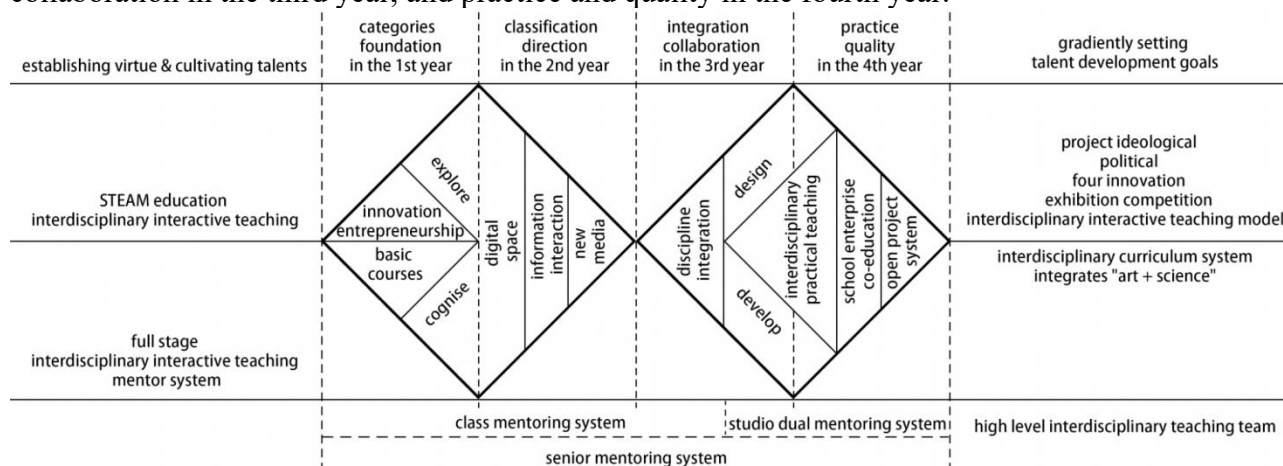


Fig. 1 Innovation in the talent cultivation mechanism for art and technology majors based on the interdisciplinary interactive teaching concept of STEAM education

(1) Emphasizing categories and foundation in the first year

Emphasizing the integration of basic courses and innovation and entrepreneurship education, strengthen students' interdisciplinary learning awareness while enhancing their level of creative design, the aim is to cultivate Class A talents with innovative and entrepreneurial spirit and design practical abilities, as well as Class B talents with strong professional and technical abilities, and to implement the school's top-level educational concept of "precision talent cultivation" in the professional talent cultivation.

(2) Emphasizing classification and direction in the second year

Emphasizing the focus on digital space and the integration of professional courses such as information exchange and new media. Scientifically, rigorously, and systematically construct an interdisciplinary curriculum system, integrating ideological and political education throughout teaching, and promoting students' solid mastery of professional knowledge in various directions.

(3) Emphasizing integration and collaboration in the third year

Emphasizing the interdisciplinary integration of art and new media technology courses, promote both general and specialized education, coordinate theory and practice, improve students' practical and hands-on abilities, and cultivate their design and development abilities that integrate "art + science".

(4) Emphasizing practice and quality in the fourth year

Emphasize the chain type practical teaching process of "project practice -innovation and entrepreneurship practice - social practice", improve the quality of practical teaching with enterprise high-end projects, and combine the enterprise design, development and evaluation standard with the process of design thinking to carry out practical teaching. With interdisciplinary practical teaching as the main body, open project system and school enterprise collaborative education as the two wings, talent cultivation is matched with market demand, achieve zero adaptation period employment for graduates, and achieve professional talent cultivation goals in the next five years of work.

2.3 Guarantee Measures for Innovation in the Talent Training Mechanism of Arts and Technology Majors

2.3.1 Full stage interdisciplinary interactive teaching mentor system

Establish a full stage interdisciplinary interactive teaching mentor system that integrates class mentoring system, studio dual mentoring system, and senior mentoring system throughout the four years of undergraduate education, enhance students' autonomous learning ability and lifelong learning awareness through guidance and assistance, achieve full element, full process, and comprehensive training, and provide institutional support for talent cultivation.

