



The impact of critical thinking on artistic creativity among fine arts majors: the mediating effect of creative self-efficacy

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ABSTRACT

Introduction. As there is a relative paucity of previous research addressing creativity in specific art fields, it is especially rare to find research on the relationship between critical thinking, artistic creativity, and creative self-efficacy among art students. In addition, Liaoning Province in China has a long history of art education and a large number of art colleges and universities. The art universities in the region have a high quality of education and have produced a large number of excellent artistic talents. Therefore, the focus of this study will be on the group of art major college students in Liaoning Province, and is dedicated to exploring in depth the issues related to the artistic creativity of this group of college students.

Study participants and methods. This study selected students from two fine arts universities in Liaoning Province (China) as the research objects. A total of 800 questionnaires were recovered in this study. After deleting invalid questionnaires with too short response time or too high repeatability of answers, 755 were valid, with an effective recovery rate of 94.38%. This study adopts the research method of questionnaire survey.

Results. In this study, there were significant differences in critical thinking ($t=7.495^{***}$) and creative self-efficacy ($t=6.076^{***}$) and no significant differences in artistic creativity ($t=1.905$) among art majors of different genders in Liaoning Province, China. There were significant differences in critical thinking ($F=22.231^{***}$), artistic creativity ($F=7.275^{***}$), and creative self-efficacy ($F=13.306^{***}$) among college students majoring in Fine Arts in Liaoning Province, China. Critical thinking significantly and positively influenced artistic creativity ($\beta=.442$, $p<.001$), critical thinking significantly and positively influenced creative self-efficacy ($\beta=.579$, $p<.001$), and creative self-efficacy significantly and positively influenced artistic creativity ($\beta=.412$, $p<.001$). Critical thinking significantly and positively influenced artistic creativity ($\beta=.301$, $p<.001$), and creative self-efficacy significantly and positively influenced artistic creativity ($\beta=.243$, $p<.001$), suggesting that creative self-efficacy has a mediating effect between critical thinking and artistic creativity among college students of fine arts majors in Liaoning Province, China.

Conclusion. Understanding the differences of gender and grade in critical thinking, artistic creativity and creative self-efficacy of fine arts students provides scientific basis for teaching students according to their aptitude in educational practice. In addition, this study also comprehensively understands the relationship among critical thinking, artistic creativity and creative self-efficacy. Through in-depth research on the positive impact of critical thinking on artistic creativity, this paper provides educators with guidance on how to guide students to cultivate independent thinking and challenge traditional concepts, which stimulates students' innovative thinking, improves the level of artistic creation.

KEYWORDS

critical thinking, artistic creativity, creative self-efficacy, creative thinking, fine arts majors

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INTRODUCTION

As society continues to progress and culture becomes increasingly diversified, artistic creation is no longer just a superficial presentation of beauty, but places greater emphasis on a deeper understanding of and response to contemporary society, culture and individual experience. China attaches great importance to the cultivation of innovative talents, and in the draft of the National Medium and Long-term Education Reform and Development Plan issued for public comment, the goal is clearly to cultivate top-notch innovative talents. The field of education, particularly within the realm of art instruction and specialized academic programs, has increasingly focused on fostering students' creative expression and cognitive development. As society places greater value on creativity and independent thought, the role of critical thinking in education has gained prominence in recent years. The college years represent a pivotal period for the rapid maturation of cognitive abilities, with critical thinking—the capacity for deep analysis and active questioning—playing a vital role in enhancing students' creative expression within the arts [1]. Critical thinking comprises multifaceted and interconnected dimensions, including the in-depth analysis of artistic phenomena, comprehensive evaluation, synthesis of diverse elements, and logical reasoning [2]. This cognitive framework empowers art practitioners to transcend superficial aesthetic representation, enabling them to delve into and deconstruct the deeper layers of artistic phenomena.

In the current societal context, creativity and innovation have emerged as pivotal driving forces behind the development of various industries [3]. This is particularly evident in the field of art, where the creativity and innovative capabilities of artists are fundamental to the enrichment of cultural landscapes and the progression of the art domain. Artistic creativity represents a profound manifestation of transcending traditional conventions and embracing innovation [4]. Creative self-efficacy, in turn, refers to an individual's self-assessed capability to generate creative outcomes as they engage in learning and personal development. This self-perception is particularly relevant within specific domains and maintains a strong intrinsic connection to overall creative performance [5]. Creative self-efficacy plays a crucial role in fostering critical thinking, prompting students to critically evaluate their creative processes and enhancing their capacity for in-depth analysis and critical interpretation of artistic works [6]. Additionally, creative self-efficacy significantly contributes to the cultivation of artistic creativity. Research indicates that both individual and environmental factors influence creativity, with creative self-efficacy identified as a key personality trait that shapes creative potential among individual factors [7].

In-depth exploration of the interrelationships between critical thinking, artistic creativity, and creative self-efficacy offers valuable insights for the development of more effective arts education strategies and pedagogical practices [8]. Despite the recognized importance of these constructs, there remains a notable scarcity of research focusing on creativity within specific art disciplines, with studies examining the interplay among critical thinking, artistic creativity, and creative self-efficacy among art majors being particularly limited [9]. Consequently, this study aims to establish a robust theoretical framework to inform future art education practices by elucidating the dynamic interactions among these factors. Such an understanding is crucial for enhancing students' artistic proficiency and advancing art instruction toward a more adaptive and profound pedagogical stage. In the context of a rapidly evolving artistic landscape, a nuanced comprehension of the connections between critical thinking, creative self-efficacy, and artistic creativity will facilitate the development of more sustainable educational models that nurture independent, innovative artists capable of critical engagement.

