Deep Integration Practice of Intelligent Information Technology and Art Design Education under the Background of Scientific Programming

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Abstract: The integration of IT into school art design courses was investigated in this paper, focusing on the changes in art design teaching content under IT. The paper discussed the changes in art design teaching methods under IT and emphasized the major issue of integrating art design teaching and IT. It also highlighted the challenges of IT to traditional art design education and proposed higher demands on teachers and students due to the integration of IT and art design teaching. The paper suggested using the decision tree algorithm to strengthen the integration of intelligent IT and art design education, as well as building a teaching model for the integration of IT and art design professional courses. According to the experiment and investigation, the decision tree algorithm was introduced into the construction of the deep integration system of intelligent IT and art design education, resulting in a new art design education system with 21% higher satisfaction than the traditional system.

1. Introduction

The integration of IT and art design education has led to extensive and profound experiences and reflections on the balance between research rigor and creative enjoyment. It has facilitated the design, development, evaluation, and management of educational resources for art education, utilizing modern education theory and intelligent IT to revolutionize art teaching.

Intelligent IT is widely used in art design education. Atahanova F Z examined art education formation in various countries and briefly reviewed design development post-country establishment [1]. Meyer Michael W believed designers face complex challenges and provided an action plan for design development [2]. Blunden Jennifer called for broader discussion of writing in art design classrooms and ensuring consistency with art design values and curriculum [3]. Safronova Olena found urban and marine culture to be concentrated, diverse, regional, and radiative, emphasizing the importance of public art design in urban image design [4]. Andrahennadi Kumanga Chanduni aimed to narrow the gap between meditation-based positive thinking methods in advanced design education and the growing psychological health crisis [5]. Dyachenko Alla revealed the

characteristics of art industry education formation at various stages [6]. Gal David analyzed ethnocentrism in post-modern heritage and its impact on art education theory and practice [7]. These studies highlight the importance of art design education but note deficiencies in intelligent IT research.

Several scholars have studied intelligent IT in art design. Bedenier Svenja emphasized the need to understand how educational technology can improve student participation in higher education, particularly in the arts and humanities [8]. Al Hashimi Samaa's survey found that many educators are starting to use various digital tools in their classrooms, exploring the integration of creativity, technology, and art design education [9]. Kong Fanwen reviewed the application of artificial intelligence in art teaching and summarized the associated problems [10]. These studies have analyzed the application of intelligent IT in art design, but there are still deficiencies.

The integration of IT and art design education is essential for the development of both IT and education. It aims to change the traditional teacher-centered teaching mode and establish a new, more innovative teaching approach. This shift not only empowers teachers but also facilitates the innovation of teaching content, methods, and concepts, creating a conducive learning environment for students' information literacy and innovative development.

2. Possibility of the Integration of IT and School Art Design Courses

2.1 Changes in the Teaching Content of Art Design under IT

The Internet's widespread use has ushered in the IT era, establishing a network platform for rapid information exchange and collection. This has paved the way for modern art design education, particularly in hand-painting and image processing. IT has not only expanded traditional art design education but also reformed its content. For instance, schools can develop software to enhance image processing and hand-painting skills, nurturing talents suitable for the modern age. The integration of intelligent IT into art design teaching has led to significant changes in modern art design education.

2.2 Changes in Teaching Methods of Art Design under IT

IT has changed the traditional teaching methods and models. Teachers can use modern multimedia equipment to educate art design. Using IT to fill in the originally dull and abstract learning content can make it lively and interesting, thus improving students' understanding and mastery. This can also cultivate students' observation ability in art design education, which is an important part of education. Making full use of IT, teachers can use teaching materials, teaching videos and other means to transmit teaching content through multimedia equipment. In this process, teachers can also give detailed teaching explanations, which can promote students to better understand the effectiveness and ability of different observation methods.

