



The Wisdom and Cultural Traditions of Plant-Based Dyeing among the Zhuang People in Baise City, Guangxi Zhuang Autonomous Region, for the Creation of a Contemporary Design Identity

ภูมิปัญญาและวัฒนธรรมการย้อมสีจากพืชของชาวจ้วง เมืองไป๋เซ่อ
เขตปกครองตนเองกว่างซี เพื่อสร้างอัตลักษณ์การออกแบบร่วมสมัย

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา และวิเคราะห์โครงสร้างอัตลักษณ์ทางวัฒนธรรมที่ปรากฏในภูมิปัญญาการย้อมสีจากพืชของชาวจ้วง เมืองไป๋เซ่อ เขตปกครองตนเองกว่างซี สาธารณรัฐประชาชนจีน และเพื่อสังเคราะห์กรอบแนวคิดสำหรับการแปลความสู่การออกแบบร่วมสมัยอย่างเป็นระบบ ภายใต้บริบทความเปลี่ยนแปลงทางสังคมและเศรษฐกิจ การวิจัยใช้ระเบียบวิธีเชิงคุณภาพ โดยศึกษาข้อมูลจากเอกสาร งานวิจัยที่เกี่ยวข้อง และการเก็บข้อมูลภาคสนามผ่านการสังเกตและบันทึก โดยดำเนินการวิเคราะห์ข้อมูล 3 ขั้นตอน ได้แก่ การจัดหมวดหมู่เบื้องต้น (Open Coding) เพื่อจำแนกประเด็นสำคัญ การเชื่อมโยงหมวดหมู่ (Axial Coding) เพื่อค้นหาความสัมพันธ์ระหว่างองค์ประกอบทางวัฒนธรรม และการสังเคราะห์เชิงแนวคิด (Selective Coding) เพื่อพัฒนาโครงสร้างอัตลักษณ์เชิงระบบ พร้อมทั้งตรวจสอบความน่าเชื่อถือของข้อมูลด้วยวิธีการตรวจสอบแบบสามทาง ผลการวิจัยพบว่า การย้อมสีจากพืชของชาวจ้วงมิได้เป็นเพียงเทคนิคเชิงหัตถกรรม หากแต่เป็นระบบองค์ความรู้ที่ฝังตัวอยู่ในวิถีชีวิต โครงสร้างของชุมชน โดยสามารถจำแนกโครงสร้างอัตลักษณ์ออกเป็น 6 มิติ ได้แก่ อัตลักษณ์ด้านสี วัสดุ คุณประโยชน์ กระบวนการ พิธีกรรมและความเชื่อ และการบูรณาการความหมาย แต่ละมิติมีความสัมพันธ์เกี่ยวพันกันในลักษณะโครงสร้างพลวัต สีครามและสีดำ รวมถึงข้าวเหนียวห่าสี ทำหน้าที่เป็นสัญลักษณ์ทางวัฒนธรรมที่ต่อยอดอัตลักษณ์กลุ่มผ่านการใช้งานซ้ำในชีวิตประจำวันและพิธีกรรม ขณะที่กระบวนการย้อมสะท้อนความรู้เชิงประสบการณ์ที่สั่งสม ถ่ายทอด และปรับเปลี่ยนอย่างต่อเนื่องผ่านกลไกของชุมชน จากผลการวิเคราะห์ดังกล่าว งานวิจัยได้ดำเนินการสังเคราะห์ต่อ โดยพัฒนาเป็นกลยุทธ์การออกแบบร่วมสมัย จำนวน 6 ประการ ซึ่งทำหน้าที่เป็นแนวทางในการนำองค์ความรู้ดั้งเดิมไปประยุกต์ใช้ในเชิงการออกแบบอย่างเป็นรูปธรรม นอกจากนี้ กลยุทธ์ดังกล่าวสามารถจัดกลุ่ม และยกระดับเป็นชุดกลยุทธ์การออกแบบร่วมสมัย

จำนวน 5 ประการ ได้แก่ (1) ถ่ายทอดความหมายทางวัฒนธรรม (2) อัตลักษณ์พื้นฐาน
วัสดุ (3) การจัดระบบสี (4) การแปรกระบวนการสู่รูปทรง และ (5) การบูรณาการ
บริบทสมัยใหม่ ซึ่งทำหน้าที่เป็นกลไกเชิงระบบในการเชื่อมโยงองค์ความรู้ภูมิปัญญา
สู่การออกแบบร่วมสมัย ข้อเสนอเชิงแนวคิดของงานวิจัยชี้ให้เห็นว่า การประยุกต์
ภูมิปัญญาการย้อมสีจากพืชสู่การออกแบบร่วมสมัยควรตั้งอยู่บนการทำความเข้าใจ
โครงสร้างความหมายภายในระบบวัฒนธรรมอย่างลึกซึ้ง มากกว่าการลอกเลียนรูปแบบ
ภายนอกเพียงผิวเผิน โดยการแปลงองค์ความรู้ดังกล่าวจำเป็นต้องอาศัยกลยุทธ์การ
ออกแบบ เข้ามาเป็นตัวกลางในการเชื่อมโยงความรู้ดั้งเดิมกับการออกแบบร่วมสมัย
เพื่อให้เกิดการพัฒนาที่คงไว้ซึ่งอัตลักษณ์ สร้างคุณค่าใหม่ และสนับสนุนความยั่งยืน
ทางวัฒนธรรมในบริบทสังคมปัจจุบันอย่างแท้จริง

คำสำคัญ: การย้อมสีจากพืช, ชาวจ้วง, อัตลักษณ์ทางวัฒนธรรม, กลยุทธ์การออกแบบ
ร่วมสมัย, สัญลักษณ์ของสี

Abstract

This research aims to examine and analyze the structure of cultural identity embedded in the traditional plant-based dyeing wisdom of the Zhuang people in Baise City, Guangxi Zhuang Autonomous Region, People's Republic of China. It further seeks to synthesize a conceptual framework for systematically translating this cultural knowledge into contemporary design within the context of ongoing social and economic transformations. The study adopts a qualitative research methodology, drawing upon documentary research, related academic studies, and field data collected through observation and systematic recording. Data analysis was conducted in three stages: Open Coding to identify key themes, Axial