LITERATURE REVIEW

1. Theoretical Foundations

Dewey's theory of reflective thinking established a comprehensive and systematic foundation that has long guided the study of critical thinking [10]. Building upon problem-solving theories, the skills theory further advances the understanding of critical thinking. Ennis developed a critical thinking

skills model that deepens comprehension of this construct [11]. Mason introduced the concept of metacognition, applying rational descriptions of metacognitive processes to real-world scenarios through the performance model, thereby integrating it into the broader theoretical framework of critical thinking [12]. Mason argues that akin to other forms of thinking, critical thinking necessitates ongoing learning and reflection to remain effective in practical applications. Piaget's stages of cognitive development theory contribute valuable insights into critical thinking, particularly regarding cognitive growth [13]. Perry's critical thinking theory extends these core ideas, addressing critical thinking assessment and developmental criteria specifically tailored for adolescents [14].

Csikszentmihalyi's systems theory of creativity has been continually refined and adopts a unique systems perspective that highlights the dynamic interplay between individuals, their professions, and broader fields [15]. This theory posits that creativity is an activity situated within specific professional domains, emerging from the interaction between an individual's distinct personality traits and the external environment, which encompasses both disciplinary and field-related influences.

In summary, within critical thinking theory, critical thinking problem-solving theory provides a framework for thinking through problems and solving challenges that help to understand how individuals use critical thinking skills to solve complex art-making problems. Critical thinking skills theories emphasize the specific skills needed to cultivate and develop critical thinking, which include analytical, reasoning, and evaluative skills that play an important role in art making [16]. The cognitive development theory of critical thinking, on the other hand, focuses on an individual's ability to recognize and deal with problems at different stages, which can provide a better understanding of the development process and characteristics of college students' critical thinking in art creation, and provide theoretical guidance and practical basis for education and cultivation. In addition, this study is based on the theoretical framework of the creativity system, which combines the theory of critical thinking to regard critical thinking as a product of the interaction between the individual and the profession. Under this framework, critical thinking pushes art creators to transcend the constraints of traditional concepts through in-depth deconstruction and analysis of artistic phenomena, thus exploring new creative ideas and possibilities.

2. Critical Thinking

At the beginning of the 20th century, researchers such as Dewey began to study critical thinking systematically and proposed "Reflective Thinking" to represent critical thinking [17]. Facione redefined critical thinking, proposed a two-dimensional structure, and integrated cognitive skills and affective tendencies to construct a systematic assessment tool, pointing out that critical thinking is a self-regulated judgment process with a clear purpose orientation. Facione redefined critical thinking by proposing a two-dimensional structure, incorporating cognitive skills and affective dispositions, and constructing a systematic assessment tool, pointing out that critical thinking is a self-regulated judgmental thinking process with a clear purpose orientation [18]. Halpern defined critical thinking as the ability to analyze, integrate, and evaluate information, and the tendency to use these abilities. a form of reasoned reflective thinking geared toward determining when to believe or act [19]. The present study adopts the perspective proposed by Byrnes and Dunbar, which categorizes critical thinking into critical analytical skills, openness to critique, and applying critique. Critical thinking is a comprehensive cognitive skill that requires individuals to be able to think critically about issues, evaluate information rationally, and make sound decisions and judgments based on this [20].

The importance of critical thinking is elucidated by the study of Pithers and Soden, which states that critical thinking is a purposeful process of self-regulation, judgment, and sustained inductive-deductive reasoning that encompasses a combination of attitudes, knowledge, and skills [21]. The development of this thinking ability not only reflects a synthesis of skills, subject knowledge, and practitioner attitudes but is also a key component of the subject's selective acquisition of knowledge. Critical thinking advocates are good at thinking and discovering problems, and constantly pioneering and innovating, and this attitude and ability not only promotes the development of the subject area but also promotes the cultivation and development of the individual's ability to learn independently. Siberian et al. study pointed out that there is a significant correlation between critical thinking skills

and creative thinking skills in cognitive learning [22]. For college freshmen, based on the findings of the study, it is important to enhance critical thinking skills and creative thinking skills which may contribute significantly to cognitive learning. Critical thinking is the most valuable skill that schools can impart to their graduates and has become a learning goal at all levels of the discipline [23]. These findings provide important insights into educational practices, suggesting that students' development in cognitive learning and self-directed learning can be fostered by developing their critical thinking skills.

3. Artistic Creativity

Artistic Creativity is an important aspect of the field of creativity and represents the specificity of the individual's creativity. Early on, artistic creativity was viewed primarily in terms of domain specificity, equating it with the creative ability of those who are highly accomplished in the field of art or who are socially recognized as artists [24]. However, with the debate over the specificity and universality of the field of creativity, the understanding of what constitutes artistic creativity has expanded, with Feist expanding the meaning of artistic creativity from the perspective of the unique abilities of a few to the creative potential or the ability to solve creative problems possessed by all individuals [25]. Subsequently, Zeki stated that artistic creativity is the ability of all individuals to solve artistic problems and produce new ideas or works of high aesthetic value [26]. Compared to scientific creativity, artistic creativity emphasizes the importance of artistic or aesthetic values and emotional factors in the creative process [27]. Heilman and Acosta suggest that artistic creativity is the ability of an individual to demonstrate artistic activities, which involves the fields of painting, sculpture, and photography [28]. The field of artistic creativity involves painting, sculpture, photography, and so on. This creativity is manifested in the uniqueness and innovativeness of an individual in creating, expressing, or appreciating artworks, which show a united relationship through the fusion of various shapes, textures, and colors, reflecting the individual's imagination, aesthetic concepts, creative thinking as well as exploring and innovating artistic forms and expressions. The ability of an artist to move away from the traditional use of a medium and experiment with new ways of presenting their work in an aesthetically pleasing way is a creative skill. Intrinsic motivation plays a central role and refers to an individual's interest in a task or job and the pleasure that arises during or after its completion [29]. This study follows the idea presented by Heilman and Acosta that artistic creativity encompasses several art forms such as painting, sculpture, and photography.