2.3 Integration of Art Design Teaching and IT is a Major Issue Facing Art Design

The current form of art design expression lacks innovation, hindering its innovative development. Innovation is crucial for creative progress in art design. In the information age, modern IT is used by consumers and designers to explore design concepts and create new artistic spaces, unprecedentedly impacting the art design industry [11]. Intelligent IT enhances art design possibilities and improves teacher training, enhancing problem-solving and cooperative learning abilities. By integrating artistic design with artificial intelligence, scientific design is achieved, making design more feasible and futuristic (Figure 1). Key challenges in art design teaching include

the scientific application of modern IT, innovation and development of IT in teaching, improving student motivation, and enhancing educational effectiveness.
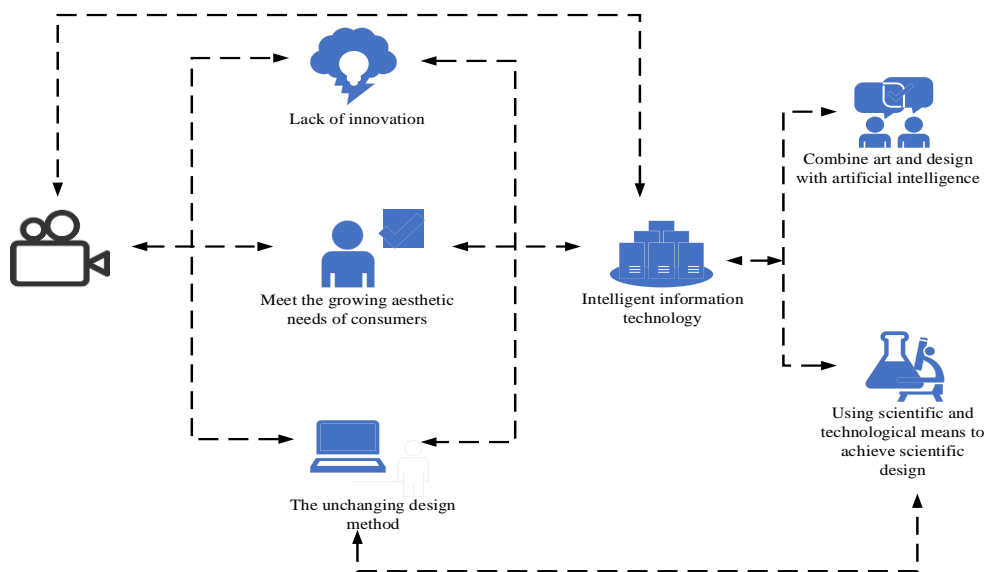

Figure 1: Integration of art design teaching and IT

3. Thoughts Triggered by the Integration of IT and Art Design Courses

3.1 Challenge of IT to Traditional Art Design Education

The rise of IT has significantly impacted education, particularly traditional forms, posing new challenges[12]. Distance education is revolutionizing traditional methods and offers significant advantages. In traditional art design teaching, students primarily engage with materials in the classroom. However, with IT's advancement, students can access online education and consultations, enabling them to learn independently at their convenience, known as distance learning. Although this shift has changed the traditional school-centered learning model, there are initial drawbacks, such as the need to strengthen direct online communication between teachers and students. Moreover, students with low self-discipline and autonomy may struggle. In essence, IT's development presents new opportunities for the advancement of art design education.

