

Research on the Impact of Teachers' Creative Thinking in Interdisciplinary Art and Science Education on Students' Comprehensive Competences in Higher Education

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Abstract: As the integration of arts and science education gradually gains traction in higher education institutions, teachers play a pivotal role in fostering students' comprehensive abilities. This paper aims to delve into the impact mechanism of teachers' creative thinking on enhancing students' overall quality in the context of art and science integrated education in universities. By drawing on existing measurement tools for teacher creative thinking, we will conduct an in-depth assessment of teachers' creative thinking levels across several critical dimensions, including innovative thinking skills, problem-solving skills, and interdisciplinary applications. The study endeavors to meticulously dissect the intrinsic connection between teachers' creative thinking and students' comprehensive qualities, thereby revealing the underlying influence mechanisms.

Keywords: Interdisciplinary Art and Science Education; Teacher Creative Thinking; Comprehensive Literacy; Impact Mechanism

1 Introduction

With the ever-increasing societal demand for comprehensive competences, the integration of arts and science education in higher education institutions has become a pivotal platform for nurturing students' innovative thinking and holistic development. In this context, the role of teachers becomes increasingly vital. Teachers are not merely dispensers of knowledge but also serve as mentors and motivators in the students' growth process. During the cultivation of students' comprehensive competences, it is considered that teachers' creative thinking plays a crucial

driving force in shaping these abilities. Therefore, this paper aims to delve into the specific impact mechanisms by which teachers' creative thinking influences the enhancement of students' comprehensive competences within the framework of integrated arts and science education in colleges and universities. Thus, we must not only focus on the transmission of knowledge within education, but also pay close attention to how to stimulate students' potential for innovation and cultivate their abilities to develop a full spectrum of competences. The creative thinking of teachers serves as a critical element in this process, and an in-depth analysis of its influence mechanism will provide robust theoretical guidance and practical insights for higher education. By gaining a profound understanding of how teachers' creative thinking shapes students' comprehensive competences, we can better respond to the complex and rapidly changing social demands of today, offering more concrete support for students' overall development.

Therefore, this paper aims to contribute a profound understanding and effective practical strategies through research into the relationship between teachers' creative thinking and students' comprehensive competences. Ultimately, this work strives to propel the integrated arts and science education in colleges and universities towards a direction of even greater innovation and comprehensive development.

2. Trends in the Development of Integrated Arts and Sciences Education in Higher Institutions

A With the advancement of educational innovation, the integration of arts and sciences education in higher education institutions has

increasingly become a prominent trend. In conducting an extensive review of pertinent literature, we have observed that the exact impact mechanisms of teachers' creative thinking on students' comprehensive abilities in this field have not yet received adequate scholarly attention. Despite the considerable interest directed towards interdisciplinary arts and sciences education, investigations into the specific mechanisms by which teachers' creative thinking influences students' comprehensive abilities within this context remain relatively sparse.

Through a careful examination of the related literature, it is clear that most studies have largely concentrated on areas such as teaching strategies and curriculum design, with little in-depth exploration of the precise workings of teachers' creative thinking in fostering students' comprehensive skills and attributes.

In the era of educational innovation, the significance of teachers' creative thinking transcends mere knowledge transmission; it fundamentally involves stimulating students' creative thinking processes and cultivating their all-around competencies. [1] However, current research mostly scratches the surface, with limited understanding of the inherent mechanisms by which creative thinking operates within the context of arts and sciences integration in education.

Therefore, through systematic research, we aspire to provide theoretical underpinnings for optimizing the model of arts and sciences integration in higher education, furnishing practical experience and guiding principles for nurturing students who are more innovative and possess comprehensive competencies. Our aim is to delve deeply into the precise impact mechanisms by which teachers' creative thinking influences the enhancement of students' comprehensive qualities within the context of interdisciplinary education in colleges and universities.

3. The Necessity of Establishing and Improving the Creative Thinking of Teachers in the Context of Integrated Arts and Sciences Education in Higher Education Institutions

In the context of integrated arts and sciences education in higher education, establishing and consolidating teachers' creative thinking is of

paramount importance, manifested in several specific aspects as follows:

3.1 Cultivating High-Quality Professional Talents

The robust establishment of creative thinking in interdisciplinary arts and sciences education among teachers is instrumental in nurturing high-quality, application-oriented, versatile, and innovative professionals in the field of art and design. Education should cultivate students' data literacy, technological literacy, and humanistic literacy. Students require data literacy to manage large streams of data, technological literacy to comprehend the working principles of machines, and humanistic literacy to collaborate effectively with intelligent machines in the future job market. [2] Teachers, by leveraging their innovative thinking, guide students to traverse the realms of art and technology, thereby developing their abilities for comprehensive growth and better adapting them to the multifaceted demands of modern society.