4. Creative Self-Efficacy

Tierney and Farmer (2002) introduced "creative self-efficacy" based on Amabile's theory of creativity, which is an assessment of an individual's confidence in his or her ability to produce creative results in a given task, and is a domain-specific manifestation of general self-efficacy [30]. According to Choi, creative self-efficacy is an individual's belief in the success of creative behavior in a given situation [31]. Richter et al. perspective states that creative self-efficacy is accumulated from an individual's previous creative behaviors and outcomes [32]. When engaging in creative activities, individuals are aware of their ability to complete the task and continue to accumulate feedback on their activities. When an individual faces a new task, creative self-efficacy reinforces the individual's beliefs, stimulates motivation, and helps him or her to complete the creative activity. This perspective helps to explain the extent to which individuals perceive creative activities, assess their ability to complete tasks, and the impact on task motivation, thus providing important theoretical support and direction for research. Abbott categorized creative self-efficacy into two dimensions, namely creative thinking self-efficacy and creative performance self-efficacy [33]. Karwowski proposed that creative self-efficacy is a set of beliefs that individuals believe they can solve problems creatively [34].

5. Hypothesized Inferences

Regarding the research related to gender differences, the study by Arslan et al. states that there is a significant difference between gender and critical thinking [35]. The results of the study revealed that female students have strong performance in critical thinking skills, compared to male students who have weaker critical thinking skills, and that educational and environmental factors have an impact on gender differences. The study by Shubina and Kulakli aimed to explore the

relationship between critical thinking and creativity and to assess the level of critical thinking and creativity among adolescents through empirical measurements [36]. It was found that the gender factor has a significant effect on critical thinking skills and creativity levels. Abdulla et al. results confirmed that females outperform males in creativity with significant gender differences [37]. Luo et al. investigated visual arts undergraduates' perceptions of gender stereotypes of creativity and the impact on creative self-efficacy [38]. Male students showed higher creative self-efficacy than female students, and gender stereotypes dominate art education in China and may hinder the development of creative self-efficacy among female students, leading to gender inequality in the visual arts. Based on the above views, this study proposes the research hypothesis H1: There are significant differences in critical thinking, artistic creativity, and creative self-efficacy among college students majoring in fine arts of different genders in Liaoning Province, China. H1a: There is a significant difference in critical thinking among art majors of different genders in Liaoning Province, China; H1b: There is a significant difference in artistic creativity among art majors of different genders in Liaoning Province, China; H1c: There is a significant difference in creative self-efficacy among art majors of different genders in Liaoning Province, China.

Regarding the studies related to grade differences, Orhan measured critical thinking among university students, and 297 valid questionnaires were collected, data analysis showed that university students' critical thinking tendencies were generally at an intermediate level, whereas the overall level of critical thinking skills was low, and there were significant grade differences [39]. Kibici used a convenience sampling method to randomly select 246 secondary school students attending selected schools in Mersin and Konya provinces [40]. The findings showed that there was a significant difference in the mean scores of students in terms of grade level in terms of artistic creativity. Maslak and Usova assessed students' creative self-efficacy based on the model's latent variable theoretical framework [41]. The results showed that there was a significant difference in creative self-efficacy in terms of grade level, i.e., first and second graders had higher creative self-efficacy than third and fourth graders. Based on the above, this study proposes the research hypothesis H2: There are significant differences in critical thinking, artistic creativity, and creative self-efficacy among college students majoring in fine arts in different grades in Liaoning Province, China. H2a: There are significant differences in critical thinking among college students majoring in fine arts in different grades in Liaoning Province, China; H2b: There are significant differences in artistic creativity among college students majoring in Fine Arts in different grades in Liaoning Province, China; H2c: There is a significant difference in creative self-efficacy among different grades of art major universities in Liaoning Province, China.

Impact of Critical Thinking on Artistic Creativity White and Robinson states that there is a strong correlation between critical thinking and artistic creativity [42]. Students who create art in conventional disciplines not only gain first-hand experience of artistic creativity but also become more adept at utilizing critical thinking styles while broadening and strengthening their understanding of these disciplines. Tsai's study aimed to explore the relationship between creative thinking and critical thinking among undergraduate art and design students in Macau [43]. A survey was conducted on 140 university students majoring in art and design in Macau. The results show that critical thinking and creativity are positively correlated. Students who excel in critical thinking demonstrate high levels of creative thinking. Based on the above observations, this study proposes the research hypothesis H3: Critical thinking significantly and positively affects artistic creativity among college students majoring in art in Liaoning Province, China.

The effect of critical thinking on creative self-efficacy. Qiang et al. used a questionnaire to confirm a significant positive correlation between critical thinking tendency and creative self-efficacy [44]. Lu et al.'s study found that an integrated program of critical thinking and creative thinking had a significant effect on students' creative thinking tendencies and creative self-efficacy [45]. Based on the above, this study proposed research hypothesis H4: Critical thinking significantly and positively affects creative self-efficacy among college students majoring in fine arts in Liaoning Province, China.

The effect of creative self-efficacy on artistic creativity. Chang et al. in a study examining the relationship between creative self-efficacy and creativity among primary and secondary school students stated that there is a significant positive correlation between creative self-efficacy and

creativity as well as the three dimensions of creativity [46]. Based on the above points, this study proposes research hypothesis H5: Creative self-efficacy of college students majoring in fine arts in Liaoning Province, China, significantly and positively affects artistic creativity.

