Digital Interaction Design for the Protection and Inheritance of Folk Batik Art from the Perspective of Interaction between Art and Philosophy

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Abstract: Traditional handicraft art faces the risk of loss. Due to the advancement of modernization, the inheritance of traditional handicrafts faces many difficulties and challenges. Digital interaction design provides a new way of inheritance for traditional handicrafts, which can better protect and inherit the cultural connotation and artistic value of folk batik art. Based on the interaction between art and philosophy, this paper analyzed the digital interaction design of the protection and inheritance of folk batik art. According to the experimental results, based on the protection and inheritance of folk batik art from the perspective of the interaction between art and philosophy, digital interaction design is a very effective way and means to inherit and display the cultural connotation and artistic value of folk batik art in a broader range. At the same time, it can also stimulate users' creativity and innovative awareness, and promote the innovation and development of folk batik art. In digital interaction design, this paper needs to consider the user's use habits and needs, pay attention to the evaluation and promotion of cultural inheritance effect, so as to constantly improve and optimize digital interaction design, and better serve the protection and inheritance of folk batik art.

Keywords: Folk Batik Art; Art and Philosophy; Digital Interaction Design; Neural Network Algorithm

1. INTRODUCTION

Folk batik art is an important component of traditional Chinese handicraft art, with a long history and rich cultural connotations. However, with the advancement of modernization, traditional handicraft art faces the risk of being forgotten and lost. Therefore, protecting and inheriting folk batik art has become one of the important topics in current cultural protection and inheritance. Digital interaction design is a new digital means, which can transform traditional art forms into digital art forms through digital means, so as to achieve the protection and inheritance of traditional art. From the perspective of interaction between art and philosophy, digital interaction design can better highlight the cultural connotation and artistic

value of folk batik art. At the same time, it can also improve the learning and experience effects of users, promote the innovation and development of folk batik art. Batik art has a history of hundreds of years and has become a part of Indonesian society and culture. Some batik patterns in Indonesia have philosophical value and are part of traditional ritual activities. With the development of the times, the creativity of batik artists has become diverse, although ancient traditional patterns are still widely produced and used as sources of inspiration. Setyawati Ria examined the legal protection of traditional batik to avoid abuse of rights by certain parties who only use traditional batik to benefit from its existence (Setyawati et al., 2021). Ming Hong briefly discussed the overview of ethnic folk art in Guizhou, including its development and characteristics, and analyzed the aesthetic expression and characteristics of art. Finally, he proposed further reflections on art, dance, and batik art, adding luster to the progress of Chinese ethnic minority culture (Ming, 2018). Batik, as an ancient folk art, has a production history of over 2000 years worldwide. In China, wax dyeing is mainly concentrated in southwestern ethnic minority areas such as Guizhou, Yunnan, and Hunan. Miao batik art has rich patterns and profound cultural connotations. At the same time, it has strong regional and ethnic characteristics, showcasing the historical changes, cultural customs, and aesthetic concepts of the Miao ethnic group. Danzhai is known as the "hometown of batik", and batik patterns are different from other types of batik due to their primitive and unrestrained style. Zhennan L. Y. U introduced the history, special process, typical patterns, and aesthetic research of traditional Miao batik in Danzhai, with the aim of discovering the aesthetic characteristics of Miao batik in Danzhai (Zhennan, 2023). Digital interaction design can improve the learning and experience effect of users. Digital interaction design is interactive and social, which can stimulate users' creativity and innovative consciousness, promote the innovation and development of folk batik art, and thus promote the development and prosperity of traditional handicrafts. Hakim Lutfi Maulana aimed to analyze the Indonesian government's efforts to transform Indonesian cultural heritage into a national brand. He explained how the Indonesian government dealt with batik artists, culture, and entrepreneurs to establish Indonesia's identity and brand country. Using batik as a national brand is an innovation and a new tool for establishing Indonesian national identity. The process of national brand development is divided into four steps, namely training, identification, implementation, and evaluation of successful government applications. The success of building a national brand jointly created by

