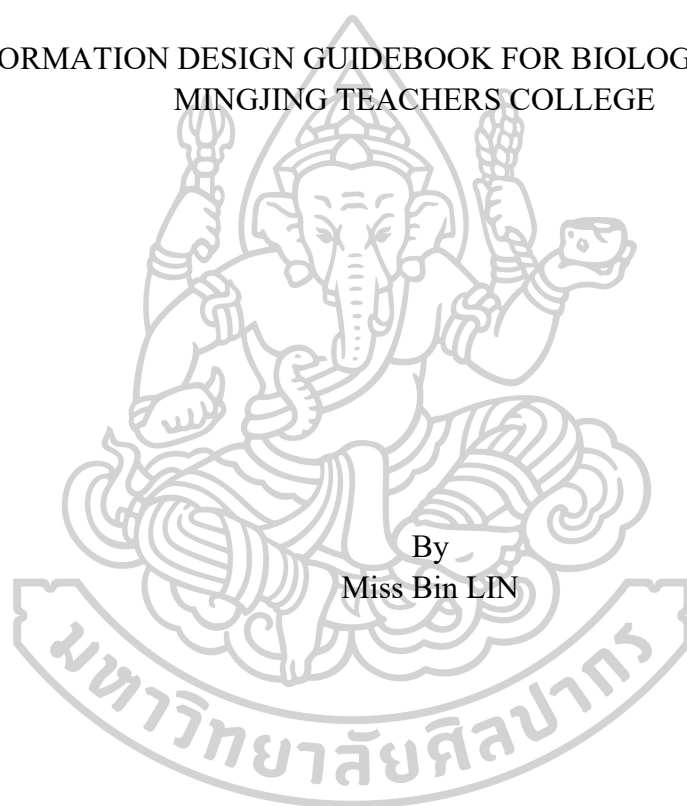




INFORMATION DESIGN GUIDEBOOK FOR BIOLOGY MUSEUM AT
MINGJING TEACHERS COLLEGE



A Thesis Submitted in Partial Fulfillment of the Requirements
for Master of Fine Arts Design Arts (International Program)

Silpakorn University
Academic Year 2024

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By
Miss Bin LIN

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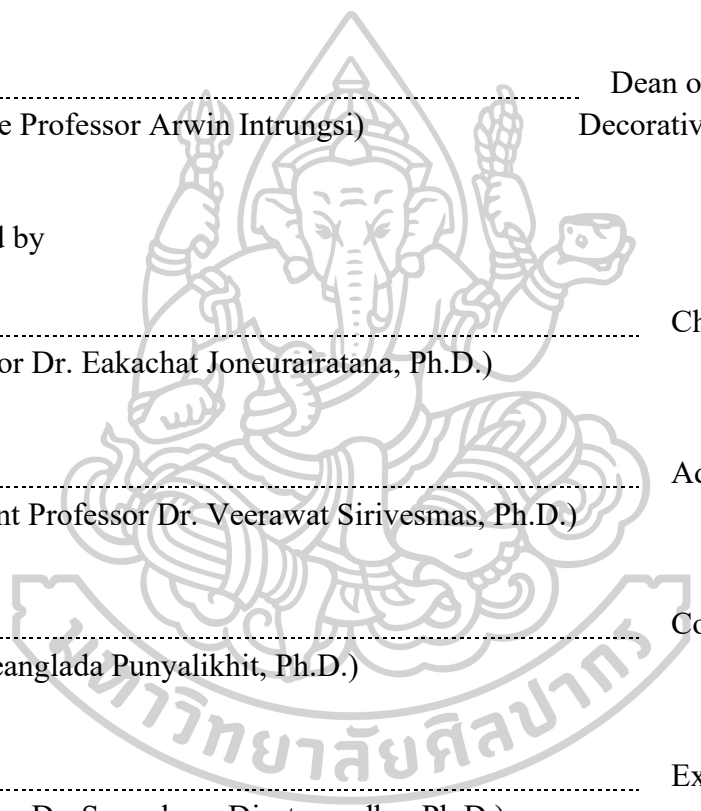
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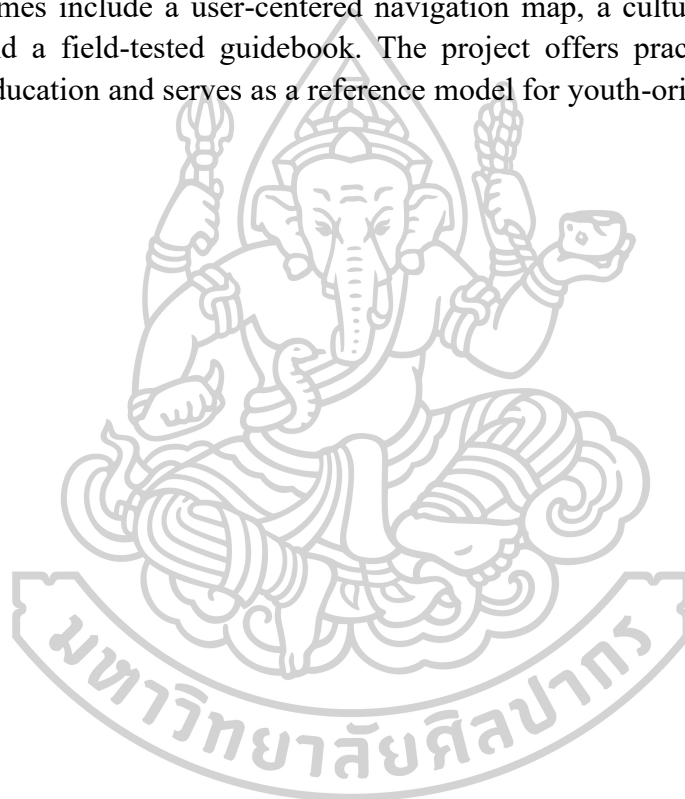
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This study focuses on the information design of the Biology Museum at Minjiang Teachers College, aiming to enhance knowledge communication and visitor engagement by integrating information design strategies with the original cartoon character “Xiao Rongbao”. Utilizing design thinking and mixed-method research, the study combines theories from visual communication, user experience, cognitive psychology, and education to develop an interactive Information Design Guidebook. Key outcomes include a user-centered navigation map, a culturally rooted character system, and a field-tested guidebook. The project offers practical contributions to museum education and serves as a reference model for youth-oriented Study tours.



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Bin LIN

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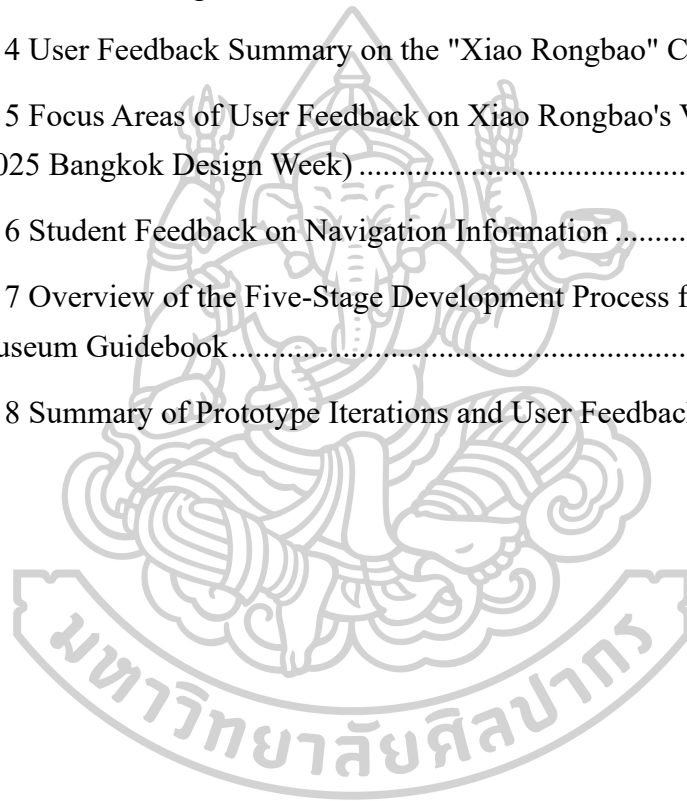
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CHAPTER1

INTRODUCTION

1.1 Significance of Research

MinJiang Teachers College, located in Fuzhou, Fujian Province, China, is a full-time higher vocational institution with a history of 110 years. The college's Biological Museum serves as a vital platform for both education and science popularization, undertaking the mission of showcasing biodiversity, disseminating biological knowledge, and cultivating students' scientific literacy. The museum houses a collection of 739 specimens, including 261 species of birds, 17 species of amphibians and reptiles, 74 species of aquatic animals, 87 species of mammals, and 300 species of insects. Among these, 30 specimens are from nationally first-class protected animals, while 66 are from second-class protected animals. The exhibits primarily adopt an immersive display approach, divided into nine major zones.

The museum was initially established to popularize biological knowledge at the basic education level, serving as a scientific education venue for young people to learn about nature and life. However, with the increasing openness of the museum to the public, many primary and secondary schools now organize student visits for study tours. Currently, the museum may face certain challenges in information design, which could affect the effectiveness of knowledge dissemination and visitor engagement.

In modern museum education, information design plays a crucial role. As an important venue for science communication, biological museums are not only spaces for knowledge display but also bear the responsibility of enhancing public scientific understanding and participation. However, many museums encounter issues in information design, such as overly specialized exhibition content that is difficult for general audiences—especially non-biology students and children—to comprehend; a lack of interactivity and visual guidance in information presentation; and unclear

visitor flow and information hierarchy, which negatively impact the overall visitor experience.

This study aims to explore effective information design strategies tailored to the museum and to develop a practical Visitor Guidebook, which may serve as a viable reference for future exhibition enhancement and science education initiatives, while also informing the development of educational study tour programs for adolescents.

1.2 Statement of the Problem

The Biological Museum of Minjiang Teachers College serves as a crucial educational venue for students and the public. However, it currently faces multiple challenges in information design, which hinder effective knowledge dissemination and visitor engagement. This study aims to explore how information design can be enhanced by introducing original cartoon characters as a core element of the guide system. The goal is to improve the museum's overall effectiveness in knowledge communication, visitor participation, navigation guidance, and digital interaction, thereby increasing interactivity and enjoyment.

The main issues according to researcher observayion:

(1)Low Information Delivery Efficiency – The current exhibition content lacks clarity in visual presentation, making complex biological concepts difficult to understand and remember.

(2)Insufficient User Engagement – The existing information design fails to effectively attract visitors, resulting in a passive viewing experience with limited interactivity and participation.

(3)Incomplete Navigation & Guidance System – Unclear signage and fragmented exhibition information disrupt the smooth flow of visits, reducing learning interest.

(4)Limited Accessibility and Lack of Engaging Information Design

The museum's current information system does not fully consider the needs of diverse audiences, such as children, non-biology students, or visitors with special

requirements. Most exhibition content relies on dense, text-heavy descriptions with limited visual cues or interactive elements. This often leads to difficulty in maintaining attention—especially among younger audiences—and reduces the effectiveness of knowledge delivery. Without a clear visual hierarchy, key information fails to stand out, making it hard for visitors to navigate and absorb content at their own pace and understanding level.

(5) Lack of a Distinctive Iconic Image, Hindering Memorability and Communication.

The current exhibitions lack a visual identity that represents the museum's cultural values and unique characteristics, such as original cartoon characters or mascots. This absence of storytelling and sustainable development potential makes it difficult to leave a lasting impression on visitors and limits the museum's ability to extend its presence through social media and other communication channels.

To address these issues, this study will design and implement an information guide system centered around a cartoon character. By introducing an original cartoon Character, the research aims to optimize information delivery, enhance interactivity, and explore its integration with digital tools. Ultimately, the study will develop a systematic Information Design Guidebook, providing feasible optimization strategies for the Biological Museum to improve visitor learning experiences and strengthen its science education function.

1.3 Research Hypotheses

(1) Applying information design principles can enhance visitor engagement and learning experience at Minjiang Teachers College's Biological Museum.

(2) Incorporating cartoon-style interactive elements in information design positively impacts knowledge retention and visitor satisfaction.

(3) A well-designed guidebook with effective visual communication can improve knowledge dissemination efficiency and strengthen visitors' understanding of exhibits.

1.4 Objective of the Research

This research aims to enhance the knowledge communication and visitor experience of the Biological Museum at MinJiang Teachers College through information design and character integration. The specific objectives are as follows:

(1) To design an aesthetically pleasing and functionally effective museum guide map based on principles of information design, with the goal of presenting the spatial layout and exhibition zones clearly and intuitively, facilitating efficient navigation and enhancing spatial understanding and visitor experience.

(2) To create and integrate an original cartoon character with strong local cultural identity as a core element in the museum's wayfinding and interpretive system, in order to increase interactivity and immersion, especially among younger audiences.

(3) To develop a Biological Museum Visitor Guidebook that combines visual and textual content-including exhibit details, spatial navigation, and character-based interactions-to improve science communication and promote deeper visitor engagement.

1.5 Scope of the Research

This study focuses on developing an information design guidebook for Minjiang Teachers College's Biological Museum, examining how information design principles can enhance visitor engagement, improve knowledge retention, and optimize the educational experience.

The research specifically addresses: Defining the core objectives for the museum's information design guidebook.

Primary user groups

students, educators, and general visitors

Research duration

limited to a defined academic research period

Application of key information design principles and visual communication strategies.

Geographic focus

exclusively Minjiang Teachers College's Biological Museum

The study excludes other museum design aspects such as exhibition curation or spatial design. The findings will specifically contribute to information design applications for improving visitor experiences in educational museums.