The mediating effect of creative self-efficacy in critical thinking and artistic creativity. Woerkom and Croon's study elaborated on the role of creative self-efficacy, and the results of data analysis showed that creative self-efficacy mediates the relationship between critical thinking and creative behavior [47]. Wang et al. selected 261 junior high school students as survey respondents and examined the effects of different evaluation types on artistic creativity [48]. The study showed that creative self-efficacy played a moderating role in the effect of evaluation on artistic creativity. Based on the above viewpoints, this study proposed the research hypothesis H6: The creative self-efficacy of college students majoring in fine arts in Liaoning Province, China, has a mediating effect on critical thinking and artistic creativity.

RESEARCH METHODOLOGY

This study formulates a research framework based on the research objectives and the results of the literature review to understand the relationships and connotations between the variables. This study investigates the relationship between critical thinking, artistic creativity, and creative self-efficacy among college students majoring in fine arts in Liaoning Province, China. Therefore, the independent variable of this study is critical thinking, the dependent variable is artistic creativity, the mediator variable is creative self-efficacy, and the background variables are gender and grade level. The details are shown in the figure below.

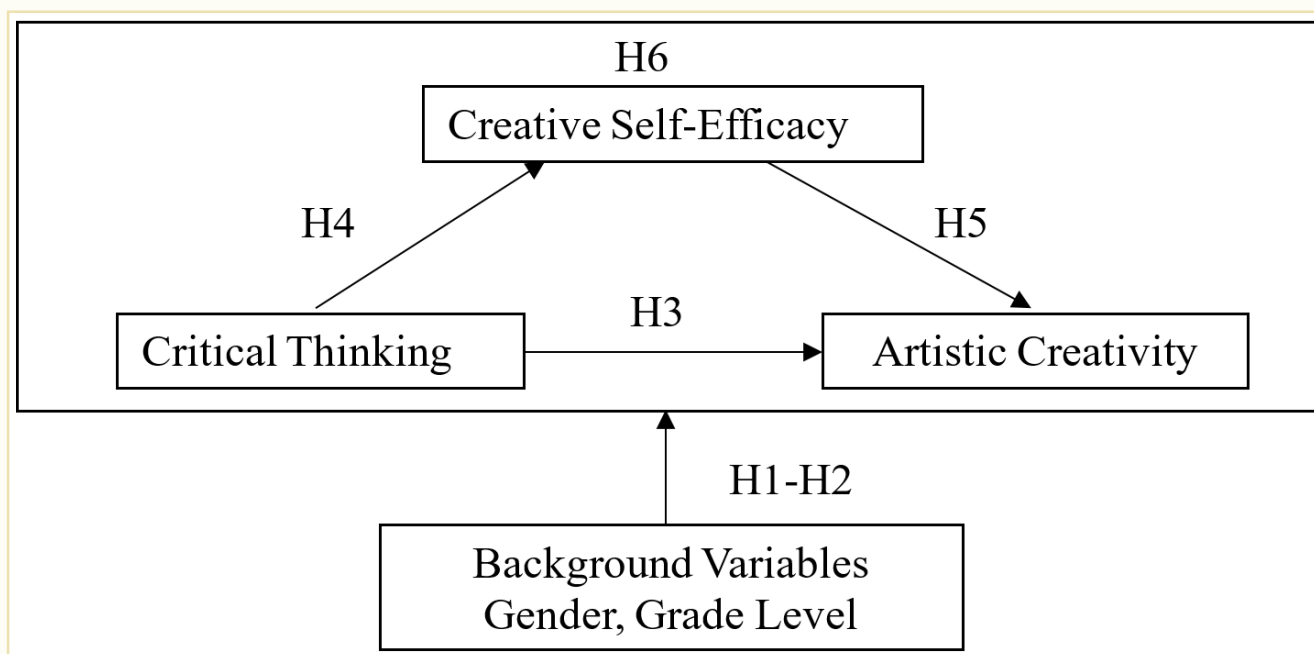


Figure 1 Research Framework Diagram

1. Research Subjects

In this study, students from two fine arts universities in Liaoning Province, China, will be selected as the research subjects. Students in fine arts colleges usually have creative thinking, and as art majors, they often have rich imagination and creative thinking and can create unique and expressive works through their observation, thinking, and expression. In this study, the principle of pre-test size proposed by Wu and Tu was followed the sample size was determined based on 3-5 times the subscale that contained the most question items in the questionnaire [49]. To fulfill the above sample requirements, this study used convenience sampling to select students from two fine arts universities in Liaoning Province, China. To ensure the credibility of the questionnaires, pre-test questionnaires

were first administered for analysis in this study. A total of three subscales were used in this study, and the Critical Thinking Scale, which has the most number of questions, contains 17 items, thus at least 85 questionnaires were required to be distributed, and 180 questionnaires were distributed to cope with the possibility of invalid questionnaires. It is also required that when the study involves the use of scales, the sample size should be at least 10 times the total number of questions [50], and the three scales used in this study have a total of 37 questions, and the data should be validly recovered in 370 copies, considering the possibility of invalid questionnaires, so the official questionnaires were distributed in a total of 800 copies. Meanwhile, the reliability of the selected scales was tested by an internal consistency test, and then the validity of the scales was tested by validated factor analysis to ensure the accuracy and adaptability of the questionnaire design [51].

2. Research Method

This study uses the questionnaire survey method, which has several advantages as a commonly used research method, with multiple advantages such as efficiency, economy, resource conservation, anonymity, standardization, wide applicability, flexibility and convenience, and objectivity [52]. Questionnaire surveys do not require the researcher to conduct interviews in person, and respondents can complete the questionnaire at their own time and place, saving the researcher's time and cost [53].