3.2 Integration of IT and Art Design Teaching Puts Forward Higher Requirements for Teachers and Students

In the information age, art teachers need higher quality and teaching ability. The traditional teaching mode emphasizes students' understanding of learning materials and teaching methods, which is crucial in this era. It also provides new teaching resources, such as teaching material processing. The application of IT has brought new characteristics to students' learning methods and attitudes, posing challenges to art design teachers. The information age requires art design teachers to actively study relevant educational theories and improve their information literacy. Constructivism theory's core is student-centered learning, promoting active exploration and learning. Unlike traditional courses, it encourages free choice and independent learning, but some students may struggle with the abundance of information online. This can lead to polarization of students' levels (Figure 2).
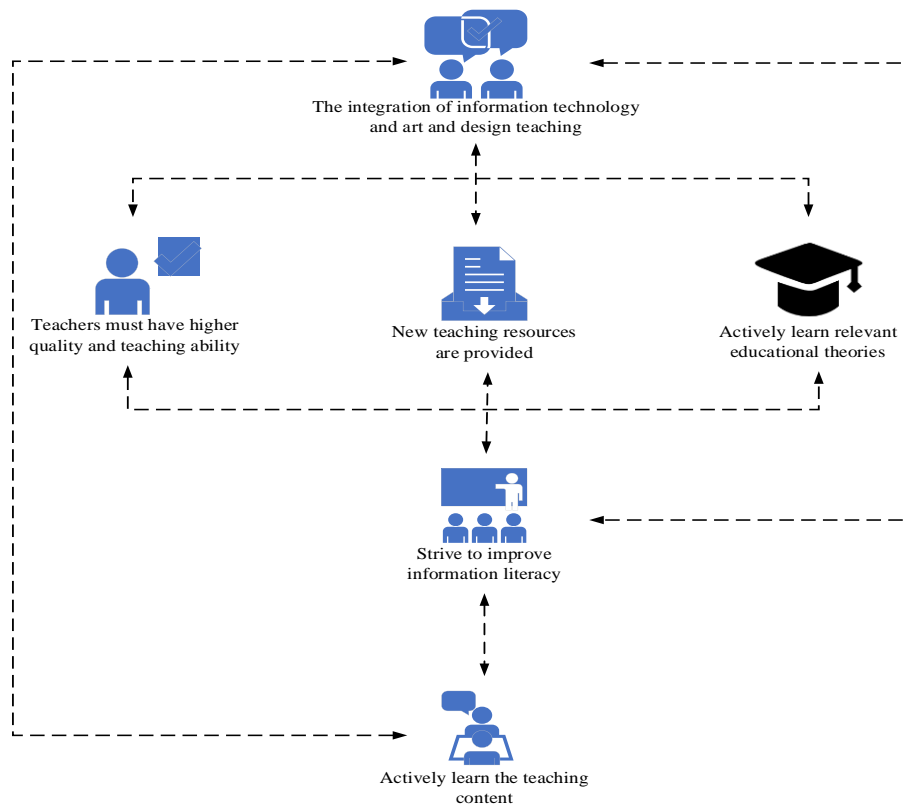
Figure 2: Integration of IT and art design teaching

3.3 Necessity of Promoting the Integration of Teaching Methods and IT in Art Design Specialty

Teachers guide students to study specific textbook content and introduce problem-solving methods. Students can then search for information, share their findings online, and collaborate to enhance their learning. By converting their results into web content linked to classroom pages, everyone can benefit from shared learning. This approach fosters students' innovative and practical abilities, provides learning materials, and encourages self-directed learning. IT education emphasizes scientific methods, values, and practical innovation, enabling students to solve real-world problems. It also facilitates information exchange, idea sharing, and peer evaluation across different schools. Students can actively utilize online resources to enhance their self-learning capabilities. This shift in learning methods promotes collaboration, communication, and deeper understanding of knowledge in the classroom.

4. Integration of Intelligent IT and Art Design Education Strengthened by Decision Tree Algorithm

The core idea of decision tree algorithm is to use information amplification to verify the data set attributes of all stages of decision tree nodes. The attribute with the highest information amplification factor is selected as an example of the test attribute, and the branch is defined according to the different values of the attribute. This method is used to reassign the next level of the node, and assign the decision tree branch for each branch's example set. The decision tree classification algorithm is based on the following principles:

It is supposed that P is the training set, and p is the number of samples. It is supposed

$H_i(i = 1, 2, ..., m)$ has m different values, and p_i is the number of samples in class H_i. The expected information is given by Formula (1):

$$J(p_1, p_2, ... p_i) = -(k_1 \cdot \log_2(k_1) + k_2 \cdot \log_2(k_2) + ... + k_m \cdot \log_2(k_m)) \tag{1}$$

Among them, $k_i = p_i / p$ is the probability that any sample belongs to H_i.