3.2 Promoting Diversification of Teaching Format

Approaches the issue of homogenization in teaching methods often exists within art and design programs. The robust establishment of teachers' creative thinking can prevent this tendency towards uniformity. By encouraging teachers to demonstrate unique creative thinking in their instruction, it contributes to the realization of more diversified development in the teaching approaches of art and design majors under the umbrella of interdisciplinary fusion and innovation in education.

3.3 Optimizing Internal Structure of Academic Disciplines

The establishment of interdisciplinary creative thinking among arts and sciences integrated educators facilitates the optimization of the internal structure of art and design academic disciplines, promoting sustainable development within the discipline. By leading faculty and students in interdisciplinary research and practice, it encourages the seamless fusion of art and design with other disciplines, thereby forming a richer and more innovative internal disciplinary structure that aligns with the evolving trends in academic

development.

3.4 Stimulating Students' Innovative Potential

The robust development of interdisciplinary creative thinking among teachers in arts and sciences integration helps to ignite the innovative potential of students, fostering their independent thinking and proactive exploration capabilities. It offers students a more diverse and enriching learning experience, enabling them to better adapt to the needs of future society. This not only provides individual students with room for personal development, but also constitutes a proactive response from the entire educational system to adapt to the evolving demands of future societal development.

4. Exploration and Practice of Teacher's Creative Thinking in the Context of Integrated Arts and Sciences Education in Higher Education Institutions

While teachers are grappling with ways to facilitate effective learning for their students both inside and outside the classroom, technology has introduced changes to teaching methods that go beyond altering the content being taught – instead, they question how to teach in a manner that achieves superior educational outcomes. From active learning to inclusive teaching practices, and from online courses to blended learning models, traditional higher education institutions are leveraging their foundational strengths while concurrently challenging the long-standing assumptions about how teachers should teach and how students should learn. [3]

I analyze the exploration and practice of teacher's creative thinking in the context of integrated arts and sciences education in higher education institutions from the following four aspects:

4.1 Revisiting and Refining Educational Objectives

Under the guidance of teacher's creative thinking, it is conducive to redefining the educational objectives of integrated arts and sciences education. By delving deeply into the intersection points between art and technology, teachers can set forth more comprehensive and innovative developmental goals for students. This ensures that students not only acquire

solid professional skills but also gain exposure to different fields, thereby cultivating a holistic set of competencies.

4.2 Strengthening the Construction of Core Curriculum

The development of creative thinking relies on a solid foundation of specialized knowledge. In practice, teachers focus on enhancing the construction of core courses in art and design programs. By employing innovative teaching designs and guiding students through practical projects, teachers strengthen students' understanding and application of professional knowledge, thus providing strong support for the cultivation of their creative thinking.

4.3 Breaking the Confinements of Traditional Art and Design Majors

The leadership of teacher's creative thinking will prompt the educational system to transcend the limitations of conventional art and design majors. We will investigate how to guide teachers in expanding teaching content through interdisciplinary integration, so that students not only deepen their expertise during the learning process but also broaden their horizons of knowledge, thereby better preparing them to cope with the complexities of future society.

4.4 Improving Evaluation Systems

To reveal the impact of teachers' creative thinking on students' comprehensive qualities, efforts must be made to refine and perfect evaluation systems. This involves assessing students across multiple dimensions, ranging from subject-specific knowledge to creativity, ability to integrate and apply knowledge, as well as interdisciplinary thinking. Through diversified evaluation methods, the goal is to provide more comprehensive and accurate feedback to higher education practices, thereby enabling the educational system to better adapt to the developmental needs of future society.

5. The Impact of Teacher's Creative Thinking on Students' Comprehensive Qualities

The creative thinking of teachers is recognized as playing a significant role in enhancing the comprehensive qualities of students. Moreover, the specific impact mechanisms of teachers' creative thinking on students' comprehensive

qualities manifest themselves in various aspects.

5.1 Stimulating Students' Innovative Potential through Creative Thinking

The creative thinking of teachers serves as a converging point for academic knowledge and artistic creation, functioning not only as a method to transmit subject matter but also as a driving force to unlock students' innovative potential. [4] Teachers, utilizing their unique creative thinking, guide students to approach problems, design imaginative lessons, create diverse learning environments, challenge conventional wisdom, and inspire independent thinking and innovative practice abilities. This process enhances students' understanding and integrative skills across different disciplines.

5.2 Interdisciplinary Thinking Promotes the Development of Interdisciplinary Competence

Teachers employing interdisciplinary thinking blend art and technology, integrating knowledge from various disciplines into their teaching. Through designing comprehensive project tasks, they guide students to consolidate knowledge from different fields, nurturing their ability to apply it across disciplines. This interdisciplinary teaching method fosters a more holistic understanding of subjects and improves students' capacity to synthesize and utilize knowledge from diverse areas, thereby enhancing their overall interdisciplinary abilities.