3. Research Instruments

The questionnaire of this study consists of three parts, namely, the Critical Thinking Scale, the Artistic Creativity Scale, and the Creative Self-Efficacy Scale, and the contents of the specific scales and the results of the reliability and validity measurements are as follows:

The critical thinking scale developed by Hou Yubo et al. was used in this study [54]. The scale consists of three dimensions: critical analysis skills, openness to criticism, and applying criticism, with a total of 17 items. 5, 8, 10, 11, 12, 13, 14, and 15 are critical analysis skills; 1, 2, 7, 16, and 17 are openness to criticism and are reversed items; and 3, 4, 6, and 9 are applying criticism. The scale was rated on a 7-point Likert scale from 1 to 7 as "Totally Disagree", "Disagree", "Somewhat Disagree", "Generally", "somewhat agree", "agree", and "completely agree". In a comprehensive assessment analysis of the data recovered from the pretest, the overall Cronbach's alpha for the scale was .922, the Kaiser-Meyer-Olkin (KMO) value was .907, Bartlett's spherical check value 1653.631 ($p=.000$), the factor loadings for each question item ranged from .746-.843, and the cumulative total explanatory variance of the factors in the three dimensions had a cumulative total explained variance of 69.614% for the factors, indicating that the Critical Thinking Scale has good reliability and validity. An internal consistency test of the formal measure of critical thinking found that the overall Cronbach's alpha coefficient of the scale was .914, indicating that the reliability of the formally analyzed critical thinking measure was good; The results of the validated factor analysis of the Critical Thinking Scale showed $\chi^2/df = 2.155$, which is less than the reference value of 5 indicating a good model fit; the results of the convergent validity test of the Critical Thinking Scale showed that the standardized factor loadings for the critical thinking variables ranged from .762-.816, which were all over the .500 criterion value, indicating good validity.

In this study, we used the Kaufman Domains of Creativity Scale (K-DOCS) [55], which contains 50 items in Chinese and is divided into five dimensions: everyday creativity, academic creativity, expressive creativity (including writing and music), mechanical/scientific creativity, and artistic creativity. In this study, we mainly excerpted the items of the scale on artistic creativity as the scale for measuring the artistic creativity of art students in this study. There are 9 items on a 5-point Likert scale, with 1 to 5 representing "little creativity", "a little creativity", "average creativity", "More creative", and "A lot creative". The scale is one-dimensional, and in a comprehensive assessment analysis of the data recovered from the pretest, it had an overall Cronbach's alpha value of .932, a Kaiser-Meyer-Olkin (KMO) value of .937, Bartlett's spherical check value of 889.395 ($p=.000$), and factor loadings on the various question items that ranged from .770-.884, and a cumulative total explained variance of 64.717% for the factors in the three dimensions, indicating

that the Artistic Creativity Scale has good reliability and validity. The internal consistency test of the formal measurement instrument of artistic creativity found that the overall Cronbach's alpha coefficient of the scale was .914, indicating that the reliability of the formally analyzed instrument for measuring artistic creativity was good; the results of the validation factor analysis of the Power of Artistic Creativity Scale showed that the $\chi^2/df = 1.206$, which was smaller than the reference value of 5 indicating a good model fit; the convergent validity test results showed that the standardized factor loadings for the artistic creativity variables ranged from .741-.762, all exceeding the .500 standard value, indicating good validity.

The present study utilized the Creativity Self-Efficacy Scale developed by Hill et al. [56]. The scale consists of three dimensions: ability efficacy, cognitive efficacy, and task efficacy, with a total of 11 items: 1, 4, 6, and 9 for ability efficacy; 2, 7, and 10 for cognitive efficacy; and 3, 5, 8, and 11 for task efficacy. The scale is based on a 5-point Likert scale from 1 to 5 as follows "Not at all", "not quite", "Somewhat", "fairly", and "fully". In a comprehensive assessment analysis of the data recovered from the pretest, the overall Cronbach's alpha for the scale was .840, the Kaiser-Meyer-Olkin (KMO) value was .813, the Bartlett's spherical check value was 773.671 ($p=.000$), the factor loadings for each question item ranged from .771-.857, and the three dimensions with a cumulative total explained variance of 70.347% for the factors, indicating that the Creative Self-Efficacy Scale has good reliability. The internal consistency test of the formal instrument of creative self-efficacy revealed that the overall Cronbach's alpha coefficient of the scale was .828, indicating that the reliability of the formally analyzed instrument of creative self-efficacy was good; the results of the validated factor analysis of the Creative Self-Efficacy Scale showed $\chi^2/df = 11.264$, which is less than the reference value of 5 indicating a good model fit; the results of the convergent validity test of the Creative Self-Efficacy Scale showed that the standardized factor loadings for the creative self-efficacy variables ranged from .734-.832, which were all over the .500 criterion value, indicating good validity.

In this study, an unrotated factor analysis was conducted on all question items with a KMO value of .931, which is higher than the reference value of .800, and the p-value of Bartlett's test of sphericity reached significance, indicating that the data were suitable for factor analysis. In total, seven factors with eigenvalues greater than 1 were extracted, and the first factor explained 30.435% of the variance, which is lower than the 50% reference value. This indicates that there is no common method bias in the official questionnaire data collected for this study.

ANALYSIS OF STUDY RESULTS

1. Descriptive Statistical Analysis

To gain a deeper understanding of the distribution of background variables and the current status of critical thinking, artistic creativity, and creative self-efficacy of students in fine arts universities in Liaoning Province, descriptive statistical analysis was conducted in this study. A total of 800 questionnaires were recovered in this study, and after deleting the invalid questionnaires with too short a response time or too repetitive answers, the valid questionnaires were 755, with an effective recovery rate of 94.38%.