artists, batik artists, cultural workers, and businessmen is the entry of batik as a world cultural heritage. This development process is also expected to regenerate the younger generation in Indonesia and directly promote and protect batik dyeing (Hakim, 2018). At the beginning of the 20th century, Ethel Wallace became notorious for his wax dyed textiles. Mamp Michael provided a more comprehensive summary of the achievements of this female artist, with a particular focus on her textiles from the 1920s, based on the main information recently obtained by a private collector (Mamp, 2021). However, they did not integrate the digital interaction design technology into the folk batik art. In order to protect and inherit folk batik art, this article designed a digital interactive display platform for folk batik art. According to the experimental results, it can be concluded that traditional handicraft art has certain limitations in the inheritance process. Digital interaction design can provide a more convenient and practical way of learning and experiencing through virtualization, so that users can better understand and learn the skills and cultural connotation of folk batik art. The innovation of this paper is that digital interaction design is interactive and social, which can stimulate the creativity and innovation consciousness of users, promote the innovation and development of folk batik art, and thus promote the development and prosperity of traditional handicrafts.

2. PROTECTION AND INHERITANCE OF FOLK BATIK ART FROM THE PERSPECTIVE OF INTERACTION BETWEEN ART AND PHILOSOPHY

2.1 Neural Network Algorithm

The combination of neural network algorithm and digital interaction design of folk batik art protection and inheritance from the perspective of art philosophy interaction can improve the understanding, maintenance and development of batik art (Anoegrajekti et al., 2019; Huang, 2021). A neural network algorithm is a machine learning algorithm that mimics human neural systems and adjusts and optimizes itself by learning and training datasets. The composition of neural network algorithms includes an input layer, a hidden layer, and an output layer, each consisting of several neurons. Therefore, it can simulate the thinking and learning styles of the brain, thus possessing strong information processing and analysis capabilities. (1) Application of neural network algorithm in image classification of folk wax dyeing art

For the protection and inheritance of folk batik art, this article needs to

accurately classify and identify batik art works (Pelupessy, 2022; Ruswaji & Sulaeman, 2021). By using neural network algorithms for image classification, classification operations can be carried out more efficiently. Convolutional Neural Network (CNN) algorithm is a widely used machine learning algorithm for image recognition and classification. It extracts features from input data through convolutional operations, and then processes feature images in layers to improve accuracy. The formula for the CNN algorithm is as follows:

$$g(a) = max(0, \epsilon^d a + y) \quad (1)$$

The CNN algorithm utilizes multi-layer convolutional filters to extract features from images, and inputs the extracted feature images into a fully connected neural network for classification. The main advantage of CNN algorithm is that it can automatically extract features from images and effectively handle issues such as image invariance and spatiotemporal relationships, thereby improving the classification accuracy of folk batik art. (2) Application of neural network algorithm in style transfer of batik art. The transfer of batik art style refers to the application of one style of batik art to another, making the results more creative and aesthetic (Kaewareelap et al., 2021; Wang, 2019). Neural network algorithms can also assist in completing such tasks. Based on a dataset trained neural network, new images can be analyzed and corresponding images can be generated to achieve style transfer. The style transfer algorithm utilizes the characteristics of convolutional neural networks to separate style and content, and synthesize the two into a new image. The formula for the style transfer algorithm is as follows:

$$Z_{total}(x, q, y) = \gamma Z_{content}(x, y) + Z_{style}(x, q)\theta \quad (2)$$

Among them, x represents the image to be generated, y represents the original image, and q represents the target style image. $Z_{content}$ represents the content loss function, and Z_{style} represents the style loss function. γ and θ represent weight parameters, respectively. (3) Application of neural network algorithm in the prediction of batik art Neural network algorithms can use historical data to predict future trends, thereby helping people better protect and inherit batik art (Abdullah & Samin, 2020; Antsiferova, 2020). The Recurrent Neural Network (RNN) algorithm is mainly used for modeling and predicting time series data, and can naturally handle the dependencies between historical and future data. The formula for the RNN algorithm is as follows:

$$h_d = \delta(W_{hh} h_{t-1} + W_{xh} x_t) \quad (3)$$

Among them, x_t represents the input of time t, and h_{t-1} represents the

hidden state of time $t-1$. W_{hh} and W_{xh} are the weight coefficient matrix of hidden state and input respectively, and δ represents the activation function. By using the RNN algorithm, people can predict future trends in batik art by learning from historical data. For example, historical data can be used to predict the popularity and development trend of a certain type of batik art in the future, and corresponding protection and inheritance strategies can be formulated based on the predicted results. In summary, neural network algorithms have broad application prospects in the protection and inheritance of folk batik art, which can assist in tasks such as automated classification, style migration, and trend prediction of batik art (Mustika, 2018; Prahmana & D'Ambrosio, 2020).