5.3 Creative Thinking Guides Students' Practical Exploration

Teacher's creative thinking extends beyond theoretical concepts and is actualized through practical cases and innovative exercises that guide students towards hands-on exploration. The introduction of real-world examples merges abstract theories with concrete issues, reinforcing teamwork and communication skills while sparking students' active thinking and enthusiasm for practical applications. This firsthand experience nurtures students' problem-solving abilities in reality, boosting their practical and innovative literacy, thus infusing new vitality into the development of arts-science integrated education at the higher education level.

5.4 Long-Term Impact of Creative Thinking

on Students' Comprehensive Qualities

Theoretical literacy in subject education reflects both the theoretical level and practical abilities of specialized subject teachers, with its core being the application of educational theory to solve practical problems. It represents a cognitive system, way of thinking, and problem-solving paradigm developed over time. [5] There exists a two-way interactive influence between the creative thinking of teachers and the comprehensive qualities of students.

Creative thinking training within blended teaching approaches can overcome many inherent challenges in classrooms and expedite the packaging of course content generated during class sessions. [6] Guided by creative thinking, students become more proactive in their learning engagement, and the comprehensive qualities they develop through practice reciprocally enrich the teacher's creative thinking. This mutual interaction fosters close collaboration between teachers and students, forming a virtuous cycle in the teaching ecosystem.

By continually guiding students to pursue innovation and interdisciplinary thinking, the creative thinking of teachers has a profound effect on students' comprehensive qualities, both in the short term and long term. It cultivates students' abilities to sustain learning and consistently innovate, setting up a lasting developmental mechanism that contributes to their all-around growth.

6. Creative Thinking Cultivation Model

Through the study of the cultivation model for teacher creative thinking in higher education's arts and science integration, this research aims to explore how to better nurture and stimulate teacher creative thinking within the existing educational framework, thereby facilitating the improvement of student comprehensive quality.

6.1 Course Design and Implementation

This part further investigates the specific design and implementation of teacher creative thinking training courses in higher education's arts and science integration, including course content structure, teaching methods, and training duration, to understand how these training courses can effectively enhance teacher creative thinking.

By analyzing the organization of creative

thinking-related content in the training courses and the diverse teaching methods employed, the study discusses how to design a comprehensive content structure that covers all elements of creative thinking, making these methods more practical and actionable.

6.2 Organization of Creative Activities

This section analyzes how higher education institutions organize and promote creative activities, delving deep into the ways these institutions foster teacher creative thinking through such activities. By examining the variety of creative activities, such as art creation, practical projects, and team collaborations, the study evaluates their actual effectiveness in cultivating teacher creative thinking.

Additionally, strategies to drive teacher creative thinking are explored, like incentive mechanisms, mentorship, and team collaboration, to encourage teachers to engage more actively in creative activities and develop innovative thinking.

6.3 Promotion of Collaborative Projects

The research examines cross-disciplinary collaborative projects initiated by higher education institutions, focusing on how these projects foster teacher creative thinking and, consequently, boost student comprehensive quality through cooperation and innovation.

By thoroughly analyzing the specific forms and promotion mechanisms of these collaborative projects, the study reveals the positive impacts these projects have on cultivating teacher creative thinking. This detailed analysis intends to provide feasible experiences and valuable references for future teacher training and discipline integration.

6.4 Feedback Mechanisms and Improvement Strategies

This part of the study looks at the feedback mechanisms established in teacher creative thinking training within higher education, primarily focusing on teacher participation experiences and opinions in course design and implementation. Teacher and student feedback literacy is a key factor in enhancing teaching effectiveness and promoting student development. [7]

By systematically collecting teacher evaluations of courses, training experiences,

and feedback, the study conducts an in-depth analysis of the actual effects of these feedback mechanisms in course design and execution. Simultaneously, it explores the teachers' specific feedback and suggestions regarding the training model, gaining a more comprehensive understanding of potential issues and challenges encountered during actual implementation. Based on this, the study proposes improvement mechanisms to continuously optimize the training model. Such efforts ensure that the implementation of the training model is more aligned with teacher needs, providing more effective support for raising teacher creative thinking levels.

7. Interdisciplinary Integration Strategies

In this part, research focus on strategies employed in higher education's arts and science integration. I summarize and analyze the effects of these strategies in fostering teachers' creative thinking and enhancing students' comprehensive qualities, in order to provide insights and guidance for future practices.