This study investigated the background variables of students in fine arts universities in Liaoning Province as gender and grade level. The results of the study showed that in terms of gender: 409 male students accounted for 52.77%; 366 female students accounted for 47.23%, with a relatively even distribution. In terms of grade level: 201 freshmen students accounted for 25.94%; 201 sophomores accounted for 25.94%; 195 juniors accounted for 25.16%; and 178 seniors accounted for 22.97%, with a relatively even distribution.

In this study, the mean and standard deviation were used to analyze the current status of students' critical thinking, artistic creativity, and creative self-efficacy in fine arts universities in Liaoning Province, and descriptive statistics were analyzed for 755 valid formal samples.

Descriptive statistical analysis of the critical thinking scale showed that the critical thinking of the students in the fine arts universities in Liaoning Province ($M=4.355$, $SD=1.062$) was higher than the theoretical median, indicating that the critical thinking of the students in the fine arts universities in Liaoning Province belonged to the middle-upper level; and the descriptive statistical analysis of the artistic creativity scale showed that the artistic creativity of the students in the fine arts universities in Liaoning Province ($M=3.317$, $SD=1.093$) was higher than the theoretical median, indicating that the artistic creativity of the students of Liaoning Fine Arts University was in the upper middle level. Descriptive statistical analysis of the Creative Self-Efficacy Scale showed that the Creative Self-Efficacy ($M=3.240$, $SD=0.860$) of the students of Liaoning Fine Arts University was higher than the theoretical median, which indicated that the Creative Self-Efficacy of the students of Liaoning Fine Arts University was in the middle-upper level.

2. Analysis of Differences

To test whether there are significant differences in critical thinking, artistic creativity, and creative self-efficacy among students of different genders in Liaoning Fine Arts Universities, this study utilized an independent samples t-test to conduct the test. The gender grouping was set as male and female students.

There was a significant difference in critical thinking among students of Liaoning Fine Arts University by gender ($t=7.495^{***}$), which was significantly higher among female students ($M\pm SD: 4.647\pm 1.046$) than male students ($M\pm SD: 4.094\pm 1.008$), indicating that female students were significantly higher in critical thinking than male students. The result of the difference in artistic creativity of students of Liaoning Fine Arts University by gender ($t=1.905$) shows that there is no significant difference in artistic creativity of students of Liaoning Fine Arts University by gender. There is a significant difference in creative self-efficacy ($t=6.076^{***}$) among students of Liaoning Fine Arts University by gender, with female students ($M\pm SD: 3.435\pm 0.879$) significantly higher than male students ($M\pm SD: 3.066\pm 0.805$), indicating that female students are significantly higher than male students in creative self-efficacy.

Table 1

Difference analysis table for students of different genders in Liaoning Province Fine Arts University

Test Variable	M $\pm$ SD		t	p	Comparison of Differences
	Male (n=409)	Female (n=366)			
Critical Thinking	4.094 $\pm$ 1.008	4.647 $\pm$ 1.046	7.495	.000	F>M
Artistic Creativity	3.246 $\pm$ 1.042	3.396 $\pm$ 1.144	1.905	.057	—
Creative Self-Efficacy	3.066 $\pm$ 0.805	3.435 $\pm$ 0.879	6.076	.000	F>M

To test whether there is a significant difference in critical thinking among students in different grade levels of Liaoning Fine Arts University, this study used one-way ANOVA analysis and post hoc multiple comparisons. The grade groupings were set as freshmen, sophomores, juniors, and seniors.

There was a significant difference in critical thinking ($F=22.231^{***}$) among the students of Liaoning Fine Arts University at different grade levels, thus post hoc comparisons were needed. Due to the heterogeneity of the sample variances, Dunnett's T3 was used to check the results, which showed that $3>1$; and $4>1$. It showed that third-year students ($M\pm SD: 4.532\pm 0.810$) were significantly higher in critical thinking than first-year students ($M\pm SD: 4.072\pm 1.175$) and fourth-year students ($M\pm SD: 4.784\pm 1.279$) were significantly higher in critical thinking than first-year students ($M\pm SD: 4.072\pm 1.175$). There was a significant difference in artistic creativity ($F=7.275^{***}$) among the students of Liaoning Fine Arts University in different grades, so post hoc comparisons were needed. Due to the heterogeneity of the sample variances, Dunnett's T3 was used to check the results: $3>1$; $4>1$. It showed that the third-year students ($M\pm SD: 3.499\pm 1.085$) were significantly higher than the first-year students ($M\pm SD: 3.049\pm 1.114$) in Artistic Creativity, and the fourth-year students ($M\pm SD: 3.471\pm 1.142$) were significantly higher than the first year students ($M\pm SD: 3.471\pm 1.142$) in Artistic Creativity. significantly higher than freshmen students ($M\pm SD: 3.049\pm 1.114$). There was a significant difference in creative self-efficacy ($F=13.306^{***}$)

among students in different grades of Liaoning Fine Arts Universities, thus post hoc comparisons are needed. Due to the heterogeneity of the sample variances, the results were examined using Dunnett's T3: $4 > 1$; $4 > 2$. This indicated that fourth-year students ($M \pm SD$: 3.510 ± 0.993) were significantly more likely than freshmen students ($M \pm SD$: 3.033 ± 0.889) to have creative self-efficacy, and fourth-year students ($M \pm SD$: 3.510 ± 0.993) were significantly more likely than sophomores to have creative self-efficacy, and fourth-year students ($M \pm SD$: 3.510 ± 0.993) were significantly more likely than sophomores to have creative self-efficacy. self-efficacy was significantly higher than sophomores ($M \pm SD$: 3.097 ± 0.663).