1.6 Research Framework

This research follows a systematic, multi-stage framework that integrates theory, design, and practice to explore the application of information design in the context of an educational biological museum.

The framework is structured as follows:

Phase 1: Problem Identification and Context Analysis

Analyze the current situation of the Biological Museum at Minjiang Teachers College.

Identify core problems related to information design, visitor engagement, knowledge dissemination, and lack of visual identity.

Define target user groups (students, educators, general visitors) and their needs.

Phase 2: Theoretical Foundation and Conceptual Research

Review interdisciplinary theories from visual communication, cognitive psychology, user experience (UX), and educational theory. Establish a conceptual understanding of information design in museum education, with a focus on accessibility, interactivity, and engagement. Highlight the potential of integrating culturally grounded cartoon characters as part of a human-centered design approach.

Phase 3: Design Strategy Development

Develop initial design goals and strategies for the museum's information system.

Formulate a plan for integrating guide maps, signage, visual hierarchy, and

interactive character-based storytelling.

Set design criteria based on principles of clarity, usability, and inclusiveness.

Phase 4: Data Collection and User Research

Conduct qualitative research (interviews, observations, cultural probe activities) to explore visitor needs and behaviors.

Carry out quantitative research (surveys, data analysis) to assess current user satisfaction and comprehension levels.

Identify pain points and preferences in the existing museum experience.

Phase 5: Prototyping and Design Practice

Create prototypes of the information guidebook, including guide maps, signage systems, and cartoon character applications.

Integrate findings from user research into visual and content design decisions.

Ensure alignment with educational goals and institutional identity.

Phase 6: User Testing, Evaluation and Refinement

Conduct participatory testing with users to evaluate the effectiveness of the proposed design solutions.

Collect feedback on usability, engagement, clarity, and knowledge retention.

Iterate designs based on testing outcomes to improve overall performance.

Phase 7: Output and Contribution

A user-centered guide map, an original cartoon character system, and a tested, practical guidebook.

Contribute to the field of museum education by offering an applicable information design model that bridges design theory and user-centered practice.

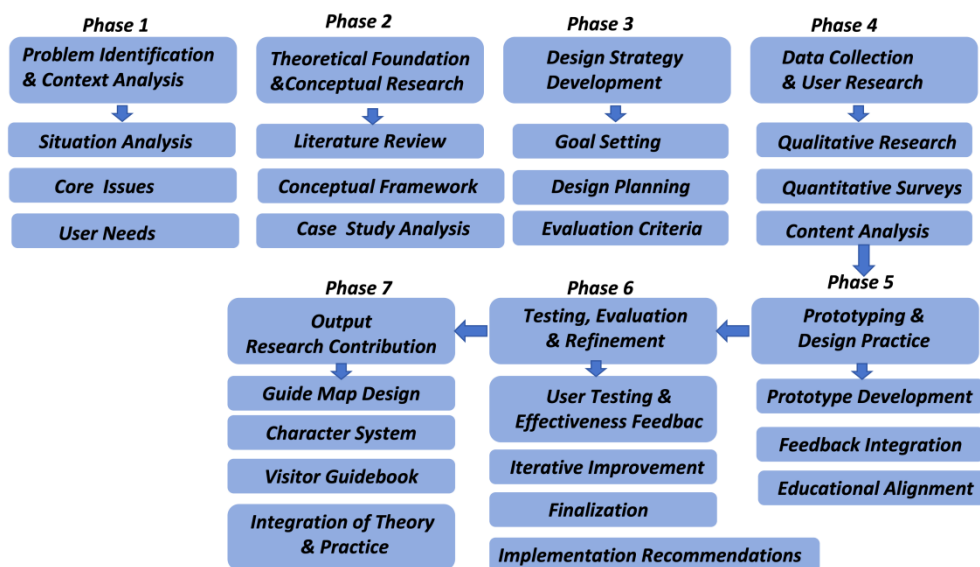


Table 1 Research Framework

1.7 Coceptual Research

This study is grounded in the interdisciplinary field of information design, combining principles from visual communication, cognitive psychology, user experience (UX) design, and educational theory. The conceptual foundation recognizes that effective information design in museum environments not only serves to guide visitors through spatial navigation but also enhances knowledge dissemination, engagement, and emotional connection.

In the context of biology museums, where scientific content can often be abstract and complex, information design plays a crucial role in transforming this content into accessible and engaging experiences for diverse audiences, particularly children and educators. Integrating cartoon characters with local cultural background and characteristics into the wayfinding system is a human-centered design approach that enhances interactivity and guidance in the visitor experience through visual storytelling and emotional design.

This research explores how visual systems, such as signage, guide maps, and interactive displays, can be improved through systematic design methods. It also

considers the application of participatory and usability-centered strategies to ensure that the design outcomes resonate with the real needs and behaviors of museum visitors. The study draws upon theories of semiotics, user-centered design, and constructivist learning to propose a comprehensive design guidebook, with a special focus on visual clarity, engagement, inclusiveness, and educational value.

Through conceptual analysis and practical application, this research aims to bridge the gap between academic theory and design practice, providing innovative solutions for improving visitor experience in educational cultural spaces like the Biology Museum at Minjing Teachers College.

1.8 Research Methodology

This study adopts a mixed-method research strategy, combining qualitative and quantitative approaches to ensure both scientific validity and practical relevance in information design. Qualitative methods such as interviews, participatory observation, and cultural probes are used to gain in-depth insights into visitor needs and behavior patterns. Quantitative methods, including surveys and behavioral data analysis, are employed to evaluate the effectiveness of the design. Additionally, practice-based research and participatory design are integrated throughout the process, emphasizing user involvement and contextual testing. The combination of these methods provides both theoretical support and practical guidance for the development of the information guide.

1.9 Research OutPut

- (1) An aesthetically optimized and user-centered guide map design for the museum, supporting improved wayfinding and communication.
- (2) A fully developed and integrated character as an interactive guide.
- (3) A comprehensive and user-tested Information Design Guidebook tailored for the

Biology Museum, integrating visual strategies, interactive elements, and visitor feedback.

1.10 Definition of Terms

Information Design: A user-centered design approach that organizes visual, textual, and graphical elements to improve the clarity, usability, and communication of information.

Visualization Design: The use of visual tools such as charts and graphics to concretize abstract data and make information more intuitive.

Wayfinding System: A visual information system designed to help users navigate and orient themselves in physical spaces, often including icons, maps, and signage.

User Experience (UX): The overall experience a person has when interacting with a system or service, including emotional responses, usability, and satisfaction.

1.11 The Relationship between RQ, RO, RM, and ROP



RELATIONSHIP BETWEEN RESEARCH QUESTION(RQ),OBJECTIVES(RO),AND RESEARCH METHODOLOGY(RM),AND RESEARCH OUTPUT(ROP)

SUBJECT: Information Design

SETTING: Biology Museum At Minjing Teachers College

PROPOSE OF YOUR RESEARCH 'TOPIC': Information Design Guidebook for Biology Museum At Minjing Teachers College

STATEMENTS OF THE PROBLEMS:

RESEARCH QUESTIONS (Identify the RQ based on the objective of the research)	RESEARCH OBJECTIVES (Identify the RO based on the purposes of the research)	RESEARCH METHODOLOGY (Identify the RM based on the objectives)	RESEARCH OUTPUTS (What are the outputs that you want from this objective?)
1. How can information design be optimized to enhance knowledge dissemination and visitor engagement in the Biology Museum at Minjing Teachers College?	To design an aesthetically pleasing and functionally effective museum guide map based on principles of information design, with the goal of presenting the spatial layout and exhibition zones clearly and intuitively, facilitating efficient navigation and enhancing spatial understanding and visitor experience.	Qualitative Research & Case Study – Analyzing existing museum information design strategies and conducting visitor and expert interviews.	An aesthetically optimized and user-centered guide map design for the museum, supporting improved wayfinding and communication.
2. How can the cartoon character be effectively integrated into the information design to improve interaction and wayfinding?	To create and integrate an original cartoon character with strong local cultural identity as a core element in the museum's wayfinding and interpretive system, in order to increase interactivity and immersion, especially among younger audiences.	Design Research & Usability Testing – Developing the Information Design Guidebook and testing for engagement and wayfinding efficiency.	A fully developed and integrated character as an interactive guide.
3. How can an information design guidebook be developed to improve knowledge dissemination and visitor engagement in the Biology Museum?	To develop a Biological Museum Visitor Guidebook that combines visual and textual content-including exhibit details, spatial navigation, and character-based interactions-to improve science communication and promote deeper visitor engagement.	Mixed Methods Research — Combining qualitative approaches (interviews, cultural probes, participatory observation) and quantitative methods (questionnaires, behavior tracking) to analyze user needs and evaluate the design outcomes.	A comprehensive and user-tested Information Design Guidebook tailored for the Biology Museum, integrating visual strategies, interactive elements, and visitor feedback.

Table 2 Research RQ,RO,RM,ROP Form

CHAPTER 2

LITERATURE REVIEW

Information Design refers to the organization, structuring, and presentation of information with the purpose of transforming complex data into easily comprehensible, clear, and useful content to effectively communicate and better serve target audiences. Information design is a branch of graphic design. It's the process of designing and creating documents and other materials that communicate information effectively. It involves the use of typography, layout, color, and other visual elements to convey information in a way that is both efficient and easy to understand. (Ezera,2023) It integrates visual, textual, and structural elements to efficiently convey complex data and information.

The core objective of information design is to create visually efficient and cognitively accessible representations. Information design is widely applied in fields such as data visualization, wayfinding systems, educational materials, and digital interfaces to enhance user experience and support decision-making processes. It focuses on organizing and presenting information in a user-friendly manner, enabling people to quickly and accurately access and understand the information they need.

2.1 About information Design

In a complex world, clear and accessible communication, across a broad range of media, has become essential. Information design addresses this need by blending typography, illustration, communication studies, ergonomics, psychology, sociology, linguistics, computer science, and a variety of other fields to create concise and unambiguous messages. While virtually all forms of design are human-centered, information design focuses on the accurate representation of specific knowledge sets and the unique needs of the end user receiving that content. (O'Grady & O'Grady,

2008, p. 6) "information design" is almost impossible. It's better to explore the discipline through the words of its most noted practitioners, review the artifacts commonly associated with the visualization of data, and investigate the philosophy of a user-centered approach. (O'Grady & O'Grady, 2008, p. 8)

In a very broad sense of the term, information design is the bridge that links information technologies and knowledge creation. It helps enhance interaction with all our senses in order to create knowledge.

Information design is also referred to as graphic design, information architecture, instructional design, content presentation, presenting information etc.(Srinivas, 2015, para. 2)

2.1.1 Types of Information Design Applications

The application of information design is extensive and includes, Information design is everywhere, but is not limited to, the following areas. (Piktochart, 2023)

- (1) Signage System Design: Designing clear signs and directional indicators to help people navigate public spaces such as museums, airports, hospitals, etc.
- (2) Data Visualization Design: Presenting complex data in the form of charts, graphs, or other visual formats, making the data easier to understand and analyze.
- (3) User Interface (UI) Design: Designing intuitive user interfaces to enable users to easily interact with digital products such as websites and applications.
- (4) Publication Design: Including the layout and typography of books, magazines, newspapers, ensuring readability and visual appeal of content.
- (5) Exhibition Design: Optimizing visitor experiences in museums, galleries, and exhibition spaces through thoughtful layout, display methods, and informative texts.
- (6) Educational Material Design: Designing textbooks, study guides, and other educational materials to make learning content easier to comprehend and remember.
- (7) Packaging Design: Information design on product packaging, including text, graphics, and symbols, helping consumers quickly understand product details.

2.1.2 Information Design Strategies

Information design strategies refer to the process of transforming complex information into clear, effective, and easily understandable communication solutions. Below are common information design strategies that can be applied across various scenarios to improve information delivery efficiency and user experience:

(1) User Needs Analysis

Target audience identification: Clearly define who the information receivers are, understanding their backgrounds, knowledge levels, needs and expectations.

Needs assessment: Determine users' specific information requirements through surveys, interviews or data analysis.

Information customization: Tailor information content and presentation based on user needs and preferences.

(2) Information Organization and Structure

Information chunking: Break down large amounts of information into smaller, manageable sections for easier understanding and digestion.

Logical sequencing: Organize information in logical order such as chronological, spatial or by order of importance.

Hierarchical structure: Use headings, subheadings and lists to establish information hierarchy for quick content navigation.

(3) Visual Presentation Strategies

Visual hierarchy: Emphasize important information through design elements like font size, color and spacing.

Graphics and charts: Use diagrams, graphs and images to visually present complex data and relationships.

Color coding: Utilize colors to categorize or highlight information for better recognition. **Icons and symbols:** Employ universal icons and symbols to quickly convey information across language barriers.

(4) Interaction Design Strategies

User engagement: Design interactive elements like buttons, links and clickable areas to encourage participation.

Feedback mechanisms: Provide immediate feedback to confirm user actions.

Responsive design: Ensure information displays properly across different devices and screen sizes.

(5) Accessibility Strategies

Barrier-free design: Follow accessibility standards to ensure information is available to all users including those with disabilities.

Multi-sensory communication: Incorporate visual, auditory and tactile methods to accommodate diverse user needs.

Language simplification: Use simple and clear language, avoiding jargon to ensure easy understanding.

(6) Testing and Optimization

User testing: Evaluate information design effectiveness by observing how users interact with the information.

Feedback collection: Gather user feedback to understand their opinions and suggestions.

Continuous optimization: Constantly improve information design based on test results and user feedback to enhance experience.