Coding to explore relationships among cultural components, and Selective Coding to synthesize a systematic identity structure. The credibility of the findings was enhanced through triangulation. The findings reveal that plant-based dyeing among the Zhuang people is not merely a handicraft technique, but a structured body of knowledge embedded in everyday life and community organization. This knowledge system involves natural dyeing processes, including, mordanting processes, and demonstrates notable colorfastness in its textile applications. The cultural identity structure can be classified into six dimensions: color identity, material identity, functional identity, process identity, ritual and belief identity, and integrative meaning. These dimensions interact dynamically within the ecological and social context of the community. Indigo blue, black, and five-colored glutinous rice function as cultural symbols that reinforce ethnic identity through repeated use in daily life and ritual practices. Meanwhile, the dyeing process reflects experiential knowledge that is accumulated, transmitted, and continuously adapted through community mechanisms. Based on these findings, the study further synthesizes six practical design strategies that function as operational guidelines for transforming indigenous knowledge into tangible contemporary design applications. At a conceptual level, these strategies are further abstracted into five contemporary design strategies. (1) Cultural Meaning Translation Strategy, (2) Material-Based Identity Strategy, (3) Color System Structuring Strategy, (4) Process-to-Form Strategy, and (5) Contemporary Context Integration Strategy, which together function as a systematic mechanism

for bridging traditional knowledge and contemporary design practice. The study proposes that the adaptation of traditional plant-dyeing wisdom into contemporary design should be grounded in a profound understanding of the internal meaning structure of the cultural system rather than superficial imitation of external forms. This transformation requires design strategies as a mediating mechanism to effectively connect indigenous knowledge with contemporary design contexts. Such an approach enables the preservation of identity, the creation of new cultural value, and the promotion of cultural sustainability in contemporary society.

Keywords: plant-based dyeing, Zhuang people, cultural identity, Contemporary Design Strategy, Color Semiotics

Introduction

Plant dyeing is a color-making process that has reflected the relationship between humans and nature since ancient times. It relies on local plant resources as sources of color, through harvesting, extraction, and hand-dyeing. This constitutes a body of knowledge that has been accumulated, transmitted, and adapted under the specific topographic, environmental, and cultural conditions of each society. Such processes produce a natural color system with distinctive physical and aesthetic characteristics, differing from industrial dyes that emphasize uniformity and standardized control at an industrial scale. The use of natural dyes is a form of local wisdom that has been passed down over a long period of time, representing an integrated relationship between the physical

environment and community culture (Junsongduang, & Prachaiboon, 2022). In the context of contemporary society facing environmental crises, plant dyeing has therefore been re-evaluated as ecological knowledge and cultural capital with potential for design development. Reflecting the concept of living in harmony with nature, plant dyeing serves as an important medium for transmitting local knowledge, ways of life, and the aesthetic worldview of communities through the colors, textures, and traces of production processes manifested on dyed materials. In this context, studying, analyzing, and translating the cultural values embedded in plant dyeing processes into the language, forms, and identities of contemporary design is not merely the preservation of traditional wisdom, but also the creation of new meanings for design in today's modern society.

The Zhuang are the largest ethnic minority group in the People's Republic of China, with their main settlements in the Guangxi Zhuang Autonomous Region, particularly in Baise City. The community's way of life is based on agriculture, together with the appropriate reliance on and utilization of natural resources. This relationship has given rise to a culture with a clearly distinctive local character. One prominent form of traditional wisdom is natural plant dyeing, which is part of everyday life. It uses locally available plants to extract dyes for textiles, which are then used to produce clothing and various products. Thus, Zhuang colors are not only aesthetic but also reflect symbolic meanings and the cultural identity of the community. However, under modern socio-economic development,

the expansion of industrial products that replace traditional folk handicrafts has begun to erode many forms of local wisdom that constitute Zhuang identity, especially the art of natural plant dyeing, a long-inherited cultural heritage. Zhuang plant-dyeing techniques are currently under pressure from multiple factors, including changes in ecosystems and climate, urban expansion, and industrial transformations shaped by modern ideas. These changes have led to a continuous decline in demand for naturally plant-dyed textiles. As a result, the number of artisans with these skills has decreased, and the transmission of knowledge has begun to stagnate, which may pose a risk of permanent loss of traditional wisdom in the future if proactive measures for conservation and development are not implemented (Yu & Yu, 2012). The Zhuang natural plant-dyeing tradition is a body of knowledge accumulated through community life over a long period, guided by the key principle of “taken from nature, returned to nature.” This is not merely a process of producing color from local plants: it also reflects the idea of living in harmony with nature and respecting surrounding resources. In Zhuang communities, especially within the Guangxi Zhuang Autonomous Region, there is an abundance of plants used for natural dyeing, such as indigo (*Indigofera tinctoria*), madder (*Rubia cordifolia*), safflower (*Carthamus tinctorius*), maple leaves, as well as various leaves, flowers, and roots. The Zhuang have developed color-extraction skills and hand-dyeing techniques that have been passed down from generation to generation, reflecting a spirit of harmony between humans and the environment.

The Zhuang dyeing wisdom described above is not found only in clothing or everyday utensils, but is also deeply embedded in rituals and traditional cultural practices - especially in “five-colored glutinous rice,” a festival food of the Zhuang in which glutinous rice is dyed with natural plants into different colors: purple, red, yellow, black, and white. Each color carries symbolic meanings such as unity, abundance, stability and safety, and cosmic balance (Wang, 2007). Five-colored glutinous rice is therefore not merely food; it is a cultural symbol that shapes Zhuang ways of life by connecting them deeply with nature, revealing the ethnic meanings and aesthetics expressed through the organization of colors within these practices. However, in an era of rapid modern industrial growth, Zhuang knowledge and skills of plant dyeing have begun to be neglected and to decline. Without appropriate processes of conservation, transmission, and development, this wisdom may disappear permanently, which would be a troubling erosion of the cultural roots of the ethnic community. Accordingly, the People’s Republic of China has begun to place greater emphasis on pride in Chinese national culture. The essence of cultural confidence lies in pride in and recognition of one’s national culture, and the inheritance and dissemination of valuable traditional culture are considered key components in strengthening cultural confidence. As cultural wisdom heritage is part of culture, it is an invaluable asset bequeathed through a long historical process of development, reflecting historical value as well as artistic and cultural

identity, within the context of safeguarding cultural wisdom heritage (Zhang, Panthupakarn, & Suvimolstien, 2025).