Table 2

Table analyzing the difference between students in different grades of Liaoning Province Fine Arts Universities

Test Variable	M $\pm$ SD		
	Critical Thinking	Artistic Creativity	Creative Self-Efficacy
1 (n=201)	4.072 $\pm$ 1.175	3.049 $\pm$ 1.114	3.033 $\pm$ 0.889
2 (n=201)	4.086 $\pm$ 0.744	3.272 $\pm$ 0.980	3.097 $\pm$ 0.663
3 (n=195)	4.532 $\pm$ 0.810	3.499 $\pm$ 1.085	3.354 $\pm$ 0.799
4 (n=178)	4.784 $\pm$ 1.279	3.471 $\pm$ 1.142	3.510 $\pm$ 0.993
F	22.231***	7.275***	13.306***
Dunnett's T3	3>1; 4>1	3>1; 4>1	4>1; 4>2

3. Correlation Analysis

In this study, to investigate the correlation between critical thinking, artistic creativity, and creative self-efficacy among college students majoring in fine arts in different grades in Liaoning Province, China, Pearson correlation analysis was used to test the correlation between the dimensions of the three variables.

The results of Pearson's correlation analysis showed that the correlations among critical thinking, artistic creativity, and creative self-efficacy among college students majoring in fine arts in different grades in Liaoning Province, China, were statistically significant ($p < .001$). Critical thinking was significantly and positively correlated with artistic creativity ($r = .437$, $p < .001$), critical thinking was significantly and positively correlated with creative self-efficacy ($r = .597$, $p < .001$), and artistic creativity was significantly and positively correlated with creative self-efficacy ($r = .413$, $p < .001$). All were low to moderate correlations with no covariance issues.

Table 3

Correlation Analysis Table

Variable	Critical Thinking	Artistic Creativity	Creative Self-Efficacy
Critical Thinking	1		
Artistic Creativity	.437***	1	
Creative Self-Efficacy	.597***	.413***	1

4. Regression Analysis

The independent variable in this study is critical thinking, the dependent variable is artistic creativity, the mediator variable is creative self-efficacy, and the control context variables are categorized as gender and grade level. Regression analysis was conducted as the variables were significantly correlated in the correlation analysis and there was no problem of covariance.

In Model I, the F-value reached significance. Critical thinking significantly and positively affects artistic creativity ($\beta = .442$, $p < .001$) indicating that the better the critical thinking the better the

artistic creativity of the students. The results showed an R2 value of 0.218, indicating that critical thinking explained 21.80% of the variance in artistic creativity controlling for background variables. Therefore, hypothesis H3: Critical thinking significantly and positively influences artistic creativity among college students majoring in fine arts in Liaoning Province, China, is established.

In model II, the F-value reached significance. Critical thinking significantly and positively affects creative self-efficacy ($\beta=.579$, $p<.001$) indicating that the better the critical thinking the higher the creative self-efficacy of the students. The results showed an R2 value of .358, indicating that critical thinking explained 35.80% of the variance in creative self-efficacy controlling for background variables. Therefore, hypothesis H4: Critical thinking significantly and positively influences creative self-efficacy among college students majoring in fine arts in Liaoning Province, China, is established.

In Model III, the F-value reached significance. Creative self-efficacy significantly and positively affects artistic creativity ($\beta=.412$, $p<.001$) indicating that the higher the creative self-efficacy the better the artistic creativity of the students. The results showed an R2 value of 0.199, indicating that creative self-efficacy explained 19.90% of the variance in artistic creativity controlling for background variables. Therefore, Hypothesis H5: Creative self-efficacy significantly and positively influences artistic creativity among college students majoring in fine arts in Liaoning Province, China, is established.

Table 4

Table of Regression Analysis Results

	Model I		Model II		Model III		Model IV	
Variable	Artistic Creativity		Creative Self-Efficacy		Artistic Creativity		Artistic Creativity	
	β	t	β	t	β	t	β	t
Control Variable								
Female	-.326	-4.857***	.074	1.219	-.332	-4.880***	-.344	-5.246***
2	.081	2.093*	.030	.857	.070	1.794	.074	1.950
3	.352	5.379***	-.005	-.092	.373	5.637***	.353	5.531***
4	.265	4.361***	.018	.323	.298	4.857***	.261	4.394***
Critical Thinking	.442	13.308***	.579	19.255***			.301	7.636***
Creative Self-Efficacy					.412	12.451***	.243	6.247***
F	44.165***		87.154***		39.546***		45.128***	
R2	0.223		0.362		0.205		0.261	
ΔR^2	0.218		0.358		0.199		0.255	

Note 1: * $p<.05$; *** $p<.001$

Note 2: Male students are used as the control group in gender and freshman year in grade.

In Model IV, the F-value reached significance. Critical thinking significantly and positively influenced artistic creativity ($\beta=.301$, $p<.001$). Creative self-efficacy significantly positively influenced artistic creativity ($\beta=.243$, $p<.001$). The results showed an R2 value of .255, indicating that critical thinking and creative self-efficacy explained 25.50% of the variance in artistic creativity controlling for background variables. Comparing Model 1 and Model 4, the standardized regression coefficient of critical thinking on artistic creativity decreased from .442 to .301 after the addition of creative self-efficacy, indicating that creative self-efficacy plays a partial mediating role between critical thinking and artistic creativity. Therefore, hypothesis H6: Creative self-efficacy in critical thinking and artistic creativity among college students majoring in fine arts in Liaoning Province, China, is established.

DISCUSSION OF THE RESULTS

In this study, there are significant differences in critical thinking among students of different genders in Liaoning Fine Arts University, and the results show that female students are significantly higher than male students in critical thinking. The results demonstrate that women generally show higher abilities and tendencies when it comes to critical thinking [36]. There is no significant

difference in artistic creativity among students of different genders in Liaoning Fine Arts University, which is contrary to the conclusion of previous studies. Studies have shown that women are more creative in the field of art, and there is a significant gender difference [37]. The reason may be that artistic creativity is closely related to an individual's interest and commitment in a particular field, which is not limited by gender [57]. There are significant differences in creative self-efficacy among students of different genders in Liaoning Fine Arts University. The results show that female students are significantly higher than male students in creative self-efficacy. Previous studies have shown that male students have a higher sense of creative self-efficacy than female students, and it is believed that gender stereotypes hinder the development of female students' creative self-efficacy, leading to gender inequality in the field of art [38].