These strategies are often interwoven in practical applications, working together throughout the information design process to create both aesthetically pleasing and functional information communication solutions. (Baer, 2008)

2.2 Applications of Maps in Information Design

Cartography, the art and science of creating maps, can also trace its history back to pre-literate man: maps are one of the earliest forms of information design. (O'Grady & O'Grady, 2008, p. 65)

Cartographic information graphics make it possible to absorb information

quickly and are therefore, in contrast to ordinary maps, limited to depicting essential components that contribute to understanding.

"Unlike a map, the form and content of a cartographic information graphic are created to communicate spatially a specific, current piece of information; it is not produced for a general purpose or overarching theme." (Scharfe, 2007, p. 142)

Maps play a pivotal role in information design by visually representing spatial relationships and complex data, thereby enhancing comprehension and decision-making. Here are some key applications of maps in information design:

(1) Data Visualization: Maps are instrumental in visualizing geospatial data, such as demographic distributions, climate patterns, and epidemiological trends. For instance, John Snow's 1854 cholera map effectively illustrated the outbreak's concentration, leading to critical public health interventions.

(2) Wayfinding and Navigation: In complex environments like airports, hospitals, or urban centers, maps facilitate navigation by providing clear visual cues and routes, enhancing user experience and accessibility.

(3) Storytelling and Journalism: Cartographic storytelling combines maps with narrative elements to contextualize events geographically, enriching journalistic content and audience engagement.

(4) Interactive Web Applications: Modern web design often incorporates interactive maps that allow users to explore data dynamically, such as real-time traffic updates or property listings, thereby improving user interaction and information accessibility.

(5) Educational Tools: Maps serve as educational resources, aiding in teaching geography, history, and environmental science by providing visual context to textual information.

2.3 Application of cartoon design in information design

Cartoon design, as an approachable and concrete visual expression, plays a

significant role in information design. It is particularly effective in contexts that require lowering cognitive barriers, capturing attention, and enhancing information retention, such as museums, public spaces, and educational platforms.

Characterized by simplified forms, vibrant colors, and direct emotional expression, cartoon design effectively attracts audience attention and reduces the cognitive load of information reception. This makes it especially suitable for children, adolescents, or cross-cultural audiences.

According to Duyet's Semiotics theory, cartoon imagery, as a visual symbol, enhances signification and recognizability through exaggeration and anthropomorphism, thereby improving the efficiency of information transmission. Additionally, the Dual Coding Theory (Paivio, 1971) in cognitive psychology suggests that dual input of images and text can enhance understanding and memory. Cartoon design supplements textual information with visual elements, creating a complementary effect between visuals and language.

Cartoon design is widely utilized in practical applications such as museum navigation systems, exhibition signage, and interactive interfaces. Cartoon characters are often employed to provide guidance and cues, particularly excelling in child-friendly environments. This approach allows visitors to quickly comprehend and respond to spatial information and behavioral instructions in a pleasant and relaxed atmosphere.

For instance, the Fujiko·F·Fujio Museum in Japan features the classic cartoon character "Doraemon" as the central figure in its navigation system. Doraemon is integrated throughout maps, exhibit introductions, and interactive activities. By using this character for guidance, the museum reduces the unfamiliarity associated with spatial navigation and leverages the emotional connection between the character and visitors to enhance the overall immersive and enjoyable experience.

Similarly, the Shanghai Natural History Museum has introduced a dedicated cartoon character named "Adventure Little Dinosaur" in its children's exhibition area.

This character appears in navigation signage, exhibit explanation screens, and interactive Q&A sessions. Through anthropomorphic design and contextual language, complex natural science knowledge is conveyed to young audiences in a simple and engaging manner, significantly enhancing the educational function and entertainment value of information design.

Furthermore, cartoon design can express specific emotions and behavioral guidance through facial expressions and actions, making information design more warm and human-centered rather than merely conveying instructions coldly. This design strategy not only improves user experience but also promotes inclusivity in information design across diverse audiences.

In summary, the application of cartoon design in information design exemplifies the trend toward visual, human-centered, and engaging communication. Its foundations in semiotics and cognitive psychology provide robust theoretical support for its widespread use in public information systems, educational guides, and digital interactions. Practical examples further demonstrate its unique value in enhancing information accessibility, affinity, and user experience.

2.4 Information Design in Museum Environments

Museums are dynamic spaces that require strategic information design to facilitate visitor learning and interaction. Hein (1998) discusses the role of constructivist learning in museums, emphasizing that visitors actively interpret information rather than passively receiving it. This underscores the need for well-structured interpretive labels, exhibition texts, and multimedia interfaces.

Serrell (1996) explores interpretive exhibit labels, arguing that clear, concise, and engaging text improves visitor comprehension and retention. Bitgood (2013) highlights the importance of attention and value in exhibition design, suggesting that information should be presented in a way that sustains visitor interest and encourages deep engagement. Müller and Kravchyna (2003) investigate digital museum interfaces,

finding that well-designed virtual exhibitions enhance accessibility and support remote learning experiences.

2.5 Case Studies: Applications of Information Design in Museums

This section selects representative case studies from multiple international and regional museums to examine their specific practical strategies in information design manuals. By comparing information design across different cultures and contexts, it reveals the critical role that information design plays in enhancing visitor experience, optimizing spatial wayfinding, and strengthening interactivity. As a multidisciplinary field, information design combines visual communication, user experience, cognitive psychology, and educational theory; its application in the museum context is not merely about presenting information, but also serves as a vehicle for facilitating learning and exchange (Srinivas, 2015; O'Grady & O'Grady, 2008).

2.5.1 The British Museum: Clarity and Structure in Wayfinding

The British Museum's wayfinding system exemplifies a clear and structured approach to spatial information design. The museum utilizes high-contrast color schemes in its maps and clearly defines exhibition zones by geographical regions and thematic topics. This information is supported by numerical codes and universally recognized icons, helping visitors quickly identify gallery locations. The spatial circulation is scientifically planned to avoid congestion and directional confusion, with prominent signage placed at key points (Space Syntax, n.d.). In addition, the museum integrates printed guides with digital applications to ensure that visitors with different preferences can navigate smoothly and locate exhibition halls efficiently (British Museum, n.d.). These design elements collectively create a user-centered, accessible, and efficient visiting experience (MuseumNext, n.d.). The circulation routes are rationally designed, with noticeable signage installed at key locations. The combination of printed guidebooks and digital applications ensures that visitors can

efficiently plan their routes, minimizing confusion and information overload.

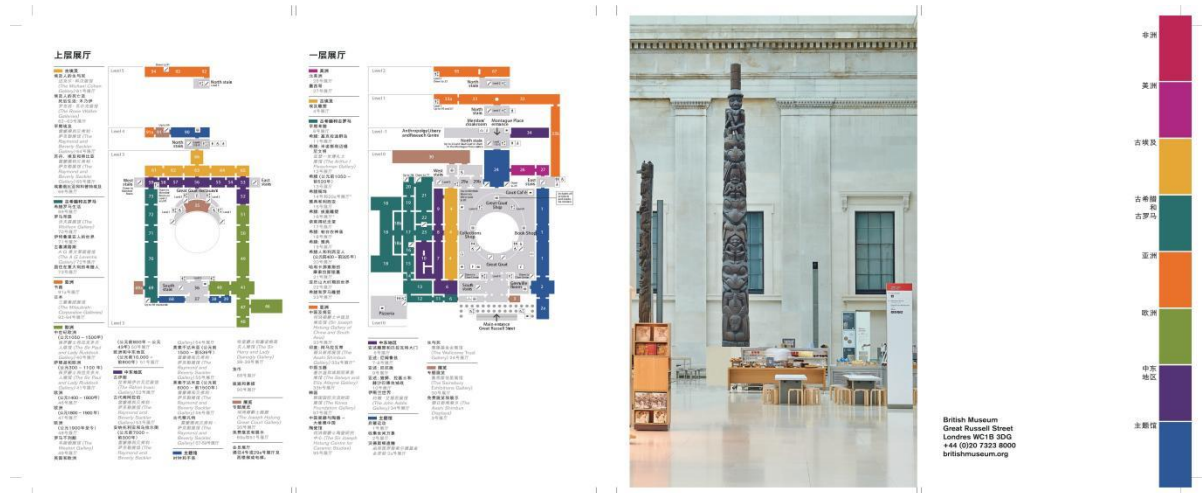


Figure 1 Bilingual Gallery Map of the British Museum

<https://www.britishmuseum.org/visit/museum-map>

The Visitor Guide published by the British Museum is a practical handbook that includes:

Seven main sections, organized by geographical regions and historical periods: Africa, the Americas, Ancient Egypt, Ancient Greece and Rome, Asia, Europe, and the Middle East. Each section introduces related exhibits and is arranged by gallery numbers, making it easy for visitors to locate them. Seven themed exhibitions: Enlightenment, Collecting the World, The Waddesdon Bequest, Living and Dying, Clocks and Watches, Money, and Prints and Drawings. At the front of the guide, there is a full-color map that provides detailed guidance for visiting the museum. (British Museum, n.d.)

2.5.2 Victoria and Albert Museum (V&A): Clear navigation logic

The V&A Museum has standardized visitor information design, creating a systematic Visitor Information Design Manual. The manual significantly enhances the recognizability of exhibition areas and the intuitiveness of route planning through high-contrast color schemes, structured maps, and consistent iconography. This design is especially suitable for large, comprehensive museums, helping visitors quickly

orient themselves in complex spaces (Victoria and Albert Museum, 2012). Additionally, the guide optimizes the maps; the redesigned maps offer excellent readability and portability in both print and digital formats, with the icon design harmonizing with the museum's humanist typeface.

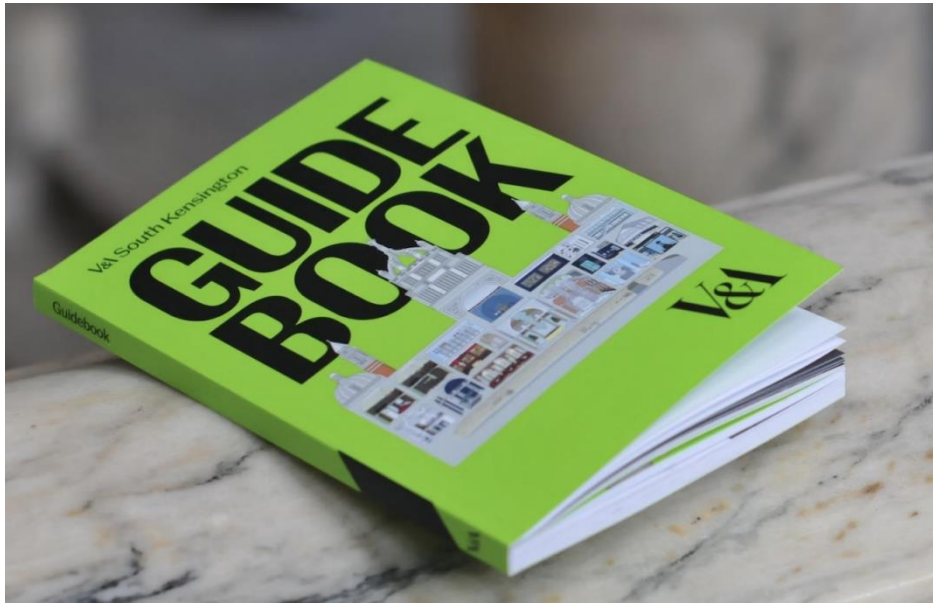


Figure 2 designweek web:Planning Unit designs the new V&A guidebook (designweek, 2024)

Source: <https://www.designweek.co.uk/planning-unit-designs-the-new-va-guidebook>

2.5.3 National Museum of Modern and Contemporary Art(MMCA): Minimalism and Bilingual Information Integration

The MMCA Guide published by the National Museum of Modern and Contemporary Art (MMCA) systematically presents the museum's historical context, exhibition information, collection introductions, and visitor guidelines through a minimalist visual approach. Utilizing basic graphic elements such as arrows and color blocks, the guide intuitively directs spatial navigation. Moreover, the bilingual presentation of Korean and English content achieves a visual and informational balance, enabling international visitors to rapidly adapt to the museum's information system. This design effectively highlights the significance of information equity in museum information design (National Museum of Modern and Contemporary Art,

2018).

2.5.4 21st Century Museum of Contemporary Art, Kanazawa: Minimalist Aesthetics and Accessibility

Located in Kanazawa, Japan, this museum integrates minimalist aesthetics with accessibility principles in its information design. A unified and straightforward signage system utilizes basic visual elements such as color blocks, lines, and arrows to indicate functional areas. All textual information is presented bilingually in Japanese and English, using clean and elegant fonts to accommodate visitors from diverse linguistic backgrounds. The open spatial layout ensures that informational cues do not dominate the visual field but provide necessary guidance when needed, embodying the “less is more” design philosophy and enhancing the overall fluidity and comfort of the visitor experience. (21st Century Museum of Contemporary Art, Kanazawa, n.d.-c)

2.5.5 Shanghai Astronomy Museum: Technological Interaction and Science Communication

The Shanghai Astronomy Museum showcases the deep application of information design in technological interaction and science communication. The museum extensively employs timeline designs to visually present abstract knowledge such as cosmic evolution and the development of astronomy through infographics and dynamic graphics, aiding visitors in understanding the chronological context of scientific events. (Xenario, 2021) The museum is equipped with various interactive information devices, including touchscreens and AR interfaces, with well-organized layouts that allow visitors to choose content and depth according to their interests, enhancing engagement and exploration. Overall, the design effectively caters to the cognitive needs of audiences across different age groups, achieving a dual function of information design in knowledge dissemination and immersive experience. (Ennead Architects, n.d.)