During the 1-5 semesters of professional teaching, an interdisciplinary class mentor system will be implemented to fully leverage the diverse guidance roles of teachers from different disciplines in students' development processes of growth, academic, professional, and entrepreneurial. The management and guidance of students' interdisciplinary learning throughout the entire process will be strengthened, and ideological and political elements will be subtly integrated, fully leveraging the hidden educational advantages of professional course teachers.

During the 6-7 semesters of concentrated practical teaching, a studio dual mentor system will be implemented, with two dual qualified teachers forming interdisciplinary complementary advantages. In the open project system practical teaching, comprehensive, targeted, and timely guidance will be provided. Relying on the "Alumni Entrepreneurship Alliance" and the "New Partnership Model", we carry out strategic cooperation in talent cultivation. The studio's dual mentors and corporate mentors collaborate to educate students, helping them embark on the path of entrepreneurship, cultivating them as the new force in building the national cultural industry, and providing strong guarantees for cultivating high-quality applied talents who integrate "art + science".

In addition, based on the core concept of OBE modern education, fully leverage the role of students as the main body and implement a senior guidance system, By forming an interdisciplinary and cross grade innovation and entrepreneurship project team throughout the four academic years of undergraduate education, utilize the "learning assistance" model to play the role of senior students in project creation, exhibition participation, innovation and entrepreneurship activities, effectively promoting interdisciplinary learning, communication, and growth among students, and using the power of role models to pass on the spirit of art from generation to generation.

2.3.2 Interdisciplinary curriculum system based on STEAM education Concept

The concept of interdisciplinary interactive teaching in the context of the new liberal arts should be guided by the concept of humanities and committed to the practice of identity in three aspects: the first is guidance of humanities, highlighting the significance and value of serving human welfare, and the process runs through ethics, intellectual property, scientific research integrity and so on. The second is growth co creation, Clarify the result orientation, tool resources, method guidance, questions, doubts, and challenges of course practice, and keep up with the continuous growth and changes of students' interests and research. The third is reconstruction and integration, based on national curriculum standards to reconstruct existing teaching content, while integrating real-life situations and interdisciplinary teaching content, to unify knowledge acquisition and application [7].

Compared to the contradiction between the independent and segmented curriculum system and the goal of cultivating students' ability to solve complex design problems, the interdisciplinary integration characteristics truly respond to the essence of "educating people". The interdisciplinary curriculum system based on STEAM education, with its characteristics of openness, subjectivity, situational nature, relevance, and development, has been in line with the development trend of China's curriculum reform from the beginning, becoming a new educational paradigm with significant advantages in promoting classroom quality and efficiency [8].

The Art and Technology major is based on the perspective of the Art and Design discipline, coordinating related disciplines, and constructing an interdisciplinary curriculum system that integrates "art + science", and adopting a four in one interdisciplinary interactive teaching model of "project ideological – political - four innovation - exhibition competition", allowing students to participate in the entire process of project planning, design, and implementation, realize the transformation of learning outcomes from homework to works, products, and commodities, comprehensively enhance students' growth ability. Results oriented, solve the problem of which science and engineering disciplines should be taught interactively in design and how to interact.

Focusing on improving the high-level, innovative, and challenging nature of interdisciplinary courses, and guided by incubating and producing innovative and entrepreneurial projects, we continuously adjust the teaching content of interdisciplinary courses based on social development needs and students' personal professional development plans [9]. Give full play to the important role of the second classroom in students' quality education, lead students to go out for practical docking and visit incubation units for entrepreneurship and innovation projects, and solve the problem of how to scientifically connect and organically combine knowledge of design and science and engineering disciplines.

2.3.3 High level interdisciplinary teaching team

The construction of interdisciplinary teaching team of art and technology major is based on a professional standard, supplementing interdisciplinary faculty, improve the level and optimize the structure of teaching team, and aligning the construction of teaching team with disciplinary development and professional settings. Using the quantitative indicator of "creating famous teachers and cultivating talents", to present the quality of interdisciplinary teacher team construction. By cultivating high-level talents and reserve talents, to enhance the stamina of professional construction and development. Adhere to placing teacher ethics education in a prominent position and encourage teachers to use original research to promote technology development and achievement transformation.

(1) Establish a sound incentive and constraint mechanism, and create a favorable competitive policy environment for the construction of interdisciplinary teaching team.