2.2 Protection and Inheritance of Folk Batik Art

The protection and inheritance of folk batik art from the perspective of the interaction between art and philosophy first need to start with cultural connotations and artistic values. Folk batik art, as one of the important forms of traditional Chinese handicraft art, needs to be inherited and protected for its unique cultural connotation and artistic value. In this process, digital interaction design is a very powerful tool. By digitizing, the cultural connotation and artistic value of folk batik art can be presented more vividly, thereby better attracting people's attention and learning. Secondly, the protection and inheritance of folk batik art from the perspective of the interaction between art and philosophy requires attention to user experience and interactivity. Digital interaction design has strong interactivity and sociability, enabling users to interact more freely with folk batik art, so as to better understand and learn this traditional handicraft. At the same time, digital interaction design can also provide a more vivid way of experience, so that users can more deeply feel the cultural connotation and artistic value of folk batik art. Finally, the protection and inheritance of folk batik art from the perspective of the interaction between art and philosophy need to focus on innovation and development. Digital interaction design has strong innovation and plasticity, which can make folk batik art develop and innovate better on the basis of digitalization. Through digital interaction design, folk batik art can be integrated with other art forms, thus promoting the development and prosperity of traditional handicrafts. The protection and inheritance of folk batik art from the perspective of the interaction between art and philosophy requires attention to cultural connotations and artistic values, user experience and interactivity, as well as innovation and development.

As a new digital means, digital interaction design can better achieve these goals, promote the inheritance and development of folk batik art, and promote the development and prosperity of traditional handicrafts.

3. DIGITAL INTERACTION DESIGN EXPERIMENT OF FOLK BATIK ART PROTECTION AND INHERITANCE

3.1 Experimental Design

3.1.1 Experimental Background

Folk batik is one of the traditional handicrafts in China, with a long history, exquisite craftsmanship, and rich local characteristics and cultural connotations. However, with the rapid development of modernization, many traditional handicrafts are facing a crisis of loss. In order to protect and inherit folk batik art, effective measures need to be taken. Digital interaction design is a new design method, which can combine traditional culture with modern technology to achieve the protection and inheritance of culture. This paper aims to explore the digital interaction design experimental design of folk batik art protection and inheritance from the perspective of art and philosophy interaction, and provide some new ideas and methods for the protection and inheritance of folk batik art.

3.1.2 Experimental Purpose

The purpose of this paper is to achieve the protection and inheritance of folk batik art through digital interaction design. The specific objectives are as follows: A digital interactive display platform for folk batik art has been designed to showcase the history, skills, and cultural connotations of traditional batik art through digital display. A digital teaching system for batik art has been designed to popularize the basic knowledge and skills of batik art to the general public through digital interaction, improving people's understanding and appreciation of folk batik art. A set of digital creation tools for batik art has been designed to provide a digital creation platform and tools for batik artists, promoting innovation and development of batik art.

3.1.3 Experimental Content

The digital interactive display platform for folk batik art is designed to determine the content and form of the digital interactive display platform, including the history, skills, and cultural connotations of batik art. The interface and functions of the digital interactive display platform are

designed to achieve digital display and interactive communication. The suitable audience and usage occasions of the digital interactive display platform have been determined to promote digital display and dissemination of folk batik art. The digital teaching system for batik art is designed to determine the content and form of the digital teaching system, including the basic knowledge and skills of batik art. The interface and functions of the digital teaching system are designed to achieve digital teaching and interactive learning. The applicable audience and usage occasions of the digital teaching system have been determined to enhance people's understanding and appreciation of folk batik art. The digital creation tool for batik art is designed to determine the content and form of the digital creation tool, including the creation methods and tools for batik art. The interface and functions of digital creation tools are designed to achieve digital creation and interactive communication. The applicable audience and usage occasions of digital creative tools have been determined to promote innovation and development of batik art.