If attribute α has δ different values (α_1, α_2, α_3), attribute α can be used to divide P into δ subsets (P_1, P_2, P_3); the samples in k_i have the same value P_i on attribute α, Formula (2) can be obtained:

$$E(\alpha) = \sum_{i=1}^{\delta} \frac{p_{ij} + ... + \alpha_{mj}}{P} J(\alpha_{ij}, ..., \alpha_{mj}) \tag{2}$$

Among them, $\dfrac{p_{ij} + ... + p_{mj}}{P}$ acts as the weight of subset J. At this time, the coding information obtained by branching on the α attribute is calculated by Formula (3).

$$Gain(\alpha) = J(p_1, p_2, ..., p_m) - E(\alpha) \tag{3}$$

By calculating the information gain of each attribute, the attribute with the highest information gain is selected as the test attribute of given α.

5. Construction of the Teaching Model for the Integration of IT and Art Design Courses

5.1 Development of Online Courses for Art Design Majors

To enhance students' online access to art design information, schools can create a web-based learning environment. Drawing on construction learning theory, internet resources can be used to meet student needs. Clear course objectives are crucial for online art design courses. The curriculum should integrate teaching practice, theory, and IT, catering to different levels of art design education. This approach promotes immersive learning, broadens perspectives, and enhances understanding of network and curriculum topics, fostering adaptability. IT education should be integrated into disciplinary guidance, rather than being limited to self-study [13].

5.2 Integration of IT and Art Design Education Promoted by Intelligent Digital Education Technology

Intelligent digital education technology (IDET) is crucial for promoting art design as a social productivity. However, contemporary art design education faces issues such as closed classrooms and a lack of emphasis on creativity. Society needs to recognize the significance of IDET in art design education. Schools should prioritize the academic status of art design education and implement teaching reforms to better develop students. The current lack of recognition and respect for art design education's importance and role in school education needs to be addressed [14].

The use of network information resources can greatly enhance art design courses by providing multimedia content such as text, images, audio, and video. This enriches the learning experience, facilitates classroom discussions, and promotes knowledge exchange among teachers. It also allows access to high-quality learning materials and curriculum records, promoting interactive learning experiences and transcending the constraints of time and space[15]. This approach encourages independent learning, supports personalized learning, and stimulates learning motivation, promoting

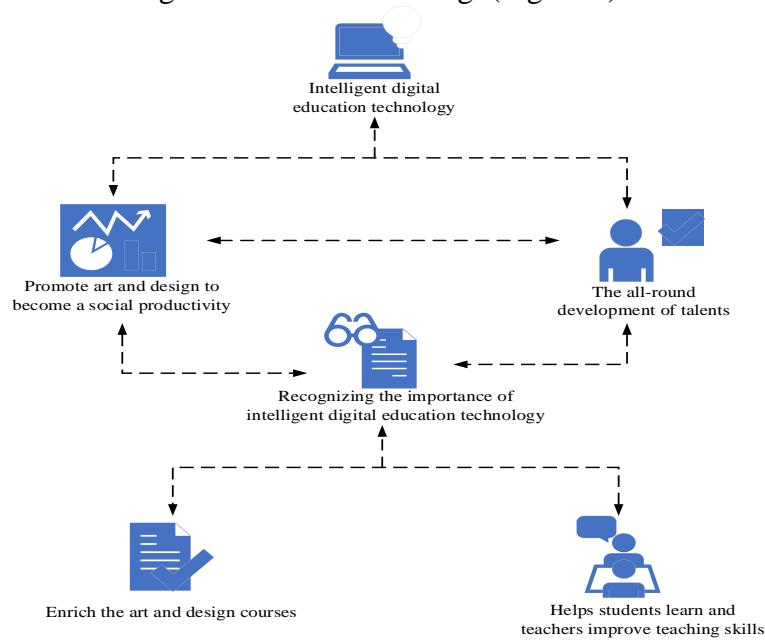research and cooperative learning in the field of art design(Figure 3).