In summary, the integration of structured navigation, inclusive design, cultural localization, bilingual information systems, and digital interaction illustrates the multifaceted applications of information design manuals in contemporary museums. These cases demonstrate that such systems are not only practical tools for spatial guidance but also play a crucial role in enhancing learning experiences, facilitating cross-cultural communication, and promoting knowledge dissemination. Information design, therefore, should be recognized as a vital medium that connects space, content, and audiences in meaningful and impactful ways (Srinivas, 2015; O’Grady & O’Grady, 2008).

2.6 Design Insights from the Literature

The literature review highlights the critical role of information design in character development, visual presentation, spatial flow, and wayfinding systems. Through an examination of relevant studies, it becomes evident that information design is not only concerned with the effective transmission of information but also with how visual language and spatial strategies can be employed to stimulate users’ comprehension, engagement, and emotional resonance. Whether through the guiding function of cartoon characters within exhibition spaces, the dual-channel reinforcement effect of combined text and visuals in educational communication, or the practical value of directional signage and path-mapping in museum environments, these design strategies collectively enhance users’ cognitive efficiency and quality of experience. Furthermore, information design emphasizes the construction of meaning and narrative expression, allowing visitors to form individualized interpretative pathways while receiving information. These theoretical insights provide a solid foundation for the design process and content development of the visitor guidebook for the Natural History Museum in this study. The following chapter will focus on the practical design process and explore how these theories can be applied to the development of the guidebook as part of a youth-oriented study tour product.

CHAPTER 3

Research Methodology and Design Process

The design of information guides in biological museums encompasses multiple facets, including information organization, user experience, and visual design. This chapter provides a detailed description of the research methods employed in designing guides for biological museums. The study adopts a multidisciplinary approach, combining both qualitative and quantitative research methods, such as experiments and case analyses. Notably, the use of cartoon characters is incorporated to enhance visitor experience.

3.1 Research Methodology

This section introduces the overall research methodology, integrating art and design research with educational and museum-based research.

3.1.1 Design Research Methods

(1) Practice-Oriented Research:

Exploring and validating the effectiveness of information design through real-world design projects.

(2) Practice-Led Research:

Advancing theoretical development and understanding based on design practice.

(3) Participatory Design:

Involving children and educators in the design process to ensure that the outcomes meet user needs.

3.1.2 Educational Research Methods

Qualitative Research: Gaining in-depth insights into the perceptions and feedback of children and educators on information design through interviews and observations.

Quantitative Research:

Assessing the readability, attractiveness, and educational effectiveness of information design using surveys and statistical analysis.

Mixed Methods Research:

Combining qualitative and quantitative research methods to provide a comprehensive analysis and understanding.

3.2 Research Process

This research process integrates multiple methodologies to achieve comprehensive and practical outcomes in the information design of biological museums. The following sections elaborate on the implementation of three interrelated approaches: practice-based research, practice-led research, and participatory action research (PAR).

(1) Practice-Based Research – Centered on the Production of Museum Information Design Outputs

Practice-based research focuses on generating tangible design outcomes—namely, museum information guidebooks—through prototype development, testing, and iterative refinement. In the initial stage, researchers developed conceptual prototypes informed by theoretical frameworks and successful case studies in museum information design. These prototypes incorporated elements such as visual storytelling techniques and cartoon character illustrations to effectively engage younger audiences. In subsequent phases, the prototypes were iteratively tested and refined through practical user engagement activities conducted in real museum settings. These evaluations focused on improving readability, navigational ease, visual appeal, and educational effectiveness. Through continuous validation and enhancement, the research produced practical and user-centered design solutions.

(2) Practice-led Research -Driven by educational inquiry and design goals

The practice-led research in this study places particular emphasis on educational exploration and theoretical advancement, with the primary goal of optimizing the

design of museum information guidebooks. Motivated by the desire to enhance visitor learning experiences and promote educational interaction, the research process involves rigorous theoretical investigation supported by practical experimentation. Drawing on theories from visual communication and educational psychology, researchers critically analyzed key design elements such as layout structure, text readability, color usage, graphic representation, and thematic coherence. Through regular reflective analysis of each design iteration, the study continuously refined guiding principles and theoretical models, ultimately contributing to broader theoretical discourse and practical application within the fields of museum education and design.

(3) Participatory-action Research (PAR) Involving children and educators as active participants.

The participatory action research (PAR) approach ensures that end users—children and educators—play an active and indispensable role throughout the research and design process. Researchers organized structured co-design workshops to collaboratively develop and evaluate initial concepts and prototypes of the information guidebooks. Elementary school students and educators provided valuable feedback on various aspects of the guidebooks, including visual style, character design, narrative content, and overall usability.

Children contributed by expressing their preferences through drawings, storytelling, and conversations, allowing designers to gain direct insights into their cognitive tendencies and emotional responses. Educators highlighted specific educational needs, identified connections to curriculum content, and assessed the practical usability of the guidebooks in real teaching scenarios. This collaborative process empowered participants with a meaningful voice in design decisions, ensuring that the final outcomes genuinely reflected user expectations and needs. As a result, the museum information design became more engaging, effective, and educationally valuable.

Through these interrelated research processes—practice-based prototyping, theoretical reflection, and participatory co-design—this study effectively bridges theory and practice, ensuring that the outcomes of the museum information guide design are theoretically grounded, contextually relevant, and practically applicable.

3.3 Methodology

3.3.1 Qualitative Research

This study employs an exploratory analytical approach to delve into the design process of information guides in biological museums, aiming to enhance understanding of user needs, behavioral patterns, and usage contexts. Methods such as interviews, participatory observation, and cultural probes are utilized to gain deep insights into visitors' subjective experiences, requirements, and perceptions of information displays.

In-depth Interviews:

Through in-depth interviews with visitors of various age groups—including students, parents, educators, and docents—we gathered insights into their comprehension of the museum's existing signage and exhibit information, key points of memory, areas of interest, and experiences with interactive elements.

Participant Observation:

In this study, participant observation was conducted with visitors to the Biological Specimen Museum—primarily including elementary and middle school students, educators, and general visitors—to systematically record their dwell times, navigation paths, visual attention, and interactive behaviors with exhibits while using the museum guidebooks. Particular attention was paid to how visitors utilized the information guidebooks and on-site signage systems for navigation, observing their efficiency in locating information and comprehending content. The collected observational data identified areas that attracted high visitor engagement, as well as

spaces frequently overlooked. These insights provide targeted recommendations for optimizing spatial layouts and information presentation, ultimately enhancing the effectiveness of information delivery within exhibition spaces.

Cultural Probes:

Encouraging visitors to document their museum experiences through drawings, photographs, stickers, or charts allows for the collection of emotional and non-verbal feedback. This approach aids in optimizing the content of information guides in biological museums.

This participatory method not only captures visitors' subjective experiences but also provides valuable insights into their emotional responses and engagement levels. By analyzing these creative expressions, museum designers can better understand visitor preferences and improve the overall effectiveness of informational materials.

3.3.2 Quantitative Research

This study employs quantitative research methods to validate hypotheses regarding the effectiveness of the Biological Specimen Museum's information design guide through statistical data, specifically analyzing visitor reception of content presentation, visual readability, and overall navigational logic. To achieve this, structured questionnaires were first developed and administered to quantitatively evaluate visitors' comprehension, information retrieval efficiency, and satisfaction after museum visits. Additionally, eye-tracking experiments were conducted to record visitors' visual attention, reading paths, and areas of interest while browsing the guidebooks, providing objective physiological data. Statistical analysis of these collected data clearly supports optimization of the information architecture, defines objectives for iterative design improvements, and ultimately enhances the visitor experience.

Questionnaire Survey:

After educational activities concluded, questionnaires were distributed on-site at the Biological Specimen Museum to students, educators, and other participants,

aiming to gather data on the effectiveness of the museum's information design. The questionnaire was developed by referencing existing museum information evaluation tools (such as Serrell's exhibition label evaluation criteria) and refined through expert interviews, ensuring its validity. Additionally, a pilot test was conducted prior to formal distribution to optimize question clarity and consistency, thereby improving the reliability of the instrument. The questionnaire specifically assessed the clarity and readability of content, levels of interest in learning generated by the information design, and participants' overall satisfaction. This data provides objective evidence for iterative design improvements.

Eye-tracking:

Conducting experiments with audience members from various age groups as samples, we analyzed visitors' focal points and areas of visual fixation within the information display zones. This approach helps in understanding how different age demographics engage with exhibit content, enabling the optimization of information layout to cater to diverse visitor needs.

Pre-test/post-test:

By comparing visitors' knowledge acquisition before and after their museum experience, we assess the learning effectiveness facilitated by information design. This evaluation determines whether the knowledge transfer has been successful.

3.3.3 Statistical Analysis and Data Visualization

In this study, statistical analysis was used to validate the effectiveness of the information guide design and to support conclusions drawn from qualitative insights. Survey data collected from different age groups, including students, parents, and educators, were analyzed using descriptive statistics (such as mean, frequency, and percentage) and inferential statistics (such as chi-square tests and t-tests) to identify patterns, differences, and correlations in user responses.

3.3.4 Mixed-Methods

(1)Integration of qualitative interviews and quantitative validation

This study integrates qualitative and quantitative research methods to ensure depth and practicality in the design of information guides for biological museums. Initially, small-scale expert interviews (involving 3-5 museum educator) and informal visitor feedback (such as follow-up observations) were conducted to identify critical usability issues, such as overly technical terminology, unclear layout logic, and unintuitive map indicators. These insights provided clear optimization directions for initial guide designs. Subsequently, researchers organized an on-site validation activity involving practical navigation tasks with 20 undergraduate and graduate visitors. Participants were asked to complete specific information-finding tasks using the guide, and their task completion times and success rates were recorded. Afterwards, they completed a 10-item Likert-scale questionnaire assessing readability and overall satisfaction. This straightforward and highly executable validation approach effectively combines subjective and objective assessments, ensuring both rigor and practical effectiveness in research outcomes.

(2)Multi-modal analysis of user behaviors in exhibition spaces

This study employed a multi-modal analysis approach to comprehensively understand user behaviors in the biological museum exhibition spaces. By integrating data from various sources—including direct observations, video recordings, eye-tracking analysis, interaction logs, and user-generated content (such as drawings, comments, and photos)—the research captured both quantitative and qualitative dimensions of visitor engagement.

The analysis focused on identifying behavior patterns such as movement paths, duration of stops, interaction frequency with digital exhibits, and user attention distribution. Visual heatmaps, movement diagrams, and coded behavioral data were used to visualize and compare how different groups (e.g., children, adults, educators) navigated the space and responded to information displays. This multi-modal approach enabled a deeper understanding of not only what users do, but also why they

engage with specific exhibits or ignore others. Such insights are crucial for optimizing the spatial arrangement, enhancing information delivery, and improving user experience design in museum environments.

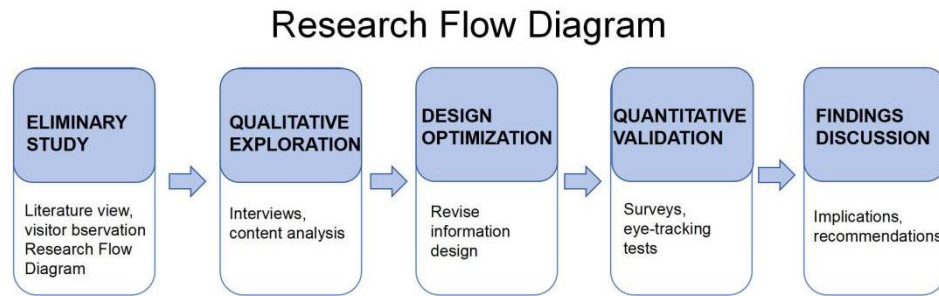


Figure 3 Research Flow Diagram

3.4 Research Flow Diagram

3.5. Design Experiment 1: The Luen Rit Community Design Program

During my master's program, I tried to design cartoon images through information design to serve the community's celebration of traditions. In this project, I gained a better understanding of Design Thinking. The entire process followed this approach, deeply understanding user needs and problems, utilizing diverse thinking methods, and developing creative and practical solutions.

3.5.1 Experiment Based on Design Thinking Theory

By incorporating the design thinking process

Design thinking

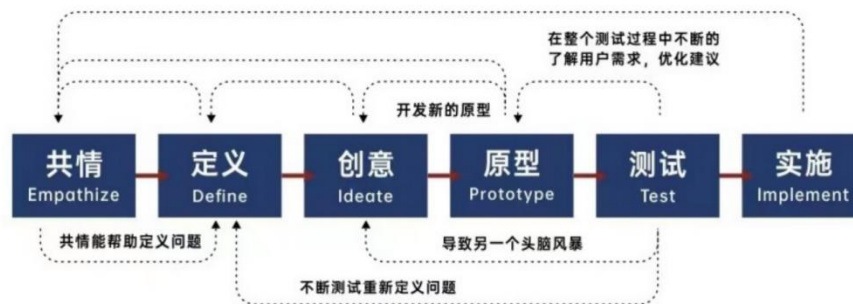


Figure 4 Framework of the Design Thinking Model

Illustrates the five key phases of the Design Thinking model: Empathize, Define, Ideate, Prototype, and Test. All three design experiments conducted in this study followed this iterative, user-centered framework. The process emphasizes understanding user needs, redefining problems, generating creative ideas, and refining solutions through prototyping and testing. The model supports the optimization of Xiao Rongbao's visual and information design system, especially in educational and communicative contexts.