However, amid contemporary economic, social, and technological changes, the Zhuang people's plant-dyeing wisdom in the Guangxi Zhuang Autonomous Region of the People's Republic of China is facing multiple challenges, including its diminishing role in everyday life, replacement by synthetic dyes, and the lack of systematic knowledge transmission. Although previous studies have focused on ethnographic documentation, cultural heritage conservation, or technical descriptions of production processes, there remains a shortage of structural analyses that link traditional knowledge with the extraction of cultural identity and the systematic translation of that knowledge into contemporary design. As a result, this body of wisdom has not yet been developed into a theoretical framework that can be applied in the current context. Therefore, this study aims to investigate the Zhuang people's plant-dyeing wisdom and culture in depth, in order to develop knowledge for constructing a contemporary design identity that systematically and sustainably connects cultural foundations with contemporary society. This research goes beyond the analysis of cultural identity by advancing toward the development of systematic and contemporary design strategies that align with its final outcomes. Such an approach establishes a proactive research direction and facilitates practical implementation, positioning the study as a mediating mechanism that connects indigenous knowledge with contemporary design.

Objective

1. To examine the body of knowledge, traditional wisdom, and culture of plant dyeing among the Zhuang people in Baise City, Guangxi Zhuang Autonomous Region.
2. To analyze the cultural identity and cultural meanings manifested in plant-dyed works of the Zhuang people in Baise City, Guangxi Zhuang Autonomous Region.
3. To propose strategies for applying Zhuang plant-dyeing wisdom to construct contemporary design identity.

Research Framework

Plant dyeing among the Zhuang people is an important part of the dyeing and weaving traditions of ethnic groups in southern China. They have developed a dyeing system and continuously accumulated knowledge, production processes, and practices of color use (Li, 2018). This system is not only used for making clothing and everyday items, but is also deeply embedded in festivals, rituals, and social relationships. In the current context, it is found that the modernization and widespread use of chemical dyes have reduced the role of certain traditional steps, thereby leading to the loss of values related to environmental friendliness, cultural distinctiveness, and the value of handcraft. In terms of safeguarding and revitalizing traditional skills, UNESCO has proposed conceptual frameworks on cultural diversity and on safeguarding intangible cultural heritage, emphasizing that the value of intangible cultural heritage lies in

continuous practice and intergenerational transmission rather than static preservation. This framework highlights a community-centered approach, with the state as a supporter and the international arena as a coordinator, and it warns against turning heritage into mere performance or excessive commercialization (UNESCO, 2003).

The concepts adopted in this study use cultural encoding and cultural translation as tools to connect traditional culture with modern design. Hall (1997) argues that cultural symbols constitute a system of meanings jointly constructed by society; their essence lies not only in visual form, but also in shared memory and identity. Xie (2025) emphasizes that effective translation should “change the form while preserving the spirit,” in order to avoid superficial use of symbols. From an integrated creative-culture perspective, plant dyeing is not confined to any single product category; rather, it is viewed as a cultural resource system that can generate diverse forms of design expression. Studies indicate that natural colors, handcrafted textures, and the dyeing process itself can all serve as a contemporary design language, applicable to cultural and creative products, exhibition spaces, visual identity systems, and lifestyle goods (Huang, 2022). This perspective shifts the emphasis from product-oriented outcomes toward design methodology, visual logic, and strategic identity construction, thereby enabling its application within contemporary design contexts.

Design strategies and development approaches based on local wisdom require the integration of various conceptual frameworks to create value and reduce differences in ethnicity, religion, and age, ultimately

contributing to sustainability. Such efforts must rely on collaboration among all sectors, while preserving traditional ways of life in order to prevent the loss of cultural identity and artistic values. Fundamental design principles should emphasize equality, flexibility, simplicity, and clarity, supported by sufficient and well-structured information, as well as ease of use. Designers must also consider essential design elements, including shape, form, and the meaning of color, which reflect emotions, enhance memorability, and reinforce identity. Each color conveys different psychological associations; for example, red represents intensity or warmth, blue conveys coolness, and gray and white signify modernity. These elements must be integrated with design theories to achieve unity, balance, aesthetic relationships, and harmony, thereby enhancing the overall completeness of the design (Wanichakorn, 2016).

To facilitate a systematic translation of indigenous knowledge into contemporary design, this study proposes “design approaches and strategies” as an intermediary mechanism bridging cultural decoding and design creation. These strategies serve to structure knowledge, direct interpretive processes, and translate cultural values into operational design elements. Through this process, the value of traditional identity is reinforced and recontextualized, based on three principal approaches as follows

1. Knowledge Structuring Strategy. Reorganizes traditional plant-based dyeing knowledge by examining relationships among materials, processes, and cultural contexts, in order to identify both aesthetic and

methodological values applicable to contemporary design. This establishes a foundation for design translation.

2. Translate the color system. Translates color systems, material qualities, and production logics into contemporary design expressions, where dye variations, textures, and experiential processes inform visual composition and design methods.

3. Integrate the environmental diemnsion. Integrates sustainability and environmental concepts into contemporary design systems, enabling practical application while supporting cultural continuity and industrial development.

Design originates not from form, but from structured cultural knowledge, transforming meaning into form and identity in contemporary design.