In this study, there are significant differences in critical thinking among students of different grades in Liaoning Fine arts University, and the results show that students' critical thinking ability is gradually enhanced with the improvement of grade. With the increase of grade, college students have experienced more academic and life challenges, and gradually formed a more mature way of thinking and problem solving ability. In the face of complex and changeable real problems, they can analyze and deal with them more calmly, so that critical thinking has been continuously developed and improved [58]. There are significant differences in artistic creativity among students of different grades in Liaoning Fine arts University. The results show that artistic creativity gradually increases with age. Students experience more learning and life experiences, expand their understanding and insight of the world, and thus enhance their own creative ability [59]. There are significant differences in creative self-efficacy among students of different grades in Liaoning Fine Arts University. The results show that senior students' creative self-efficacy is significantly higher than that of freshman students, and senior students' creative self-efficacy is significantly higher than that of sophomore students. It can be seen that in the first year, many students lack sufficient confidence and understanding of their artistic ability and creative potential, mainly because they have just entered the university and have not mastered the professional knowledge and skills deeply enough. However, after several years of professional learning and a lot of practical accumulation, students gradually build confidence in their own abilities and dare to try new forms and methods of creation [60].

Through the quantitative research results, it can be seen that the critical thinking of fine arts students in Liaoning Province has a significant positive impact on artistic creativity. This conclusion further validates the previous view that "critical thinking is the foundation of creative thinking" [61]. Critical thinking has a significant positive impact on creative self-efficacy of fine arts majors in Liaoning Province, China, that is, the higher the critical thinking tendency of students, the higher the creative self-efficacy. Some studies have proved that critical thinking can effectively improve individuals' creative self-efficacy [62]. Students with high critical thinking usually show an open mind, can accept a variety of different viewpoints and opinions at the same time, and maintain a strong curiosity for knowledge, and pursue the truth and objectivity of knowledge. Creative self-efficacy of college students majoring in fine arts in Liaoning Province has a significant positive impact on artistic creativity. The results show that there is a significant positive correlation between creative self-efficacy and creativity, and the former can effectively predict the latter level. As a special field of creativity, artistic creativity has received less attention than other fields of creativity in the research, but there have been studies to confirm the close relationship between the two. This relationship is mainly determined by the nature of creativity and creative activities [63]. Creative self-efficacy of college students majoring in fine arts in Liaoning Province of China has a partial mediating effect between critical thinking and artistic creativity. Students with typical critical thinking tendencies are more willing than ordinary people to try new and original solutions to problems and show a higher level of creative self-efficacy. These characteristics enable students to show a higher sense of creative self-efficacy in creative activities, so as to effectively resist the damage of external negative factors to creativity, and significantly improve students' creativity level [64].

CONCLUSIONS AND RECOMMENDATIONS

From the results of data analysis of critical thinking, artistic creativity, and creative self-efficacy of art major college students in Liaoning Province, China, it was found that there were significant differences in critical thinking and creative self-efficacy and no significant differences in artistic creativity among art major college students of different genders; and that there were significant differences in critical thinking, artistic creativity, and creative self-efficacy among art major college

students of different grades in Liaoning Province, China. Critical thinking, artistic creativity, and creative self-efficacy. Critical thinking significantly and positively affects artistic creativity among art majors in Liaoning Province, China. Critical thinking significantly and positively influences creative self-efficacy among art majors in Liaoning Province, China. Creative self-efficacy significantly and positively influences artistic creativity among college students majoring in Fine Arts in Liaoning Province, China. Creative self-efficacy of college students majoring in Fine Arts in Liaoning Province, China, partially mediates the effect of critical thinking and artistic creativity.

To better enhance the overall quality of students, this study proposes relevant research recommendations aimed at helping students achieve higher levels of academic and artistic creativity.

Create an equal and open teaching environment. When designing and implementing critical thinking training programs, educators and schools should consider gender differences and adopt different teaching strategies to meet the needs of students of different genders.

Cultivate abstract analytical thinking. Teachers can cultivate students' abstract thinking and analytical ability through a variety of specific guidance methods, so as to enhance students' critical thinking and creative self-efficacy. Teachers can ask open-ended questions and guide students to think about problems from different angles.

Strengthen art appreciation ability. The goal of art appreciation teaching is to improve students' critical thinking ability and stimulate their initiative to solve problems. The teaching of art appreciation can help students to construct their own aesthetic schema, and also enhance their creative ability and problem-solving ability.

Break through schema imitation. Students can engage in interdisciplinary art creation training and create interactive art installations. It is helpful for students to expand the boundaries of creation in the traditional art field, and it can also integrate knowledge and methods from other disciplines into students' artistic creation, so as to stimulate innovative thinking, enrich creative content and improve artistic creativity.

Strengthen the cultivation of professional self-confidence. College students' professional confidence refers to their confidence and trust in their ability and knowledge level in a specific professional field. The establishment of a self-confidence level evaluation system for college students can be used to assess and enhance the professional self-confidence of art majors through a systematic approach, thus improving students' creative self-efficacy.

Cultivate students' self-practice ability. Teachers should arrange more hands-on practical activities for students, such as the use of art materials and the mastery of techniques, so that students can deeply explore art materials and techniques in actual operation, which is conducive to students' understanding of theoretical knowledge, and improve students' creativity through specific operations.

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