3.1.4 Experimental Significance

The significance of this article is mainly reflected in the following aspects: Through digital interaction design, the protection and inheritance of folk batik art are realized, and the tradition and development of traditional culture are promoted. Digital technology is utilized to enhance people's understanding and appreciation of folk batik art, and cultivate their interest and love for traditional culture. The innovation and development of batik art are promoted and the integration of traditional culture and modern technology is explored.

3.2 Experimental Results

This article conducted a questionnaire survey and analysis on the digital interactive display platform of folk batik art. 50 people were selected for the questionnaire survey, divided into 5 groups, namely A-E group, with ten people in each group. The average situation of each group was calculated. The questionnaire survey questions are as follows:

3.2.1 User experience Evaluation

The questionnaire title is: What is the evaluation of the aesthetics, ease of operation, functional integrity, and cultural inheritance effect of the digital interaction interface in this experiment? The results are shown in Figure 1 and Table 1.

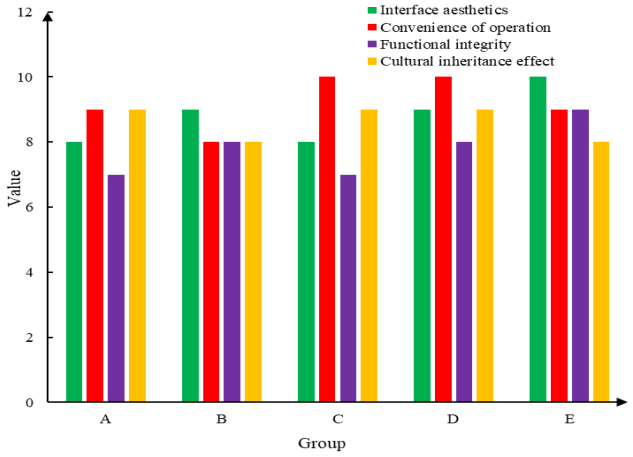

Figure 1: Statistical Chart of User Experience Evaluation Survey Scores

Table 1: Overall and Average Scores of User Experience Evaluation Indicators

	Total Score	**Average**
Interface Aesthetics	44	8.8
Convenience of Operation	46	9.2
Functional Integrity	39	7.8
Cultural Inheritance Effect	43	8.6

As shown in Figure 1 and Table 1, the user's ratings for the aesthetics, ease of operation, functional integrity, and cultural inheritance effect of the digital interaction interface in this experiment are all at a high level. Among them, the score for ease of operation is the highest, with a total score of 46 and an average score of 9.2. This experimental design meets the user's usage habits and needs, while also effectively inheriting and showcasing the cultural connotations and values of folk batik art.

3.2.2 User Usage Habits

The questionnaire question is: What are the main usage time periods when using this experiment? The results are shown in Figure 2.

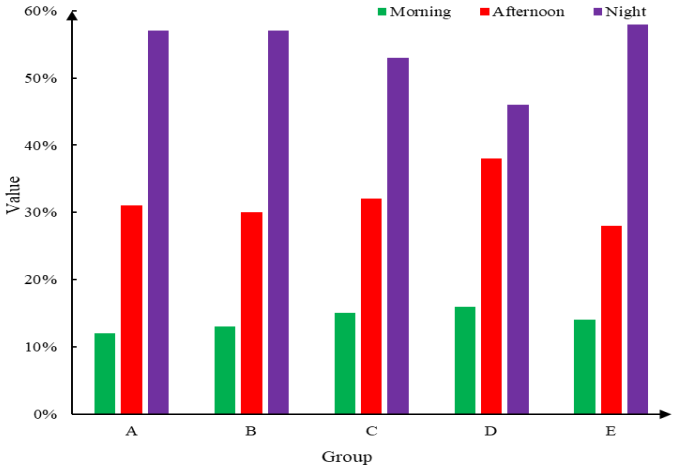

Figure 2: Proportion of User Usage Habits

As shown in Figure 2, users have a relatively high proportion of usage time in the afternoon and evening, with a peak of 38% in the afternoon and 58% in the evening. This indicates that the use of this experiment mainly occurs during idle time on weekdays and study days. This also suggests that the inheritance and promotion of folk batik art need to consider users' living habits and time arrangements.