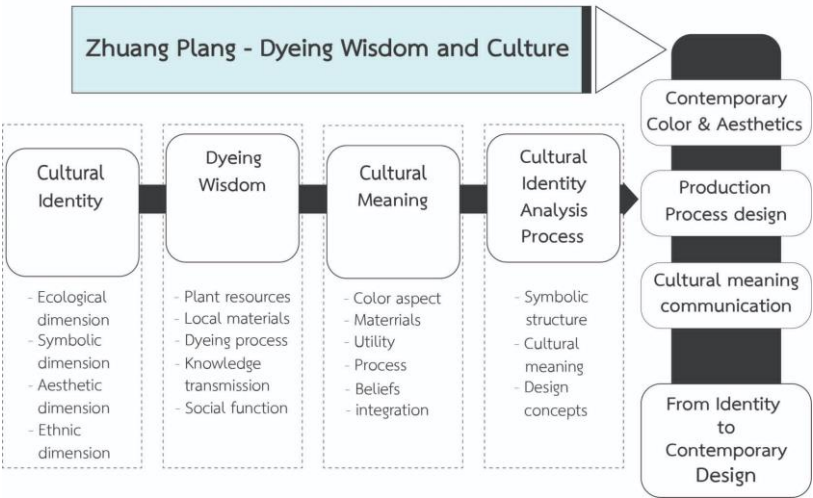


Figure 1. Research framework

Method

This study is a qualitative study employing documentary research in combination with artifact analysis. Data were collected from academic documents, related studies, historical sources, and photographic records of Zhuang textile products in Baise City, Guangxi Zhuang Autonomous Region. The collected data were analyzed through content analysis and conceptual synthesis in order to explain the knowledge structure, cultural identity, and pathways for application to contemporary design. The research procedures include:

1. Research scope and study area The study area is Baise City, Guangxi Zhuang Autonomous Region, People's Republic of China, where the use of dye plants and the dyeing of five-colored glutinous rice can still be observed in both ritual contexts and everyday life. The study focuses specifically on the Zhuang people's plant-dyeing system in western Guangxi and does not cover other ethnic groups.

2. Research study and data collection The data sources used in this study are divided into four categories.

- 2.1 Documentary sources This study examines documents, research studies, academic articles, books, and reports related to plant dyeing, Zhuang culture, theories of cultural identity, and concepts of cultural translation, drawing on Thai-, English-, and Chinese-language sources. No fewer than 30 sources are included, selected based on their direct relevance to plant dyeing and cultural identity construction. In addition, information is collected from the official websites of local museums.

2.2 Fieldwork Fieldwork is conducted through site visits to community locations, local museums, and cultural learning centers in the study area. Data are collected through observation, photography, video recording, and note-taking, with a total fieldwork period of no less than 15 days. The fieldwork emphasizes observing the dyeing process, product use, and related ritual contexts, and the collected data are analyzed and summarized for subsequent research steps.

2.3 Artifact analysis Textile products, indigo-dyed fabrics, and five-colored glutinous rice in ritual contexts are analyzed to examine color characteristics, materials, process structures, and symbolic meanings.

2.4 Integrated Approach This study applies theories of art, design, semiotics, and aesthetics to analyze identity in Zhuang plant dyeing. Technical processes, color use, aesthetic qualities, and cultural wisdom are systematically classified and interpreted to reveal embedded cultural meanings. The study therefore constructs a comprehensive body of knowledge that supports the understanding and preservation of Zhuang plant-dyeing traditions.

3. Data Analysis This research conducted data analysis in three stages. Stage 1 involved preliminary reading and categorization (Open Coding) to classify data related to materials, processes, and meanings. Stage 2 involved linking data categories (Axial Coding) to identify relationships among cultural elements. Stage 3 involved conceptual synthesis (Selective Coding) to develop identity structures and design strategies. In addition, triangulation among documents, field data, and theoretical frameworks was employed to enhance the reliability of the analytical results.

Synthetic Research Results

Findings on the body of knowledge, traditional wisdom, and culture of Zhuang plant dyeing in Baise City, Guangxi Zhuang Autonomous Region

1. Background of the Guangxi Zhuang and Plant Dyeing Guangxi, located in southern China, is the principal settlement area of the Zhuang ethnic group. Its mountainous terrain and warm, humid climate support diverse dye plants. The Zhuang have long practiced rice agriculture and village-based living closely tied to seasonal cycles. In this cultural–ecological context, plant dyeing is not merely a craft but a localized practice connected to natural resources, household labor, and everyday life (Liang, 2006). Thus, understanding Zhuang plant dyeing requires linking ecology, lifestyle, and traditional knowledge together. systems.



Figure 2. Map of the People's Republic of China



Figure 3. Map of the Guangxi Zhuang Autonomous Region

2. Origins of Zhuang plant dyeing in Guangxi The Zhuang are among the ethnic groups that discovered and utilized plant dyeing at an early stage. In 1954, a red earthenware three-eyed stove accompanied by five figurines was excavated from a Han Dynasty tomb near Donghu Lake in Guixian, Guangxi. Scholars have interpreted this as a model object representing a dyeing workshop. The figurines' gestures - scooping water, boiling dye, and lifting cloth from a dye pot - indicate that by that time, bleaching and dyeing techniques had already developed into a relatively systematic process with a division of labor and defined procedures (Qin & Chen, 2003). In its developmental trajectory, Zhuang plant dyeing in Guangxi exhibits two key characteristics. First, it inherited the early indigo-dyeing techniques of southern China, reflecting the historical influence of

technological transmission. Second, the Zhuang adapted these techniques to local climatic conditions and plant resources, modifying both the selection of dye materials and the dyeing steps, thereby forming a dyeing system centered on natural plants with clear local specificity. Therefore, plant dyeing is not a technical activity separated from the social context; rather, it is closely integrated into the Zhuang way of life and cultural structure.



Figure 4. Zhuang Women's clothing . Adapted from “Museum without Walls: Guangxi Longlin” by Liang Hanchang, 2007

https://search.worldcat.org/th/title/271844320?utm_source=chatgpt.com

3. Dye material system and local plant resources The dye materials used by the Zhuang in Guangxi are notably local in character and clearly aligned with the ecological conditions of the region, such as indigo plants, red indigo grass, maple leaves, red-dye roots, turmeric, and Buddleja flowers. The specific properties of these plants reflect an ethos of living in

harmony with nature and using resources in a measured and appropriate way. Ethnobotanical field studies have also found that in western Guangxi there are several important dye plants that are repeatedly used over time, showing both high frequency of use and clear cultural significance. This provides empirical evidence supporting the material resource system and the knowledge structure of plant dyeing.