(1)Empathize: Stage-Through in-depth interviews with users, we analyzed and gained a deep understanding of their true needs, motivations, and emotional experiences. The core of this stage is to build a trusting relationship with users, listen to their voices, and uncover the challenges and pain points they may encounter in real-world scenarios. In this project,the design team conducted systematic data collection and analysis using face-to-face interviews questionnaires, and cultural probes, ensuring that a user-centered design direction was established from the outset. This approach not only facilitated effective communication between designers and users but also laid a solid foundation for subsequent concept generation and solution development.

(2)Define Stage-identify the real issue: There are few shops open in the

community. The community lacks popularity and aims to revitalize itself through events to attract foot traffic, including tourists.

In the Define Stage, the designer synthesizes and analyzes the user data gathered during the empathy phase—such as interview transcripts, observation notes, and cultural probe artifacts. Using techniques like affinity mapping, user journey mapping, and thematic clustering, they extract key insights to pinpoint users' core needs, pain points, and potential opportunities. Based on these insights, the team crafts a clear point-of-view statement and problem definition, establishing a focused design challenge and objectives that will guide the subsequent ideation phase.

(3) Ideation Stage - Based on the design challenges distilled in the Define stage, we employed a variety of divergent and convergent thinking methods to generate and screen creative solutions. Through brainstorming and concept mapping, we visualized related concepts, user needs, and pain points to uncover new combinations and connections. Sketching and low-fidelity prototyping were used to quickly materialize abstract ideas into tangible forms for discussion and iteration. Finally, using the triple criteria of feasibility, desirability, and viability, we scored and ranked the concepts. By combining user feedback with business requirements, we selected the most promising solutions as inputs for prototyping.



Moon and rabbit

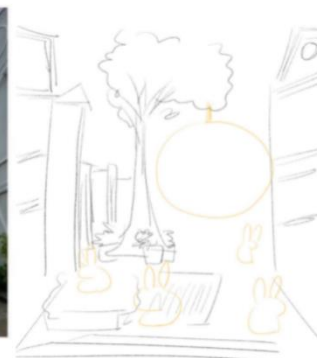
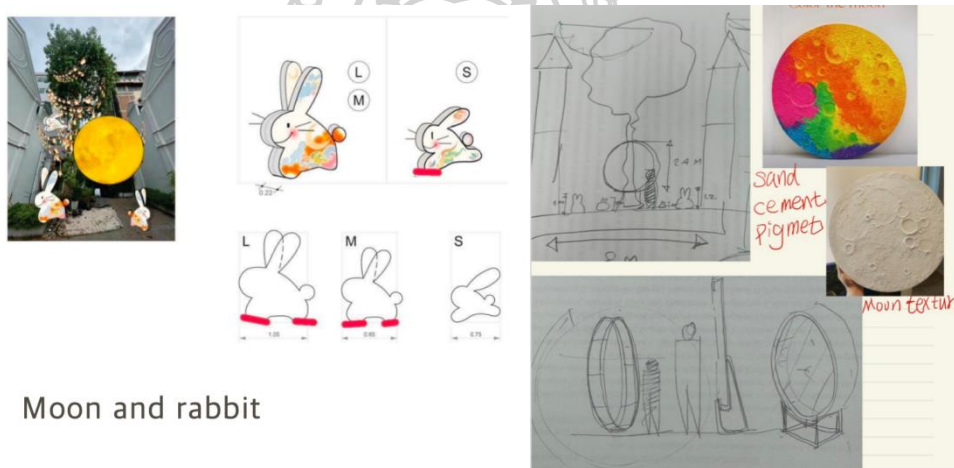


Figure 5 Community Meeting and Initial Sketch of Mid-Autumn Festival Installation

The left side of the figure shows the team’s co-creation session with local community members, focusing on user needs and identifying existing problems through direct conversation. The right side presents the initial sketch developed after the first brainstorming session. The design explores symbolic imagery of the Mid-Autumn Festival, such as rabbits and a glowing full moon, aiming to create a culturally resonant atmosphere. This stage reflects the practical application of the “Empathize–Define–Ideate” phases within the design thinking process.



Moon and rabbit

Figure 6 Divergent Thinking and Sketch Exploration for the Mid-Autumn Festival Installation

After completing user interviews and problem definition, I entered the “Ideate” phase of the design thinking process. Centered on the Mid-Autumn Festival theme, we applied divergent thinking to explore various creative interpretations of the “moon and rabbit” imagery. Through hand sketches, form variations, proportional analysis, and material experimentation, multiple design ideas were generated. We not only considered visual cuteness and cultural recognizability, but also integrated multisensory elements such as glowing effects and moon surface textures to enhance immersion and atmosphere. This creative exploration laid a solid foundation for the

next phase of prototyping.

(4) Prototyping Stage-In the prototyping stage, the research team transforms the most promising concepts selected during the ideation phase into testable prototypes. Through rapid iterative testing, each prototype is subjected to usability tests with a small group of users; feedback is collected and used to continually refine the details. The objective of this stage is to validate design hypotheses, optimize information presentation and interaction flows, and provide a reliable foundation for subsequent development and implementation.



Figure 7 Prototyping and Testing Process of the Glowing Moon Installation

This figure documents the step-by-step process of prototyping and testing the “glowing moon” component of the Mid-Autumn Festival installation. The first photo shows the manual creation process using balloon molds, layers of tissue, and glue. The second photo presents the drying stage, where the spherical form takes shape. The third photo captures the result of internal lighting during testing. However, the prototype failed during testing—only a small-sized version could hold the light effectively without collapsing or losing its visual effect. This experience highlights the importance of hands-on prototyping and learning from failure within the design thinking process.

(5) Test Stage

After encountering structural challenges during the prototype testing phase, the team decided to replace the glowing moon element with a mooncake, a culturally symbolic element of the Mid-Autumn Festival. To enhance the visual appeal and relevance, we designed a cartoon character named “FuLong,” placed at the center of the mooncake. “Fu” means blessing and “Long” means dragon in Chinese, making “FuLong” a dragon who brings good fortune and happiness. The design reflects both the 2024 Chinese Dragon Year and traditional festival imagery, enriching the installation’s cultural depth and storytelling potential.



Figure 8 Design Adjustment from Moon to Mooncake and Creation of “FuLong” Character

(6) Implement

The creation and execution of the “Fu Long” mooncake installation involved a hands-on painting process. I manually crafted the large mooncake surface using a combination of spray painting, outlining, and hand-drawing techniques to integrate the “Fu Long” character into the central visual. Inspired by the Chinese Lunar Year of the Dragon, the design of “Fu Long” blends the imagery of the dragon with the concept of “Fu” (blessing), symbolizing happiness, good fortune, and auspiciousness. This

stage demonstrated the transformation of a conceptual prototype into a tangible visual expression, reinforcing the visibility and cultural resonance of the cartoon character in public space.



Figure 9 Painting and Implementation of the “Fu Long” Character: From Prototype to Execution





Figure 10 Final Presentation of the “Fu Long Mooncake” Installation at the Luenrit Mid-Autumn Festival

The “Fu Long Mooncake” installation was successfully implemented as part of the Mid-Autumn Festival celebration in the Luenrit community. Positioned in the central plaza, the installation served as both a photo backdrop and stage decoration during the festival. It attracted many local residents and visitors, encouraging photo-taking and public interaction, and significantly enhanced the festive atmosphere and foot traffic in the area. Through this project, I gained a deeper understanding of the Design Thinking Model and experienced its full cycle—from empathizing and ideating to prototyping, testing, and implementation. This process provided me with a solid theoretical and methodological foundation for future design practice.

3.6 Design Experiment 2: Cartoon Character Design Based on Bangkok Design Week 2025:

The 2025 Bangkok Design Week adopted the theme “Design Up+Rising: Facing Challenges with a Positive Twist,” encouraging designers to respond to social change and environmental issues with creativity and a positive mindset. Taking this as an opportunity, this experiment focused on “IP character design for local universities,” integrating Fuzhou’s regional culture and educational communication needs. Centered around the banyan tree as the core creative element, the project explores the functional role of a university cartoon mascot in information design and emotional connection. Minjiang Teachers College is located in Fuzhou, Fujian Province, China. The city tree of Fuzhou is the banyan tree, which is why the school’s logo features a large banyan tree. The cartoon character is designed based on the shape and symbolism of the banyan tree.

3.6.1 Design Background and Cultural Basis

Minjiang Teachers College is located in Fuzhou, Fujian Province. Fuzhou has long been known as the “City of Banyans,” with the banyan tree designated as the city tree, deeply influencing the region’s cultural and ecological identity. The school emblem itself features a banyan tree, symbolizing rootedness in education and inclusive growth. The design draws inspiration from the form and cultural symbolism of banyan branches and leaves, reflecting an educational philosophy rooted in local culture and dedicated to strong, healthy development. It also conveys the idea that students, like banyan trees, grow upward with resilience while staying firmly grounded.



**The Minjiang
Teachers
College
Logo is a
large Banyan tree**



Figure 11 Cultural Prototype of “Xiao Rongbao”: Relationship Between the Fuzhou Banyan Tree and the Minjiang Teachers College Logo

Minjiang Teachers College is located in Fuzhou, a city known as the “City of Banyans,” where the banyan tree serves as the official city tree. The college’s logo features a stylized banyan tree, symbolizing the rootedness and growth of education. Inspired by this visual and cultural symbol, the cartoon character “Xiao Rongbao” was developed using the banyan tree’s form and meaning as its design prototype, reinforcing both campus identity and local cultural connection.

3.6.2 Experiment Process Based on Design Thinking Theory

(1)Empathize Stage: Through questionnaires and interviews, data was collected from the target groups (students, teachers, and children) regarding their preferences for cartoon characters, associative keywords, and visual expectations. This helped identify users’ aesthetic preferences and psychological needs.

(2)Define Stage: The role of the cartoon character was clearly defined as a knowledge guide + emotional companion + campus ambassador, with functions spanning information guidance, event promotion, study tour support, and campus culture enhancement.

(3)Ideate Stage:Keywords for character concept development included: natural, friendly, energetic, and intelligent. The character’s form integrates natural elements such as banyan tree trunks, leaves, and roots, and features anthropomorphic facial expressions and gestures to enhance expressiveness and approachability. The color scheme primarily uses green and warm brown to convey a sense of nature and educational warmth.

(4)Prototype Stage:Initial outputs included character sketches and expressions, as well as prototypes for various application scenarios, such as a guidebook cover illustration, campus signage, activity badges, and digital sticker packs for interactive use.

(5)Test and Feedback Stage:A small-scale showcase and feedback session was

conducted on campus to gather evaluations on character recognition, memorability, and appeal. Based on this feedback, character details were iterated to optimize its effectiveness and adaptability for communication across different platforms.

3.6.3 Practical Implementation of the Experiment

Character Feature Definition:

Project	Setting Description
Name	小榕宝 (Xiao RongBao)
Role Description	Campus Tour Guide, Knowledge Narrator, and Emotional Companion
Visual Features	A hairstyle shaped like banyan leaves, a trunk-colored body, big expressive eyes, and a cheerful smile.
Personality Traits	Friendly, intelligent, optimistic, and patient. Loves leading others on fun learning adventures.
Catchphrase	"Come explore with me!"
Scene Applications	Campus study tours, navigation icons, educational guidebooks, and interactive exhibition panels.

Table 3 “Xiao Rongbao”Character Feature Definition

Visual Expression and Character Map Visual Expression Sketches:

Presentation of initial visual concept sketches:

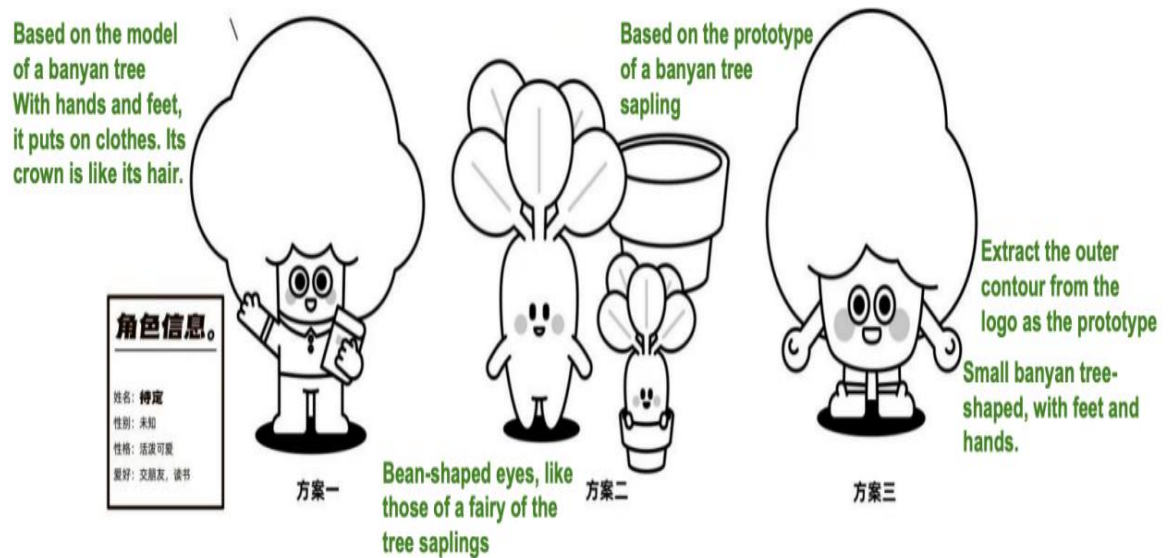


Figure 12 Initial Visual Concept Sketches of “Xiao Rongbao”

This figure presents three early design concepts for the cartoon character “Xiao Rongbao.” Plan 1 is based on a mature banyan tree, with the tree crown styled like hair, featuring human-like limbs and educational accessories. Plan 2 takes inspiration from a banyan sapling, using bean-shaped eyes to create a fairy-like and approachable look. Plan 3 extracts the outer contour from the school’s logo to form a simplified banyan-shaped figure with arms and legs. These sketches lay the visual foundation for character development, combining personified information design with local cultural identity.