Figure 3: Promoting the integration of IT and art education

5.3 Use of Art Design Teaching Resources Provided by Intelligent IT

IT enhances art design education by providing more resources and high-quality teaching materials. Traditional courses have limited resources, resulting in lower-quality education, but IT expands learning opportunities. It also helps students understand and compare evaluation results, improving their understanding and appreciation. The integration of IT in art education changes content and teaching methods, providing broader resources for art design education, as shown in Figure 4. This integration promotes the development of art design education, enabling students to receive high-quality education.
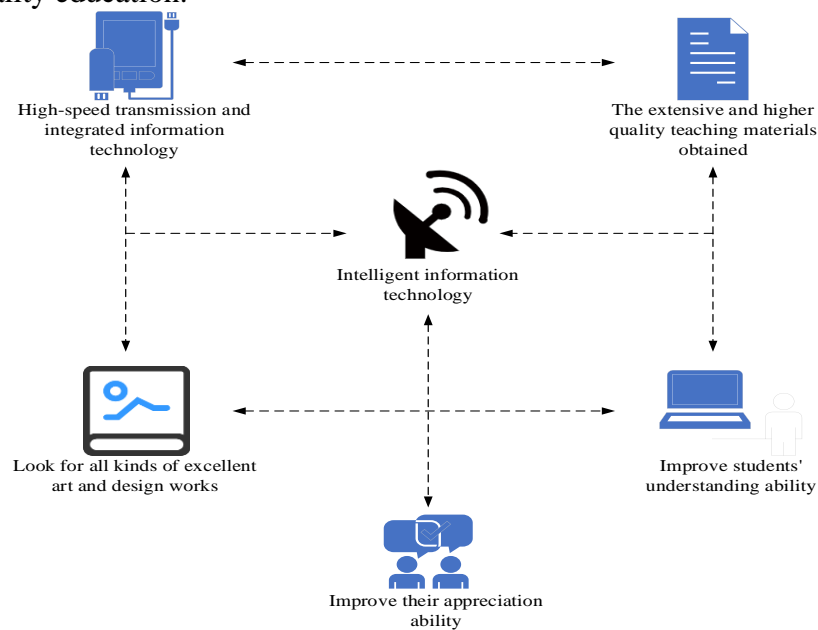

Figure 4: Teaching resources of art design

6. Evaluation Based on Decision Tree Algorithm and Experimental Investigation

In an era of rapid economic, cultural, and technological advancement, the integration of information technology has significantly impacted art design education. This integration is crucial for the advancement of art design education. To understand the current state of art design education, a survey was conducted among students and teachers in the design departments of three universities, involving 150 students. Through a questionnaire, the survey assessed students' perceptions of the current teaching effectiveness, methods, content, materials, and teacher-student interactions in art design education at Universities A, B, and C. The specific results are detailed in Figure 5.

A. Teaching methods and teaching content

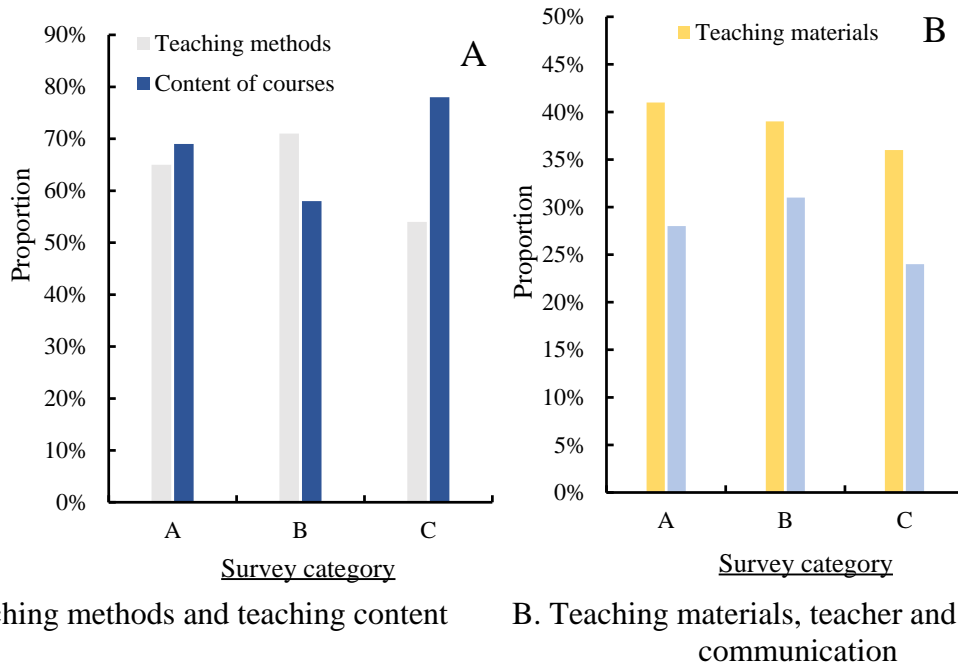B. Teaching materials, teacher and student communication