4. Application contexts of plant dyeing Plant dyeing among the Zhuang in Guangxi is closely connected to everyday life and cultural practices. The value of this traditional wisdom is not limited to dyeing techniques alone, but is also reflected in its applications. First, in the domain of clothing, plant dyes are used for ethnic garments and everyday woven textiles, especially indigo and black tones, which meet practical needs for durability and resistance to staining while also creating a recognizable visual identity. Second, in the domain of food, the use of plant colors extends to food dyeing, particularly “five-colored glutinous rice,” which is used in major festivals and rituals. Villagers use local plants to dye glutinous rice into multiple colors for ancestral worship, blessing rituals, and celebrations. Third, in the domain of household items, dyed fabrics are made into blankets, bed sheets, wrapping cloths, aprons, tablecloths, and other items, reflecting the appropriate use of local resources and allowing natural color tones to harmonize with the living environment. Therefore, Zhuang plant dyeing is not merely a specialized handicraft, but an integrated cultural practice that links clothing, food, and everyday living.



Figure 5. Natural plant dyes and five-color glutinous rice

5. Traditional dyeing process of the Zhuang The plant-dyeing process of the Zhuang in Guangxi generally includes raw material preparation and color extraction, the use of dye assistants, color reaction and fixation, washing, and drying. A key example is indigo dyeing. It typically begins with preparing indigo or extracting the dye, conditioning the dye bath, and repeatedly immersing the fabric. After the fabric is removed from the dye vat, it is exposed to air to trigger oxidation and stabilize the color. This requires flexible control of temperature, time, concentration, and the conditions of dye assistants. In practice, dyers collect local dye plants, air-dry them, cut them into pieces, and then boil them for extraction or ferment them. The liquid is then filtered to obtain the dye bath, and alkaline ash water, limewater, or alum is added to enhance the bonding between the dye and the fibers. Dyeing commonly follows the method of “multiple immersions, gradually deepening the shade layer by layer,” and each time the fabric is taken out of the vat, oxidation or sun-drying is used to stabilize the color. In addition to indigo, yellow, red, black, green, and purple colors are often obtained through decoction, the

use of dye assistants, or over-dyeing. The entire process emphasizes experiential control: dyers judge the dye bath by its hue, smell, temperature, and texture to determine heat intensity and duration, and they adjust according to water quality, seasons, and weather conditions. As a result, although the process has a stable structure, the outcomes still display natural color layering and the traces of craftsmanship (Li, 2018).

6. Cultural meanings The colors produced through plant dyeing among the Guangxi Zhuang do not serve only aesthetic purposes; rather, they constitute a cultural symbolic system whose meanings are continuously assigned and interpreted in both everyday life and ritual contexts. Indigo blue and black - obtained by repeatedly dyeing with indigo to deepen the shade - are durable and resistant to staining, aligning with an agrarian way of life. They also convey calmness, simplicity, and endurance, and are linked to respect for ancestors and traditional social order, thereby becoming visible symbols of ethnic group identity (Chen, 2009). In festival and ritual contexts, colors are further transformed into a “cultural language.” For example, five-colored glutinous rice, dyed with different plants, is used for praying for blessings, honoring ancestors, and expressing respect for nature; each color signifies abundance, peace, and the continuity of life. Therefore, the meanings of color are not fixed, but arise from the processes of material selection, dyeing, and use in different contexts, which are transmitted and jointly interpreted within the community. In this way, color becomes a carrier of shared memory and plays an important role in strengthening the cultural identity of the Zhuang.

The symbolic meanings of the five colors

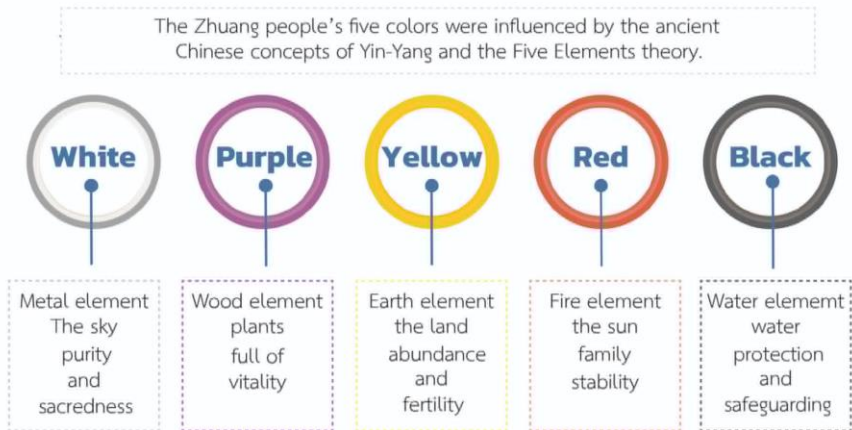


Figure 6. The symbolic meanings of the Zhuang people's five colors

Results of the analysis of cultural identity and cultural meanings manifested in Zhuang plant-dyed works in Baise City, Guangxi Zhuang Autonomous Region.

Based on qualitative analysis using a cultural-interpretive approach, the study summarizes the characteristics of cultural identity into six key dimensions as follows.

1. Color identity Within the Zhuang plant-dyeing system in Guangxi, color is a highly distinctive cultural symbol. Traditional clothing often uses blue and black tones as the primary colors in everyday life, stemming from the widespread use of indigo plants, and reflecting the values of an agrarian society that emphasizes simplicity, durability, and order. Dark blue and black gradually became visual symbols of ethnic groups through

historical processes and household handicraft practices. In particular, the Black-Clothed Zhuang (Heiyi Zhuang) repeatedly dye cloth with indigo until it becomes deep black, creating a unified appearance and clearly strengthening the recognizability of group identity. In addition, black carries symbolic meanings related to warding off misfortune and praying for blessings, and it also serves as a medium connecting ancestral beliefs and the community's shared memory. During the festival of "five-colored glutinous rice," which includes red, yellow, black, purple, and white, the colors further reflect ideas of natural order and the aspiration for a peaceful and happy life. This shows that color in Zhuang culture not only functions as visual differentiation but also constitutes a symbolic system that community members can collectively understand. Therefore, color identity is not merely a form of visual art; it is a stable cultural narrative structure and a visual code that clearly reflects the identity of the ethnic group.

2. Material identity Material identity reflects an ecological system in which the community has long relied on local natural resources and has developed dye materials with a variety of local plants as key components. These materials have been developed through observation and experience in accordance with seasonal rhythms and plant growth cycles. This deep understanding of nature means that the dyeing process reflects the principles of living in harmony with nature and using resources in a measured and appropriate way. The significance of this identity dimension indicates that dyeing is not merely a technical activity separated from the environment, but a practice embedded within natural systems.