3.2.3 System Logs

The questionnaire question is: What are the main operations performed when using this experiment, such as viewing the pattern library, learning production techniques, uploading works, etc? The experimental results are shown in Table 2.

Table 2: System Log Analysis Survey Results

User Action	Number of Times
View Pattern Library	156
Learn Production Techniques	82
Upload Works	21
Communicate and Interact with Others	47

As shown in Table 2, users mainly perform operations such as viewing the pattern library, learning production techniques, and interacting with others. This indicates that users mainly focus on the production techniques and pattern design of folk batik art in this experiment, and also hope to communicate and share with other enthusiasts.

3.2.4 Evaluation of Cultural Heritage Effect

The questionnaire title is: What is the effect of this experiment on the inheritance of artistic value, skill, cultural connotation, and aesthetic awareness of folk batik art? The experimental results are shown in Figure 3 and Table 3.

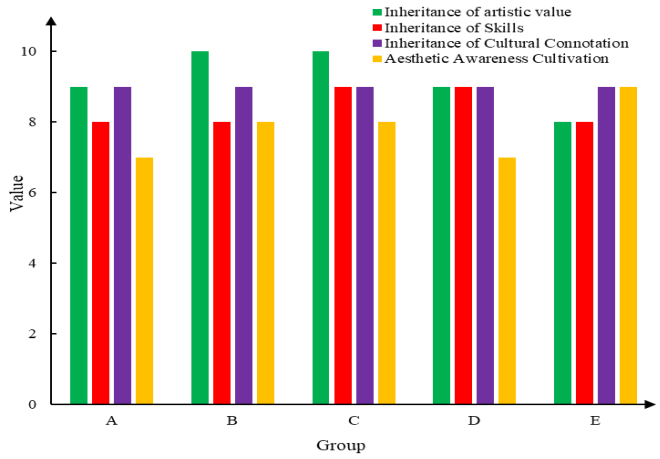

Figure 3: Scoring of Cultural Heritage Effectiveness Evaluation Indicators

Table 3: Average and Total Scores of Cultural Inheritance Effectiveness Evaluation Indicators

	Total Score	**Average**
Inheritance of Artistic Value	46	9.2
Inheritance of Skills	42	8.4
Inheritance of Cultural Connotation	45	9
Aesthetic Awareness Cultivation	39	7.8

As shown in Figure 3 and Table 3, users believe that this experiment has a good effect on inheriting the artistic value, skills, cultural connotations, and aesthetic awareness of folk batik art. Among them, the inheritance of artistic values and cultural connotations scored higher, with a total score of 46 and 45, and an average score of 9.2 and 9, respectively. This also indicates that the experiment can effectively inherit and showcase the cultural value and historical inheritance of folk batik art. Based on the above data analysis, the digital interactive display platform for folk batik art designed in this article can well meet the needs and expectations of users, while also effectively inheriting and protecting the cultural connotation and artistic value of folk batik art.

4. CONCLUSIONS

Through the design and data analysis of the above experiments, the following conclusions can be drawn in this article. Digital interaction design can effectively inherit and protect the cultural connotation and artistic value of folk batik art. Through digital means, folk batik art can be inherited and displayed on a wider range, while also providing users with more convenient, practical, and diverse learning and experience methods. Digital interaction design needs to consider user habits and needs. Through the analysis of the user's use time period and operation mode, this paper can understand the user's needs and preferences for the folk batik art digital interaction design, so as to better meet the user's expectations and needs, and improve the user's satisfaction and experience. Digital interaction design needs to pay attention to the evaluation and promotion of cultural inheritance effect. Through the user's evaluation and analysis of the cultural inheritance effect of digital interaction design of folk batik art, this paper can understand the effects and shortcomings of digital interaction design in artistic value inheritance, skill inheritance, cultural connotation inheritance and aesthetic awareness cultivation, so as to further improve and optimize digital interaction design and improve its cultural inheritance

effect and value.

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