Figure 5: The proportion of students recognizing the teaching effect of the current art design education

Figure 5A displays the approval rates of teaching methods and contents in current art design education by design department students at three universities. University A had 65% approval for teaching methods and 69% for teaching contents, while university B had 71% and 58%, and university C had 54% and 78% approval, respectively. Figure 5B shows the recognition of teaching materials and teacher-student exchanges in current art design education. University A had 41% recognition for teaching materials and 28% for teacher-student exchanges, while university B had 39% and 31%, and university C had 36% and 24% recognition, respectively.

To further investigate the problems in current art design education, a questionnaire was used to survey 30 teachers from the art colleges of the three universities. The survey revealed difficulties in accessing teaching resources, insufficient communication between teachers and students, low student learning awareness, and other issues. The specific survey results are shown in Table 1.

Table 1 shows the teachers' views on the current difficulties in art design education at three universities. University A's teachers cited difficulty in obtaining teaching resources (74%), insufficient communication (69%), low student learning awareness (26%), and other problems (13%). University B's teachers cited difficulty in obtaining teaching resources (68%), insufficient communication (61%), low student learning awareness (44%), and other problems (21%). University C's teachers cited difficulty in obtaining teaching resources (76%), insufficient communication (79%), low student learning awareness (41%), and other problems (29%).

Table 1: Problems in the current art design education of 30 teachers of the art colleges

	Difficult access to teaching resources	Insufficient communication between teachers and students	Low learning awareness of students	Other problems
A	74%	69%	26%	13%
B	68%	61%	44%	21%
C	76%	79%	41%	29%

To investigate the teaching effect of integrating intelligent IT and art design education, intelligent IT was applied to art design courses at the three universities, and a survey was conducted with 150 teachers and students. The survey assessed the impact of intelligent IT on teaching methods, content, materials, and teacher-student communication after the art design course. The results are shown in Figure 6.
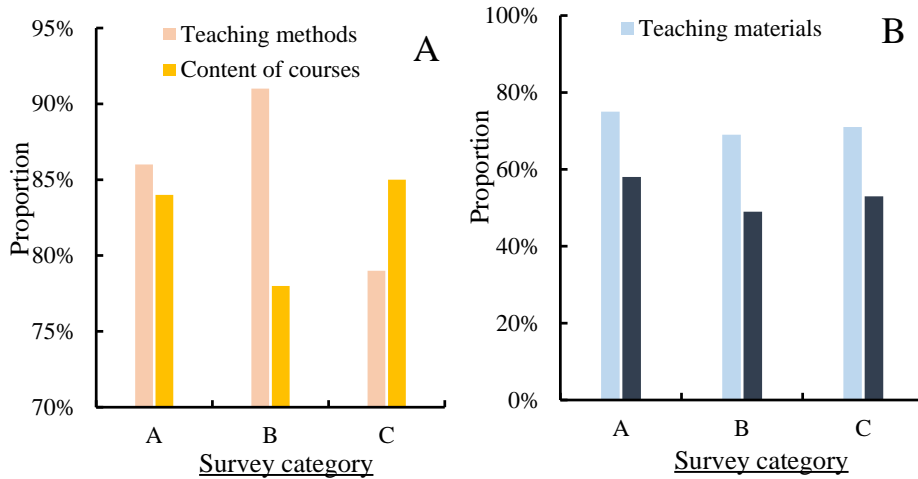

Figure 6: Teachers and students' recognition of the application of intelligent IT in art design teaching

The approval rates of intelligent IT application in teaching methods and contents by 150 teachers and students from three art colleges after art design courses are displayed in Figure 6A. Figure 6B shows the approval rates for teaching materials and teacher-student communication. University A's art college had 86% approval for teaching methods and 84% for teaching content, while university B had 91% and 78%, and university C had 79% and 85% approval, respectively. The recognition of teaching methods and content increased by 22% and 14% after implementing intelligent IT in art design courses.