Iterative Character Development:

Display of the character’s front and side views, along with proposed color schemes.

Front view
Side view and Rear view

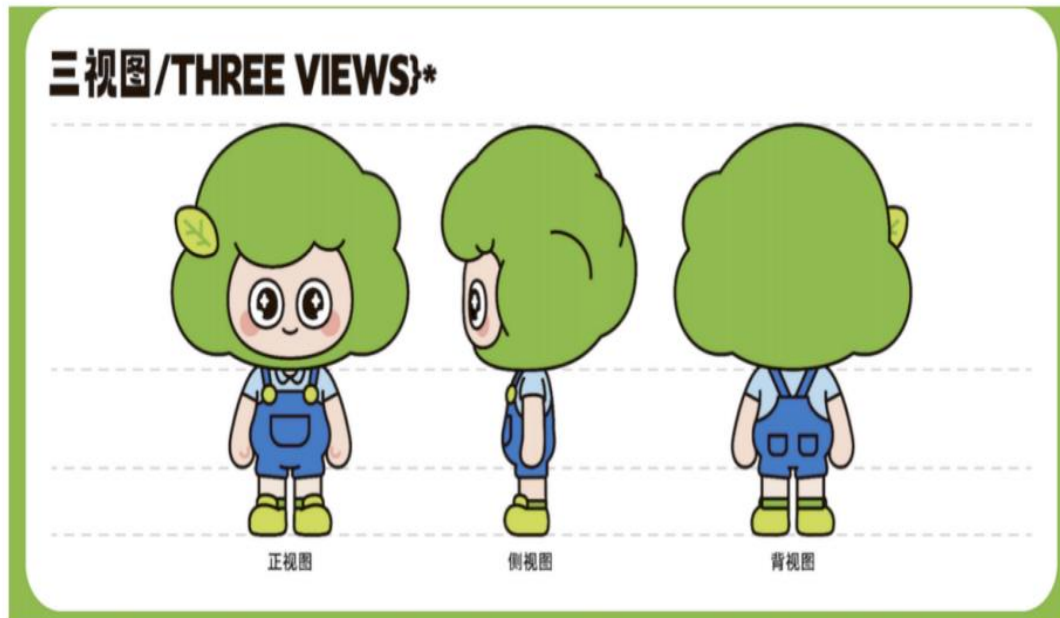


Figure 13 Iterative Visual Presentation of “Xiao Rongbao”: Front and Side Views of the Base Character Design

This figure illustrates the front and side views of the base cartoon design of “Xiao Rongbao,” aimed at ensuring visual consistency and adaptability across various application scenarios. The front view highlights the character’s friendly appearance with large eyes, a crown-shaped hairstyle, and a welcoming smile. The side view complements the design by showing the three-dimensional structure and form, supporting further visual development for use in guide maps, interactive media, and digital animations.

Color Schemes



Figure 14 Presentation of “Xiao Rongbao” Basic Character Design and Color Scheme

This figure presents the basic character design of “Xiao Rongbao” along with its corresponding color scheme. The design uses green as the primary tone (e.g., #91BB51), symbolizing nature and vitality, with the crown representing banyan leaves. Blue tones (such as #477BC6 and #BFDAEF) are used for clothing, reflecting educational themes and approachability. Supporting colors like yellow (#D0DB60) and pink (#E5ACA1) add vibrancy and child-friendliness. Black, white, and skin-tone shades are applied for outlines and facial features, ensuring visual clarity and balance. This color scheme ensures visual coherence and scalability across various application scenarios.



Figure 15 “Xiao Rongbao” Cultural and Creative Product Designs

Following the completion of the basic character design, a range of cultural and creative products centered around “Xiao Rongbao” was developed. These products integrate local cultural elements and include practical items such as backpacks, T-shirts, canvas bags, pillows, keychains, and towels. Through this extended design approach, the character is brought to life in users’ everyday settings, fostering emotional resonance and enhancing engagement. The integration of design and function allows “Xiao Rongbao” to serve as both a friendly educational companion and a medium for cultural communication.



Figure 16 “Xiao Rongbao” Bangkok Limited Edition Character and Cultural Product Applications

This figure presents the Bangkok limited edition of “Xiao Rongbao,” developed as an extension of the original visual identity system. The design integrates traditional Thai cultural elements—such as a jasmine flower hair accessory, the “wai” greeting gesture, and a local-style sarong—while maintaining consistency with the original character style. This localized adaptation is applied to cultural products including T-shirts and tote bags, allowing Xiao Rongbao to be reimagined and reintroduced across different cultural contexts. It demonstrates the flexibility and communicative power of the IP character in global and cross-cultural settings.

3.6.4 Design Evaluation and User Feedback

User feedback was collected through small-scale on-campus exhibitions, group interviews, and questionnaires:

Student Feedback: Most students found the cartoon character “Xiao Rongbao” to be friendly and memorable, and expressed willingness to engage in activities guided by the character. They particularly liked the features where “Xiao Rongbao” could “speak” and “give directions.”

Teacher Feedback: Teachers believed the character helps create a relaxed learning atmosphere, making it suitable for thematic teaching and effective in guiding students into specific learning contexts.

Suggestions and Adjustments: Some feedback recommended developing different themed versions (such as environmental or historical editions) to expand the character's applicability across various educational activities and study tour themes.

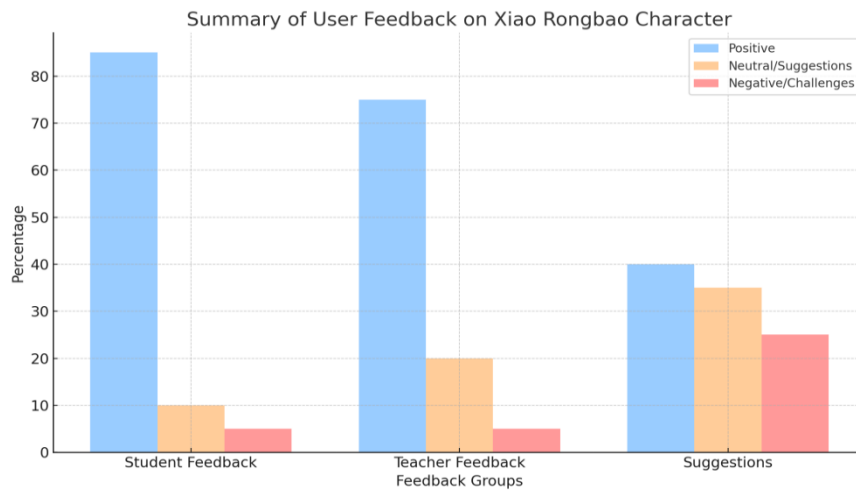


Table 4 User Feedback Summary on the "Xiao Rongbao" Character

This bar chart illustrates the feedback collected from students, teachers, and suggestion contributors regarding the educational mascot "Xiao Rongbao." The majority of student responses (85%) were positive, highlighting the character's friendly and memorable traits and its ability to enhance engagement. Teachers also provided strong positive feedback (75%), noting the character's role in fostering a relaxed and thematic learning environment. Suggestions focused on expanding the character's applicability by introducing themed versions (e.g., environmental or historical). A small proportion of responses indicated challenges or room for improvement.



Figure 17 User Engagement and Feedback Collection at Bangkok Design Week

This project was presented at the 2025 Bangkok Design Week, where it attracted many visitors. The audience showed great interest in the “Xiao Rongbao” character and shared suggestions for improvement. Valuable feedback was collected through direct interaction, observation, and questionnaires. These insights played a key role in helping the designer reflect on and refine the visual identity and information design strategies, enhancing both cultural relevance and user experience.

**User Feedback Focus Areas on Xiao Rongbao's Visual Extension
(Collected During 2025 Bangkok Design Week)**

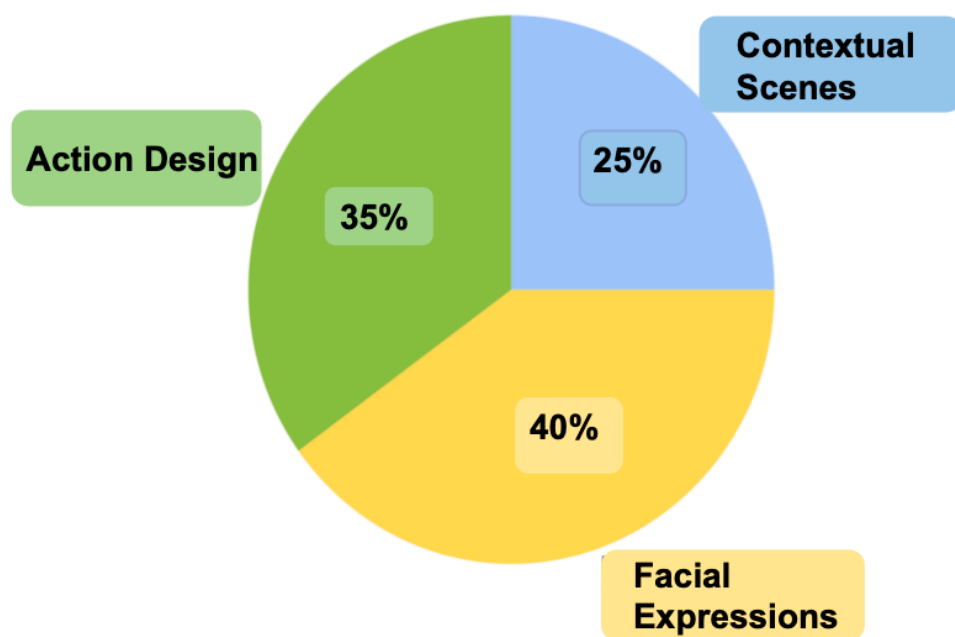


Table 5 Focus Areas of User Feedback on Xiao Rongbao's Visual Extension (2025 Bangkok Design Week)

The pie chart illustrates user feedback collected during the 2025 Bangkok Design Week regarding enhancements to Xiao Rongbao’s character design. 40% of respondents emphasized the importance of facial expression development for emotional engagement, 35% suggested enriching character actions for interactivity, and 25% focused on expanding the character’s use in diverse contextual scenarios. These insights provide valuable direction for future refinement of the character’s adaptability and visual vitality.

3.7 Design Experiment 3: Study Tours Handbook Design for Minjiang Teachers College

This experiment focuses on the practice of information design within the study tour process by creating a handbook tailored for primary and secondary school students visiting Minjiang Teachers College. The cartoon character "Xiao Rongbao" is used as a key visual element for information delivery and emotional engagement, exploring the role of cartoon IP in enhancing educational communication and the study tour experience. The handbook reflects a student-centered design philosophy in its structure, visual language, and level of user engagement. It also integrates design thinking and cultural probe methods to create a learning tool that is both practical and interactive.

3.7.1 Design Objectives

The study tour handbook is designed with a student-centered approach to enhance students' autonomy and sense of participation in learning. By combining text and visuals and employing information visualization techniques, the handbook simplifies complex content, making it easier to understand, remember, and apply. It aims to create a tool that supports recording, exploration, and sharing—helping students construct knowledge through walking, playing, and doing. The integration of the "Xiao Rongbao" cartoon character adds an approachable and engaging element, strengthening the emotional connection between students and the study tour content.



Figure 18 Cover Design of the Study Tour Handbook for Minjiang Teachers College

3.7.2 Target Audience and Application Scenarios

The handbook is primarily intended for use in on-campus study tour activities organized by Minjiang Teachers College, covering visits to the campus, nature-based learning, and cultural-educational spaces such as the Biology Museum.

The target users are young students aged 8 to 12, so the design language must be easy to understand, with a visual style that is lively and approachable.

3.7.3 Design Content and Experimental Process

The handbook presents information through a visually engaging combination of text and images, tailored to primary and secondary school students. It includes an introduction to the college and its study tour base, as well as photo and illustration-based highlights of key exhibition areas such as the Biological Specimen Hall and the Planetarium. A detailed daily schedule is provided to clearly communicate the timing and structure of activities, along with safety instructions and behavioral guidelines. The overall design adopts a friendly and lively visual language, with the cartoon character "Xiao Rongbao" enhancing recognition and appeal. This approach helps guide students in efficiently accessing information and actively participating in the study tour.

The handbook is divided into the following four core modules:

(1) Study Tour Overview: A concise introduction to the study tour's location, theme, and itinerary. A task checklist is included to guide students in exploring with clear goals.

(2) Location Information: Features hand-drawn landmark illustrations, "Xiao Rongbao's explanation tips", key knowledge points, and simplified maps.

(3) Observation and Recording Section: Includes open-ended questions, a drawing and doodling area, and on-site observation tables. This section encourages students to ask questions, record phenomena, and develop independent thinking habits.

(4) Interaction and Reflection Section: Offers guided reflection prompts such as "My favorite stop" and "What I learned," along with cartoon emotion stickers to enhance fun and a sense of ceremony.



Figure 19 Interior Layout of the Study Tour Handbook for Minjiang Teachers College

3.7.4 Practical Implementation of the Design Experiment

Integration of Cultural Probe Methods: Certain pages of the handbook are designed to work in conjunction with a "Cultural Probe Toolkit," featuring tasks such as "Take a photo of the most beautiful scenery in your eyes" and "Interview a local resident," encouraging students to actively explore their surroundings.