Materials therefore are not only physical sources of raw inputs, but also repositories of accumulated local knowledge. These material systems thus become evidence of the community's shared memory and cultural continuity.

3. Functional identity The functional identity of plant dyeing indicates that dyeing is not valued only for aesthetic beauty, but is also “part of the life system” that is closely linked to eating, living, everyday use, and the community's ritual order. The data show that women in the community often dye cloth, embroider, and tailor garments during periods free from agricultural work in order to prepare clothing for daily wear and for important family festivals. This reflects the clear role of plant dyeing in subsistence and household stability. However, this functional role does not diminish its cultural value; instead, cultural meanings are further reinforced through continuous repeated use. In various rituals such as weddings, coming-of-age ceremonies, guest-reception rituals, and religious rites - clothing made from plant-dyed fabrics plays a symbolic role. Different colors and patterns are used to indicate status and to express emotion, respect, and blessings. In addition, dyeing practices extend into the food system: “five-colored glutinous rice,” dyed with local plants, is used in rituals and festivals, so that dyeing is not limited to textile techniques but becomes part of the broader life-ritual system (Chen, 2009). Therefore, the functional identity of Zhuang plant dyeing reflects the coexistence of practical utility and ritual sacredness; that is, it both meets everyday needs and provides a material foundation that supports the community's cultural order.

4. Process identity Zhuang plant dyeing is a knowledge system that can be transmitted and reproduced through community mechanisms. The first key point is that dyeing skills do not rely on written rules; rather, they emerge through continuous repeated practice, gradually accumulating into expertise in assessing critical factors such as time, temperature, and dye-bath concentration. This experiential knowledge is embedded in the rhythms of everyday life, so the process is constantly tested and refined. Second, women play a crucial role in the craft process, both as direct practitioners of dyeing and as transmitters of skills and cultural values through demonstration, collaborative work, and participatory learning within the family. As a result, both the techniques and the associated worldview are passed down continuously from generation to generation. In addition, process identity reflects cooperation within dyeing techniques. Production commonly depends on division of labor and collaboration among family members or within the community, indicating a form of collective production. Therefore, plant dyeing is not merely a technical activity aimed at producing finished goods; it is a dynamic knowledge process that is continuously created, transmitted, and adapted within the community system.

5. Ritual and belief identity The ritual and belief identity of Zhuang dyeing is clearly manifested through the roles of “five-colored glutinous rice” and plant-dyed clothing within the contexts of traditions and rituals. Five-colored glutinous rice is rooted in rice-farming culture, in which glutinous rice is regarded as sacred and is often used in important

ceremonies such as ancestor worship and weddings. In religious-symbolic terms, five-colored glutinous rice serves as the principal offering and as a medium for expressing respect, gratitude, and prayers to ancestors. The preparation of five-colored glutinous rice not only follows ritual conventions but also reflects respect for the rules of nature and the seeking of blessings from sacred powers, expressed through the use of colors, ingredients, and taste qualities that carry specific meanings.

At the same time, textile dyeing is also embedded within ritual structures, whether in weddings, coming-of-age ceremonies, guest-reception rituals, or religious rites. Dyed garments are used as symbols to indicate status, differentiate roles, and convey blessings. Therefore, Zhuang plant dyeing functions as both a material medium and a symbolic medium that plays an essential role in the enactment of community traditions and beliefs.

6. Meaning-based identity Meaning-based identity refers to the way in which color, materials, processes, and functions are continuously interpreted and re-explained within the Zhuang community until they form a symbolic system that members of society can collectively recognize and understand. This dimension clearly emphasizes the role of specific mechanisms in identity formation. After ritual proceedings are completed, five-colored glutinous rice shifts from a sacred offering to a shared food eaten by everyone, turning the offering into a bridge that strengthens social bonds among people. Food sharing thus creates spiritual connections and strengthens community unity. At the same time,

five-colored glutinous rice is also regarded as an edible cultural message, through which ethnic memory is repeatedly affirmed via embodied experience and patterns of consumption. In textile dyeing, collective dyeing for festival use becomes a community meaning-making process in which members work together to produce and display dyed items, thereby reinforcing the group’s cultural boundaries. Furthermore, within the contexts of safeguarding cultural wisdom heritage and rural development, plant dyeing has been revitalized as an ecological cultural resource through cultural creative work, tourism, and contemporary design. Thus, the meaning of plant dyeing does not remain at the level of static preservation, but is continuously adjusted, reinterpreted, and developed within new social contexts, clearly reflecting the dynamic relationship between tradition and contemporaneity.

Table 1. Synthesis of cultural identity and cultural meaning of Zhuang plant-derived colors in Baise City, Guangxi Zhuang Autonomous Region

Identity	Components	Meaning	Role
Color	Indigo-derived blue-black; Black-Clothed group; Five-colored glutinous rice	Color functions as a visual code, signifying stability, protection, and natural order	Indicates ethnicity and status; creates group unity

Identity	Components	Meaning	Role
Materials	Indigo plants; wild plants; fermentation dye pits; dyeing workshops	Reflects ecological knowledge and the human– nature relationship	Connects traditional wisdom with place; creates cultural continuity
Functional value	Clothing for everyday life and rituals; five- colored glutinous rice	Integrates practical utility with a sacred dimension; conveys status and blessings	Supports household systems and ritual order
Process	Repeated dyeing; factor assessment; women’s roles; collaborative work	Experiential knowledge transmitted through practice	Organizes labor and intergenerational transmission
Rituals and beliefs	Five-colored glutinous rice and ceremonial clothing	A medium between humans and the sacred	Creates sacredness and cultural legitimacy

Identity	Components	Meaning	Role
Meaning-based Identity	Communal Dining, Collaborative Dyeing, Heritage Revitalization	Dyeing as a Process of Shared Meaning Construction	Reinforcing Unity and Identity within a New Context

Strategies for Applying Zhuang Plant-Dyeing Wisdom to Construct Contemporary Design Identity.