Figure 6B indicates varying recognition levels of teaching materials and teacher-student communication by 150 teachers and students from three art colleges after implementing intelligent IT in art design courses. University A had 75% recognition for teaching materials and 58% for teacher-student communication. University B had 69% and 49%, while University C had 71% and 53% recognition, respectively. After applying intelligent IT, the recognition of teaching materials increased by 33%, and teacher-student exchanges increased by 25.6%.

The decision tree algorithm was utilized to construct a deep integration system of intelligent IT and art design education, resulting in a new art design education system. To evaluate its effectiveness, a questionnaire survey was conducted with 100 students and teachers in the design department of a university's art college. The survey compared the satisfaction levels of the traditional and new art design education systems, categorizing responses as satisfied, average, or dissatisfied. The specific results are presented in Figure 7.
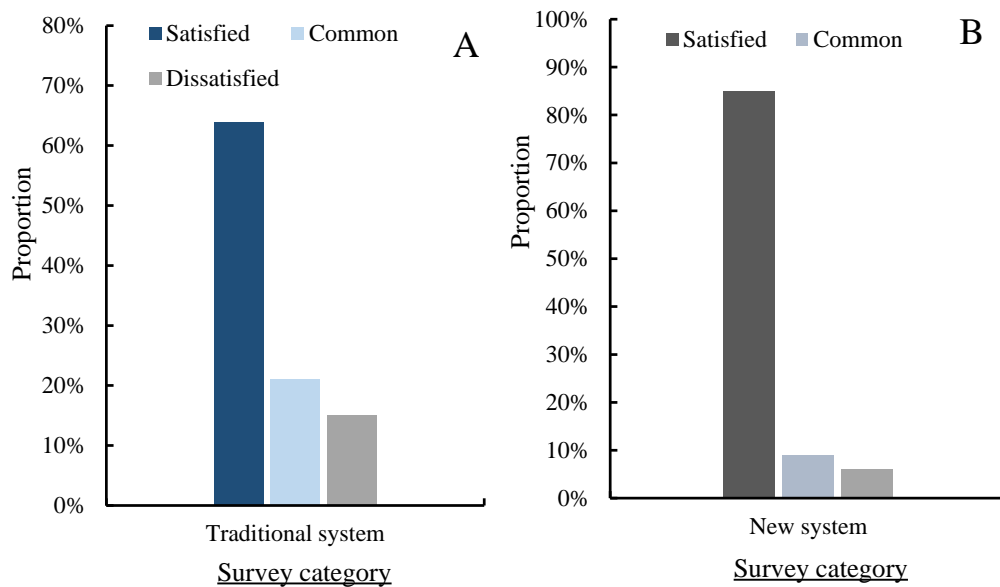
A. Students and teachers' satisfaction with the traditional art design education system
B. Students and teachers' satisfaction with the new art design education system

Figure 7: Comparison of students and teachers' satisfaction with the traditional and new art design education system

Figure 7A shows satisfaction levels of students and teachers with traditional art design education, with 64% satisfied, 21% neutral, and 15% dissatisfied. Figure 7B displays satisfaction with the new art design education system, where 85% were satisfied, 9% neutral, and 6% dissatisfied. The introduction of the decision tree algorithm in the deep integration of intelligent IT and art design education led to a 21% higher satisfaction rate compared to the traditional system, based on experiment and investigation.

7. Conclusions

Guided by modern education theory and art design teaching methods, information art education design represents a contemporary form of art design education, fostering communication and collaborative learning between teachers and students. It leverages modern educational tools, introduces educational information resources and methods, and nurtures students' innovative spirit, practical skills, and artistic design education theory. System theory and constructivism theory provide a robust foundation for the integration of IT and art design education, facilitating the realization of art design education. This paper developed a new teaching model for art design, centered around teachers, while incorporating student-centered learning. Through the use of modern IT, the educational process of art design is transformed into an emotionally integrated experience, injecting vitality into the classroom and enhancing students' interest in learning, thus significantly improving the teaching efficiency of art design classes.

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