Application of the Design Thinking Process: The handbook design follows the framework of "Empathize – Define – Ideate – Prototype – Test," with regular testing and feedback sessions conducted with students and teachers to continuously refine content and improve the interactive experience.

Guidance through IP Character: "Xiao Rongbao" serves as the study tour guide throughout the handbook, using friendly and humorous language to assist with explanations, effectively enhancing the accessibility and engagement of information delivery.

MingMinJiang Teachers College Graphic Map Design



Figure 20 Graphic Campus Map Design of MinJiang Teachers College

The campus map design followed a structured information design process. Initially, user research and on-site observations were conducted to clearly identify the actual needs of the target audience—primary and secondary school students—and to collect key information about study tour locations. In the ideation stage, preliminary sketches and digital graphic design techniques were used, optimizing visual elements in a friendly cartoon style. A prototype version was then created for user testing, where several student participants joined eye-tracking experiments and completed surveys to evaluate the visual effectiveness and clarity of information delivery. The test results indicated that over 90% of students quickly recognized key landmarks and understood navigation routes, while more than 85% found the visual style engaging and easy to comprehend, significantly increasing their interest and engagement with the study environment. Based on user feedback, the design team refined color contrasts, labeling clarity, and route prominence to enhance information delivery. The final product demonstrated an effective graphic communication approach, illustrating both the practical application of information design principles and the value of a user-centered, iterative design process.

CHAPTER 4

RESEARCH RESULT

This chapter centers on the core practical activity of the study-the creation process and outcomes of the Biology Museum Information Guidebook-and systematically presents the resulting design outputs. By integrating character-led guidance with information design, the research team continuously tested design hypotheses through field research, user participation, and multiple rounds of iteration. This approach generated in-depth design knowledge and contributed to the innovation of communication methods within the educational context of the museum.

4.1 The Substance in Art and Design Research



Figure 21 Field testing of the guidebook involving adolescent participants and educational staff

This study views the creation process of the Biology Museum Information Guidebook as a practice-based research approach. Throughout the project, the research team engaged in continuous prototyping and real-time testing of wayfinding maps, exhibition layouts, and interactive interfaces to explore the dynamic relationship between information design and user experience. A wealth of data was collected, including interview records and user feedback on preferences, cognitive

behaviors, and interaction responses. Through reflective documentation and visual sketching, implicit design experiences were transformed into an actionable theoretical framework, offering valuable insights for future educational settings and exhibition projects.

At the same time, this study is deeply embedded within the educational and exhibition context of the museum, serving a diverse audience that includes adolescents, educators, and general visitors. By integrating interdisciplinary approaches across biological science communication, visual communication design, and cognitive psychology, the research ensures scientific accuracy, visual readability, and engaging interactivity. This work contributes to the advancement of museum information system design oriented toward educational visitation.

4.2 Navigation Map Design

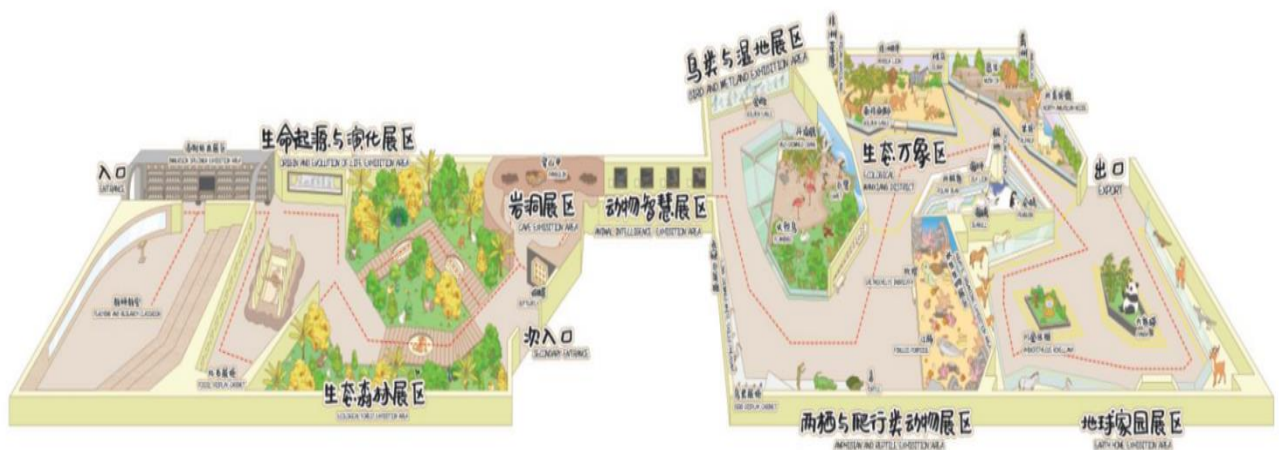


Figure 22 First Draft of the Exhibition Map Using Information Design Methods

An initial version of the exhibition layout map designed with basic information design principles. While it includes spatial orientation and exhibition zones, the lack of clear visual hierarchy and color distinction made it difficult for users to distinguish

between areas and navigate effectively. This draft informed later improvements in usability and visual clarity.

This study optimized the design of a navigation map that integrates visual aesthetics with spatial functionality, serving as a core element of information guidance. The map adopts a modular design language to clearly present the spatial structure and exhibition layout of the museum, complemented by color coding, icon prompts, and route suggestions. Its visual design is tailored to the handbook usage context, helping visitors quickly plan their routes and locate exhibits, thereby enhancing the fluidity of the viewing experience and reinforcing spatial memory.

Based on the mixed research strategy combining qualitative and quantitative methods described in Chapter 3, the design of the navigation map followed a user-centered design process, which included the following research activities:

4.2.1 Qualitative Research (Observation and Interviews):

Through on-site observational tracking and interviews with over ten middle school students, it was found that visitors commonly experienced spatial confusion, such as "not knowing where to start after entering the museum" and "frequently retracing their steps inside the exhibition space."

Cultural Probe Feedback:

In the "My Visit Route" probe task, participating students' self-drawn paths revealed a lack of clear spatial guidance during their free exploration, with some areas of the museum not visited at all.

Quantitative Data Collection (Questionnaires + Behavioral Counting):

Analysis of post-visit questionnaires showed that approximately 72% of surveyed students expressed a desire for "clearer pathways or map guidance within the exhibition halls." Additionally, behavioral data indicated that users equipped with a map exhibited significantly longer average visit durations and higher exhibit coverage rates.

Student Feedback on Navigation Information

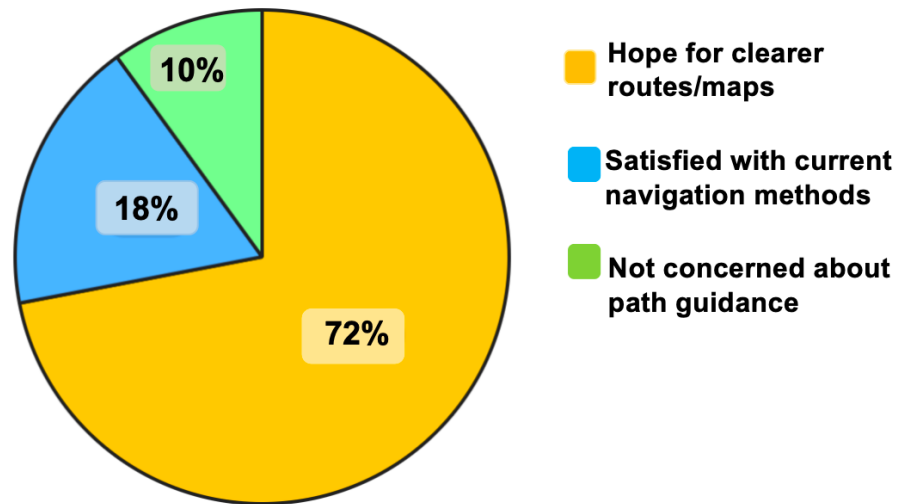


Table 6 Student Feedback on Navigation Information

A pie chart showing students' opinions on navigation clarity during the study tour. 72% hoped for clearer routes or maps, 18% were satisfied with the current navigation methods, and 10% were not concerned about wayfinding. The data highlights the need to improve visual guidance and map usability for student users.

Together, these findings highlight a key design pain point: the current method of spatial information communication fails to effectively help users construct a complete and coherent mental model of the exhibition layout.

4.2.2 Map Design Principles and Optimization Strategies

In response to the issues identified above, this study implemented structural optimizations to the navigation map in the following areas:

Modular Spatial Representation:

Instead of using a traditional top-down floor plan, the map adopts a modular tile-based design, presenting spatial logic through a three-layer structure of "room–path–node." This approach maintains an overall coherence while preserving detailed information.

MingMinJiang Teachers College's Biological Museum

Graphic Map

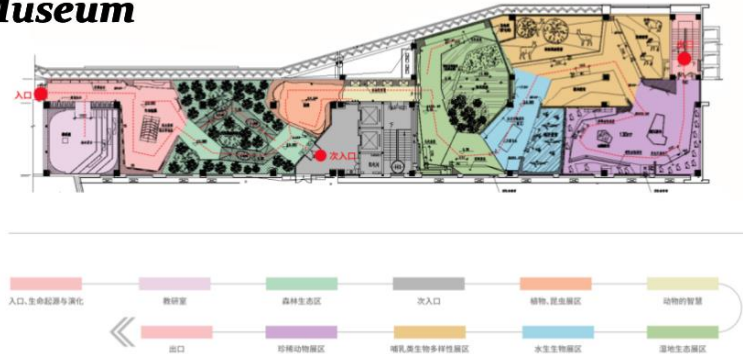


Figure 23 Color-Coded Zoning Map of the Biological Museum at Minjiang Teachers College

Color Zoning and Icon Guidance:

Different color blocks are used to distinguish exhibition areas based on their themes, supplemented by functional graphics such as "animal symbols," "fossil icons," and "observation tips," to enhance the efficiency of visual recognition and map comprehension. Color-Coded Zoning Map of the Biological Museum at Minjiang Teachers College, Modular color blocks are used to distinguish different thematic areas within the museum. The use of color enhances visual hierarchy, improves the clarity of navigation, and helps visitors better understand the spatial structure and movement paths of the exhibition.

Cartoon and Character Integration to Enhance Cognition:

Cartoon exhibit icons and the character "Xiao Rongbao" appear as guides at key turning points on the map, providing directional cues and task prompts, and offering a friendly entry point for spatial interaction.

Format Adaptation for the Guidebook:

The map is designed in a horizontally spread layout across pages to fit the format of the guidebook, making it convenient for on-the-go reference. Visually, the design emphasizes color contrast and clear layering to ensure print clarity and on-site

readability.

4.2.3 User Feedback and Iterative Validation

After the map design was completed, two rounds of user testing with student participants were conducted:

In the first round of prototype testing, users commented that "the map's colors are appealing, but the connections between exhibition areas are not clear enough."

In the second round, after adding dynamic path lines and "Cartoon guiding" icons, testers were able to accurately identify the location of target exhibits within one minute on average. Navigation efficiency improved by approximately 30% compared to the first round, based on path completion time statistics. Interview feedback indicated that students felt "the map looks like a task card that helps you find the exhibits step by step — it's really fun."

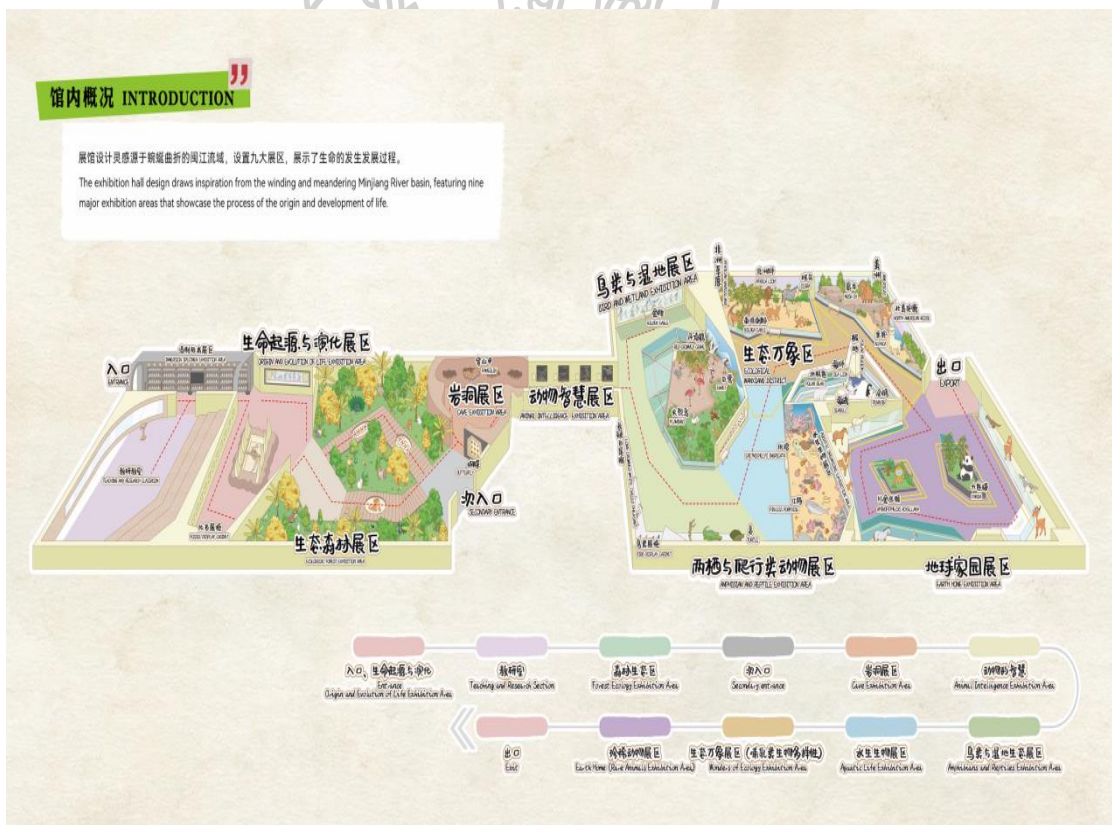


Figure 24 The biological museum integrating visual clarity and emotional engagement

The iterative map design not only enhanced the efficiency of spatial information communication but also seamlessly integrated cartoon animal exhibits and the mascot "Xiao Rongbao" as guiding elements. This strategy reflects the integration of informational and emotional guidance, improving visitor engagement and immersion—especially for young audiences—and exemplifying a user-centered approach in educational exhibition design.