Build an interdisciplinary teaching team that combines full-time and part-time teaching, improve the assessment and employment system for full-time and external teachers, and form a dynamic management system for survival of the fittest. By deepening the reform of systems and mechanisms as a breakthrough, optimizing the development environment for teachers as a guarantee, to stimulate the vitality and comprehensively enhance the cohesion of the teaching team [10].

(2) By planning effective training to enhance teachers' interdisciplinary interactive teaching abilities, to enhance their professional abilities and comprehensive professional qualities.

Regularly select and send teachers to enterprises and institutions to participate in practical training on the integration of industry, academia, and research, in order to improve the interdisciplinary interactive teaching ability, science and education integration ability, and industry education cooperation ability of self-owned teachers of the art and technology major [11]. Provide interdisciplinary interactive teaching and research sharing platforms for teachers, strengthen inter school communication and training, and implement resource sharing, talent integration, and complementary advantages with peer colleges.

(3) Adhere to the principle of "not seeking everything and location, but seeking application", and transform the traditional thinking mode of talent introduction.

Fully utilize high-quality intellectual resources from society, both domestically and internationally, and focus on introducing scarce talents for interdisciplinary talent cultivation, actively invite high-level talents to lead the fields of digital space, information design, and new media, as visiting professors for interdisciplinary talent cultivation, fully leverage the leading role of high-level talents in "learning-research-production-innovation", to achieve internationalization of domestic teaching and localization of international teaching, form an interdisciplinary teacher echelon with strong teachers, stable teacher-student ratio, reasonable structure, high energy efficiency in combination of teaching and practice, and high level of achievements.

3. Summary

The Art and Technology major is based on the STEAM education interdisciplinary interactive teaching concept, by innovating the major talent cultivation mechanism, constructing a full stage interdisciplinary mentor system and interdisciplinary curriculum system, and forming an interdisciplinary teacher team with distinct disciplinary integration characteristics, the original educational ecological balance has been broken, the major construction goal of cultivating high-quality applied talents with the integration of "art + science" has been achieved, the formation of a new ecosystem of interdisciplinary interactive teaching in the field of design has been promoted.

4. Acknowledgment

General project for the 2021 year of the 14th Five-Year-Plan for education and science in Jilin province<Research and practice on the reform of interdisciplinary interactive teaching in art and technology majors under the background of new liberal arts>. Project approval number: GH21415

References

- [1] Li Kedong, Li Ying. STEM Education Interdisciplinary Learning Activity 5EX Design Model. E-education Research, 2019, 40(04):5-13.
- [2] Liu Keyi. Building a New Liberal Arts Talent Training System. Guangming Daily,2023.
- [3] Dong Yan, Sun Wei, et al. Research on interdisciplinary learning under the integration of information technology. E-education Research, 2019, 40(11):70-77.
- [4] Yang Min. Research on Interdisciplinary Learning of Undergraduate Students in the Context of New Liberal Arts. Lanzhou University,2023(01):79.
- [5] Zhang Baoming. Thoughts on New Liberal Arts: One is joy, the other is fear. Henan University,2020.
- [6] Guan Jiazheng. Research on Integration of Interdisciplinary Training Mode of Design in comprehensive university under New Liberal Arts. Design,2021,34(19):104-106.
- [7] Ye Dewei. Teacher positioning and growth strategies in interdisciplinary teaching. China Education Daily,2022.

- [8] Wang Guojun. Research on interdisciplinary curriculum integration based on STEAM education. *Innovation and Practice in Science and Education*, 2022(11):80-84.
- [9] Wang Zi. Interdisciplinary Curriculum Design and Implementation Based on Professional Communities: Taking STEM Education Professional Communities as an Example. *Jiang Su Education*, 2021(48):11-14.
- [10] Cao Yuan, Du Jian, et al. Strategies and Practices for the Development of Interdisciplinary Research in Chinese Universities under the Construction of "Double First Class" - Based on the Perspective of Organizational Theory. *Science and Technology in Chinese Universities*, 2023(03):26-33.
- [11] Hu Jinyan. Creating "New" Liberal Arts through Inheritance and Innovation. *New Liberal Arts Theory and Practice*, 2022(03):68-75.