7.1 Course Design and Integration

The multifaceted intersections between core competencies and various disciplinary courses dictate that interdisciplinary integration serves as a crucial path for cultivating students' competencies; interdisciplinary thematic learning, as an approach, provides a platform for competency development. [8] This research investigates the strategies for course design and integration in arts-science integrated education at universities, with particular attention given to the integration across different disciplines. It focuses on how art subjects intertwine with other disciplines and how such integration fosters the development of creative thinking.

7.2 Formation and Collaboration of Teaching Teams

Firstly, art majors typically embody unique creativity and expressive qualities. Through collaboration with teaching teams from other disciplines, they can broaden their horizons and enhance teaching quality. For instance, partnering with disciplines like science and engineering can lead to the creation of more diverse and engaging teaching content, arousing students' interest.

Secondly, multi-disciplinary members of teaching teams can mutually learn from each other's professional expertise, promoting cross-disciplinary exchange of ideas. Art teachers can draw inspiration from other fields, expanding their own creative thinking while also providing an artistic perspective to other disciplines, thereby facilitating interdisciplinary crossover cooperation.

Moreover, interdisciplinary teaching teams can better meet students' diverse disciplinary needs, nurturing art talents with comprehensive competencies. We should adopt humanistic values as a guiding principle for our learning and research, aiming to achieve mutual integration and symbiosis within original disciplines, leading to new knowledge growth, triggering disciplinary transformation, innovation, and development, thus giving disciplines renewed vitality. [9] By collaborating with teachers from other disciplines, art teachers can holistically focus on students' overall development, thereby enhancing teaching effectiveness.

7.3 Implementation of Practical Projects

This research examines interdisciplinary cooperation in practical projects at universities, focusing on the collaborative promotion of practical projects across different disciplines. By transforming practical teaching contents into project-oriented formats, connecting various course knowledge points through projects, a comprehensive experimental teaching system integrating verification, synthesis, and design experiments can be formed. [10] The emphasis is placed on how these projects cultivate students' problem-solving abilities in real-life scenarios and explores the stimulating effect of practical projects on teachers' creative thinking. From a practical problem-solving perspective, this research delves into the specific implementation of practical projects in interdisciplinary cooperation and how such collaboration positively impacts and nurtures teachers' creative thinking.

Through study on the implementation of practical projects, we aim to provide universities with more concrete and actionable suggestions, promoting the actual development of teachers' creative thinking while simultaneously driving the enhancement of students' comprehensive competencies.

7.4 Assessment Mechanisms and Sharing of Achievements

This research analyzes the assessment mechanisms adopted by universities under interdisciplinary integration, with a particular focus on how the performance of teachers and students in projects is evaluated. Additionally, it studies how universities encourage teachers and students to share their achievements gained through interdisciplinary integration, prompting more people to participate in innovative practices.

By deeply exploring these aspects, a comprehensive understanding can be reached regarding the strategies employed by universities in interdisciplinary integration, clarifying their role in fostering teachers' creative thinking and students' comprehensive competencies. These insights offer substantial reference and advice for future practices.

8. Conclusion

Creative thinking ability is recognized as an essential quality for art professionals, and this capability is considered vital for the sustainable development of any profession. This research thoroughly investigates the impact mechanism of teachers' creative thinking on enhancing comprehensive competence within the context of arts-science integrated education in higher education institutions, thereby providing both theoretical backing and practical evidence to optimize educational models and elevate the overall quality of education. Against the backdrop of contemporary postmodern educational concepts that stress the importance of individual comprehensive literacy, the role of teacher-guided creative thinking becomes particularly significant.

Creative thinking goes beyond just the cultivation of a skill; it fundamentally involves shaping a mode of thought. Under the guidance of teachers who exhibit creative thinking, students not only acquire professional knowledge within an arts-science integrated education setting but also develop an innovative mindset, problem-solving abilities, and the capacity to apply knowledge across multiple disciplines. This holistic development helps students better adapt to the demands of future society, thereby laying a solid foundation for enhancing their individual

comprehensive competence.

Postmodern educational philosophy emphasizes the nurturing of students' practical skills and innovative skills, and the guidance provided by teachers' creative thinking aligns perfectly with this approach. By introducing real-life cases and designing creative practical exercises, students not only gain enriched practical applications of specialized knowledge but also concentrate on cultivating their actual problem-solving abilities and the development of a practical and innovative competence through firsthand engagement.

Overall, this study furnishes a theoretical framework and a practical pathway for arts-science integrated education in higher education institutions, contributing novel insights and knowledge to innovation and development within the field of higher education. By delving deeply into the mechanisms through which teachers' creative thinking influences students' comprehensive competencies, it holds promise to provide instructive references for educational reform and explore fresh directions in cultivating talents with enhanced and more comprehensive qualifications.

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