Based on the study and analysis of Zhuang plant dyeing for constructing contemporary design identity, many related studies share a consistent view that, if traditional culture is to be integrated into modern design, a key factor lies in cultural encoding and cultural translation, with the community positioned at the center. This aligns with Manzini (2015), who argues that collaboration is the foundation of social innovation, which often emerges through cooperation among organizations, communities, and institutions. One of the important roles of design is to build collaborative networks so that people and stakeholders from different sectors can meet, communicate, co-create, and continue to act over time. From the synthesis of the above theories and practical studies, this research indicates that the contemporary transformation of Zhuang plant-dyeing wisdom in Guangxi should not stop at imitating external visual symbols, but should instead establish a holistic system across three

dimensions: structure, mechanisms, and collaboration. Accordingly, three approaches and methods are proposed as follows.

1. Pathway of structural extraction and translation into methods

In practice, it is necessary to extract the core generative mechanisms from the traditional material system, the logic of the dyeing process, and the symbolic order of colors, and then translate these mechanisms into methodological principles for modern design rather than directly copying formal elements. Design identity should be grounded in environmentally friendly material ethics, a graded color structure, and the generative logic of process, so that traditional wisdom is integrated into the design system as internal order rather than as external ornamentation.

2. Pathway of building collaborative mechanisms

When integrating ideas of social innovation and co-design, contemporary expressions of Zhuang plant dyeing require collaboration among community bearers, artisans, designers, and cultural institutions. Design is therefore not merely a tool for product development, but a means of constructing relationships and operational mechanisms that enable cultural creativity to continue through multi-party communication and co-creation. Design identity, accordingly, does not arise from one-way extraction of traditional elements, but gradually takes shape through collaboration.

3. Pathway of living application and narrative transformation

At the level of cultural meaning, identity symbols and ritual backgrounds carried by Zhuang plant dyeing should be transformed into design narratives that contemporary audiences can understand. At the same time,

contexts such as product use, exhibitions, or digital media should be employed so that traditional culture can continue to operate within everyday life. Design identity thus emerges from the unity of structural consistency and value communication, rather than from the repeated use of a single symbol.

Based on the analysis of six dimensions of cultural identity in traditional plant-based dyeing of the Zhuang people, this study further synthesizes findings at the empirical level to develop contemporary design strategies that translate indigenous knowledge into practical applications. Each identity dimension is decoded into design keywords that guide the design direction and are consolidated into six practical strategies as follows.

1. Color Layering Strategy. Emphasizes gradation and depth derived from repeated dyeing to preserve handcrafted and natural characteristics.
2. Material Identity Strategy. Promotes the use of natural, locally grounded materials to reinforce cultural and environmental values.
3. Functional Continuity Strategy. Supports everyday usability and reuse to sustain cultural identity.
4. Process-Driven Design Strategy: Values irregularity and imperfection as aesthetic qualities emerging from experiential processes.
5. Cultural Meaning Communication Strategy. Focuses on conveying narratives, symbols, and beliefs beyond visual form.
6. Holistic Integration Strategy. Integrates color, material, process, and meaning into a coherent identity system.

At the conceptual level, the six practical strategies are found to be interrelated and can be abstracted into a systematic mechanism for translating indigenous knowledge into contemporary design. Accordingly, this study synthesizes them into a set of Contemporary Design Strategies as a conceptual model applicable across diverse design contexts. These can be grouped into five main strategies as follows.

1. Cultural Meaning Translation Strategy: Transforms meanings, symbols, and beliefs into design elements, synthesized from cultural narrative and functional continuity.

2. Material-Based Identity Strategy: Uses materials as a primary driver of identity and contextual relationships.

3. Color System Structuring Strategy: Develops layered, gradated, and naturally varied color systems.

4. Process-to-Form Strategy: Derives form from production processes and experiential making.

5. Contemporary Context Integration Strategy: Integrates all elements into coherent designs aligned with present-day contexts.

Based on the synthesis of the findings, this study proposes the System-Based Cultural Identity Formation Model (SBCIF Model) to explain the formation of cultural identity through indigenous plant-based dyeing knowledge. The model illustrates the relationships among cultural inputs, interpretive processes, and transformation into contemporary design expressions, where design strategies function as a mediating mechanism linking cultural interpretation to practical design development. The model

is grounded in three theoretical propositions: (1) cultural identity emerges from the relationships among resources, materials, processes, and social contexts; (2) multidimensional interpretation-symbolic, ethnic, ecological, and aesthetic-transforms cultural elements into structures of meaning; and (3) contemporary design is not a direct reproduction of form, but a transformation of knowledge into new expressions within current contexts. At the practical level, the model provides a framework for design development, progressing from identity analysis to keyword extraction, strategy development, and contemporary design creation. Thus, the SBCIF Model serves as both a conceptual framework and a practical tool for translating indigenous knowledge into contemporary design.

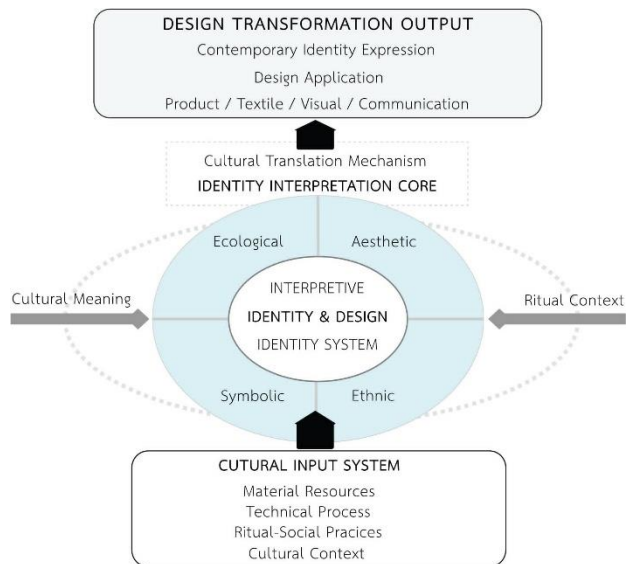


Figure 7. SBCIF Model illustrating the translation of indigenous dyeing knowledge into contemporary design through design strategies.

Integrating modern technologies with traditional wisdom can also help ensure the continued existence of plant-based colors and Zhuang culture in a sustainable manner into the future. For this reason, this study makes an important contribution to expanding knowledge in the fields of art and design, and it can serve as an analytical framework for further studies of identity in design among other ethnic groups within the contexts of adaptation and cultural conservation in the modern era.

Discussion

Plant Dyeing as a Cultural System and a Mode of Meaning-Making

The findings indicate that Zhuang plant dyeing is not merely a handicraft technique, but a cultural system composed of structurally interrelated elements, including materials, processes, color, meaning, society, and rituals. The continuity of this system depends not only on individual skills, but also on transmission and repeated practice within the community. This corresponds to UNESCO's concept of intangible cultural heritage, which views culture as a living process that is reproduced through ongoing social practice. This finding suggests that analyzing plant dyeing requires a systems-level perspective that goes beyond the level of objects, because meaning does not reside in products alone but emerges from relationships among cultural elements, consistent with Ge, Suvimolstien, and Khochprasert (2025). In analyzing the embedded cultural meanings of the component system of color and symbolic meanings, the research shows that plant dyeing, as an important source for the color system of Yunjin textiles, not only gives the textiles a distinctive artistic form but also

provides an essential foundation for contemporary revitalization and innovation. Such revitalization includes restoring the traditional color system, reviving ancient dyeing techniques, and creatively reconstructing historical color combinations in order to maintain cultural authenticity and respond to environmental conservation needs.

Color as a Mechanism for Communicating Identity Interpretive analysis found that colors derived from natural plants - especially indigo blue and black - do not function only to create visual beauty, but also operate as mechanisms for communicating group identity through use in everyday life and rituals. Color therefore functions as a cultural code that community members collectively recognize and understand. This can be explained through Stuart Hall's encoding and decoding framework, which proposes that cultural symbols are constructed and stabilized through repeated practice within social contexts. The findings thus indicate that color is not merely a formal element, but a site where identity is continuously produced and affirmed. This aligns with Chummalee and Chanthoo (2025), who note that color terms are related to environmental contexts, demonstrating that language and environment are interconnected. People use linguistic vocabulary to describe meanings of things, and environment and culture shape color naming and perspectives on color perception. Variation across languages must therefore be grounded in an understanding of cultural contexts, ecological living conditions, and their environments.

The Dyeing Process as a Cultural Practice System The findings indicate that sequences of actions, experiential knowledge, unwritten rules,

and shared community understandings - from raw material preparation and fermentation to repeated dyeing and waiting for natural timing-are all carried out within a framework of meanings transmitted through repeated practice and intergenerational learning. From a theoretical perspective, this process can be explained through the concept of cultural practice, which views culture as existing through actions and everyday reproduction rather than residing only in material forms. This perspective aligns with UNESCO's intangible cultural heritage framework, which emphasizes that cultural value lies in processes and practice-based transmission. Therefore, plant dyeing should be understood as a practice system that holistically connects material elements, beliefs, rituals, and social structures. Viewing it in this way expands the analytical focus from the level of products to the level of processes and opens space for structural analysis that can be applied to contemporary design in a principled manner.

Implications for Contemporary Design. From Symbolic Reference to Knowledge-System-Based Design The findings indicate that Zhuang plant-dyeing wisdom does not hold value only at the level of symbols or visual forms, but is grounded in a knowledge system that integrates understandings of materials, processes, timing, social contexts, and cultural meanings in a holistic way. Therefore, applying this knowledge to contemporary design should not stop at referencing colors, patterns, or cultural imagery, but should be based on understanding and synthesizing the internal structure of that knowledge system. Knowledge-system-based design means using the logic of material use, the mechanisms of color-layer formation, the process of repetition, and the relationship between

practice and meaning as a framework to guide creative direction. This approach elevates cultural application from symbolic decoration to conceptual development that is responsive to original contexts and meanings. It also opens space for innovation that links wisdom heritage with contemporary design in a principled and sustainable manner. This is consistent with Cheuypoung and Utiswannakul (2022), who discuss analyzing dyeing wisdom in Tai Lue culture to identify distinctive features that build community identity and can be further developed into creative production by linking cultural capital with industrial production systems for small and medium-sized enterprises, thereby generating occupations and sustainability for communities. It also aligns with Loymek, Runglertsri, Wongkrajang, and Ongkananuwong (2024), who note that using natural colors in everyday life - derived from natural processes and safe and non-harmful to humans and the environment is an important alternative that can replace synthetic dyes and supports the continuation of wisdom heritage in natural color extraction, conservation, and further knowledge development. Importantly, the findings suggest that contemporary design strategies should be understood as a *design roadmap* rather than a set of outcomes. These strategies guide designers in decoding cultural structures and extracting embedded knowledge systems, enabling the transformation of indigenous wisdom into applicable design directions. In this sense, design strategies function as a mediating mechanism between cultural analysis and creative practice, allowing knowledge-system-based design to be implemented in a systematic and practical manner.

Development of the Conceptual Framework This study is not limited to a descriptive account of plant dyeing. Instead, it synthesizes the findings to develop a system-based conceptual framework that explains the relationships among materials, processes, color, meaning, and social context as a cultural identity structure. This framework expands the understanding of local wisdom from the level of objects or forms to the level of structure and knowledge systems. It also builds a bridge between cultural studies and contemporary design scholarship, enabling the resulting knowledge to have concrete potential in both explanatory and applied terms. This aligns with Sangch (2015), who notes that studying natural dyes from local biological resources can generate knowledge that leads to the development of community products to support community enterprises and the utilization of local biodiversity. Within this framework, design strategies are positioned as a key operational layer that connects cultural interpretation with design application. They function not only as conceptual constructs but also as practical tools that enable designers to systematically translate cultural identity into contemporary design outcomes.

Research Suggestion

1. Applying plant-dyeing wisdom to contemporary design should be grounded in an understanding of the system-based identity structure across the dimensions of materials, processes, and meanings, rather than selecting only certain colors or external forms. This process should be supported by the development of a design strategy toolkit that provides practical guidelines for translating indigenous knowledge into contemporary design applications.

2. The development of related products or creative projects should be carried out on the basis of participation by the cultural owner community in order to maintain contextual accuracy and build social sustainability.

3. Further experimental design research should be undertaken to test the proposed conceptual framework in real contexts and to evaluate the potential of plant-dyeing wisdom for systematically constructing contemporary identity. In particular, future studies should address the issue of *colorfastness*, including the durability, stability, and reproducibility of natural dyes, as this remains a critical limitation for their application in contemporary industrial contexts.

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