Figure 25 Floor signage using the "Xiao Rongbao" character for directional guidance

4.3 Original Cartoon Character Design — "Xiao Rongbao"

"Xiao Rongbao" is an original character developed based on Fuzhou's city IP image, combining local cultural symbolism with aesthetic appeal for young audiences. The character is designed as both a knowledge guide and an engaging companion within the biology museum. Throughout the navigation process, "Xiao Rongbao" accompanies users through illustrations, voice prompts, and task guidance, serving as both an informational intermediary and a trigger for interactive engagement. The character's design and visual representation effectively strengthen users' emotional connection and desire to explore, significantly enhancing the sense of participation—especially among teenagers.

4.3.1 Iterative Optimization Based on User Feedback

After establishing the basic design of "Xiao Rongbao", a systematic extension was carried out based on its core visual features, such as banyan tree elements, cartoonish proportions, and a friendly, approachable temperament. Through continuous refinement of its actions, facial expressions, and situational portrayals, the character's visual expressiveness and emotional appeal were significantly enhanced. These iterations were guided by user feedback to better align the design with the aesthetic preferences and usage needs of the target audience.

4.3.2 Extension Design Strategies



Figure 26 Action development of the "Xiao Rongbao" character.

(1) Action Development

Based on the personality traits of "Xiao Rongbao", a variety of lively poses were designed to enrich its dynamic expressiveness, including jumping, waving, hugging, peeking, and running. Specific gestures such as waving to greet, pointing directions, hugging a book, and using a magnifying glass help enhance visual appeal and

interactive engagement in handbooks, promotional materials, and guidance tools.

(2) Facial Expression Variations

Multiple expressions representing emotional states—such as happiness, shyness, surprise, curiosity, seriousness, and mischief—were developed. These variations help convey emotions more effectively and build stronger emotional resonance with young users, enriching the interactive experience.



Figure 27 Facial Expression Variations of the "Xiao Rongbao" character.

(3) Thematic Adaptations

To enhance cultural relevance and visual diversity, themed versions of Xiao Rongbao were created based on traditional festivals, local customs, and seasonal elements. Examples include the "Spring Festival Fortune Dragon" outfit, a refreshing summer edition, and versions inspired by traditional Fuzhou attire, all of which deepen its cultural identity and regional resonance.

(4) Application Scenario Expansion

The extended designs have been applied across various media, including cultural and

creative products, promotional posters, study tour handbooks, interactive games, and AR experiences. This creates an immersive and friendly cartoon character that strengthens Xiao Rongbao's role in education, communication, and cultural dissemination.

Xiao Rongbao Application Scenario Expansion



Figure 28 Application Scenario Expansion of the "Xiao Rongbao" character

Through continuous visual innovation and content enrichment, Xiao Rongbao has evolved from a city mascot into a culturally expressive and emotionally engaging cartoon character. It not only strengthens public awareness and emotional connection to Fuzhou's city culture but also lays a solid foundation for future brand promotion, educational product development, and cross-sector collaborations.

4.4 Design of the Biology Museum Guidebook

The Biology Museum Guidebook represents the final and most important output of this study. Its design and development were carried out through five distinct stages, covering the entire journey from user research to the final delivery of a functional and engaging tool. This process embodies the integration of design thinking, interdisciplinary collaboration, and educational innovation.



Figure 29 Cover and introductory page of the Biology Museum Guidebook

The design features the mascot "Xiao Rongbao" and uses a friendly visual language to introduce the guide's theme and tone. The opening message emphasizes nature education, ecological respect, and inspires exploration.

4.4.1 Overview of the Development Process

The design and development were carried out in five stages, covering the entire process from user research to prototype testing.

Stage	Methods	Key Outcomes
Problem Identification	Cultural Probe Participatory Observation	Users' interests, behavioral pain points, and content preferences
Concept Formation	Design Thinking Card Sorting	User needs model and core design concept
Prototype Development	Rapid Prototyping Scenario Simulation	handbook sketches and map prototypes
User Feedback	Group Interviews Role-Playing Test	Suggestions for content optimization and interaction insights
Outcome Integration	Reflexive Interdisciplinary Collaboration	Final delivery of the complete guidebook system

Table 7 Overview of the Five-Stage Development Process for the Biology Museum Guidebook

This development process ensured that the final design was not only pedagogically effective but also emotionally engaging and user-friendly. It reflected the voices of young users and the collaborative efforts of educators, designers, and field experts. The Biology Museum Guidebook thus stands as a practical, research-based design outcome that integrates learning, exploration, and interaction.

4.4.2 User Research and Design Starting Point: Application of Cultural Probe



Figure 30 Selected layouts from the Information Design Guidebook 1



Figure 31 Selected layouts from the Information Design Guidebook 2

Based on the cultural probe strategy outlined in Chapter 3, the research team developed a toolkit tailored to young users.

The toolkit included the following components:

My Observation Map: Encouraged students to record their movement paths and points of interest within the museum.

The Exhibit That Impressed Me Most: Collected students' preferences for specific visual elements or types of knowledge.

Exhibit Questions Sticky Wall: Captured frequently asked questions or moments of curiosity that arose during the visit.

Through the collection of probe responses and follow-up group discussions, the research team identified the following common user characteristics:

Age range concentrated between 8 and 14 years old;

Preference for guidance by cute or friendly characters;

Tendency to engage in task-oriented and challenge-based learning;

Visual content (pictures) is preferred over text-heavy explanations.

4.5.3 Guidebook Content Strategy Based on User Research

In response to the user research findings, the final guidebook was developed around the visual and narrative theme: "Explore the Museum with Xiao Rongbao." This character-led approach not only engages young learners but also strengthens emotional resonance throughout the learning journey. The content is structured into four main modules:

Museum Overview and Route Planning

A hand-drawn cartoon map is provided along with recommended thematic paths. Students can choose different routes based on their interests, making the exploration more personalized and goal-oriented.

Exhibit Interpretation and Knowledge Guide

Key exhibits are explained through dialogue with the cartoon character, integrating local biodiversity and cultural elements. This narrative style helps simplify

complex knowledge and improve understanding.

Interactive Tasks and Activity Pages

The guidebook includes stamp collection, fill-in-the-blank activities, and knowledge quizzes to encourage active participation. These gamified tasks turn passive observation into an engaging, hands-on experience.

Reflection and Extended Exploration

Post-visit activities prompt students to continue observing, documenting, and expanding on what they learned. These include reflection prompts, drawing spaces, and additional questions to encourage deeper thinking.

Design Features

The entire guidebook emphasizes visual clarity, interactive guidance, and emotional engagement, ensuring that the learning experience is both enjoyable and educational. The balance of images and text, combined with cartoon elements and hands-on tasks, enhances the guidebook's appeal and practical value in an educational context.

4.4.4 Concept Development and Design Strategy Formulation

Version	Style & Content	User Feedback	Major Revisions
V1	Flat map with textual descriptions	Map structure was hard to follow; reading was too burdensome	Added visual color blocks to structure layout; simplified textual explanations
V2	Introduced "Xiao Rongbao" cartoon character dialogues and icon-based interactions.	Increased engagement, but interaction methods were limited.	Added check-in pages, QR code quizzes, and sticker feedback mechanisms.
V3	Integrated text and visuals; varied tasks; clear route suggestions.	Tasks were more engaging; students expressed interest in revisiting the guidebook at home.	Finalized design; improved paper quality and folding structure.

Table 8 Summary of Prototype Iterations and User Feedback

Based on findings from the cultural probe and participatory interview data, the research team established three core design principles:

Character-Led Guidance with Visualized Paths

Emphasizing the role of the cartoon character in conveying information and supporting spatial navigation.

Task-Driven Interaction with Lightweight Content

Encouraging users to actively acquire knowledge through engaging tasks, while avoiding cognitive overload from excessive text.

Modular Handbook Structure

Allowing users to choose their own routes and sequence of content, enhancing flexibility and user autonomy.

In addition, the overall structure of the guidebook was informed by the spatial logic of the museum and the thematic layout of its exhibits, ensuring educational coherence throughout the experience.

4.4.5 Prototype Iteration and User Testing

The design process involved three rounds of prototype testing, each followed by adjustments based on insights gathered from interviews and role-playing sessions. These iterative refinements focused on improving user comprehension, interaction quality, and overall engagement with the guidebook content. Each round of prototype evaluation was conducted through small-scale student trials combined with interviews, forming a complete “test–feedback–iteration” cycle.

4.4.5 Final Design Outcome Presentation

The finalized version of the Biology Museum Guidebook integrates visual aesthetics, educational guidance, and local cultural elements to create a student-centered learning tool. The guidebook includes the following main sections:

Cover and Character Introduction

The cartoon character Xiao Rongbao uses a friendly and relaxed tone to invite students to begin their exploration journey.

Map Navigation Page

A customized museum map highlights character check-in points, recommended

routes, and color-coded exhibition zones for easier navigation.

Exhibit Knowledge Pages

Content is presented through a combination of visuals and text, with special “Xiao Rongbao Explains” info boxes to provide key facts and cultural context in a simplified manner.

Interactive Task Pages

Tasks such as "Find it", "Draw it", and "Stamp your memory card" are designed to engage students in observation, reflection, and playful learning.

User Notes and Feedback Page

This section encourages students to mark their favorite exhibits and leave personal reflections or messages after the visit.

Each prototype was evaluated through small-scale student trials and follow-up interviews, forming a complete test–feedback–iteration cycle.

Initial trials of the final guidebook with sample student groups demonstrated high engagement levels and strong knowledge retention, confirming the effectiveness of information design in supporting educational communication for young learners.



Figure 32 Interactive page design from the Biology Museum Guidebook featuring the "Xiao Rongbao Explorer Challenge".

This layout integrates interactive Q&A prompts led by the mascot Xiao Rongbao,

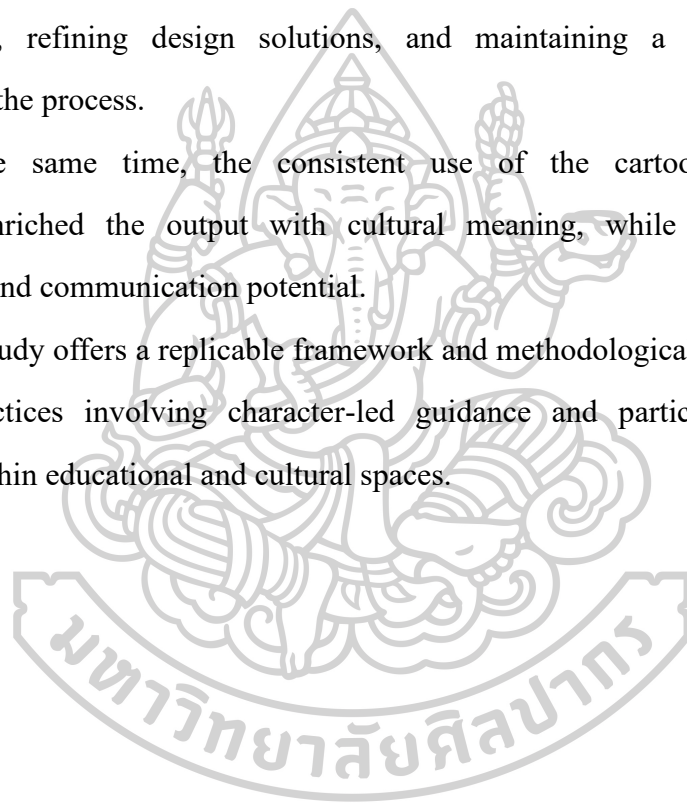
encouraging students to observe specimens, identify species, and think critically. The playful tone and bilingual content enhance engagement and make the learning experience more immersive.

4.4.6 Summary of Design and Development

This section demonstrates how the design and development of the guidebook were directly informed by the research methodology. In particular, the use of cultural probes and iterative prototyping proved highly adaptable and effective in identifying user needs, refining design solutions, and maintaining a user-centered focus throughout the process.

At the same time, the consistent use of the cartoon character "Xiao Rongbao" enriched the output with cultural meaning, while also enhancing its scalability and communication potential.

This study offers a replicable framework and methodological reference for future design practices involving character-led guidance and participatory information systems within educational and cultural spaces.



CHAPTER 5

CONCLUSION

5.1 Conclusion of Dissertation

This study adopts a systematic information design strategy centered on the integration of "information design and character-guided navigation" to optimize the knowledge dissemination and visitor experience at the Biology Museum of Minjiang Teachers College. Aiming to enhance the museum's function as an educational space for study tours, the research improves both the efficiency of wayfinding and the quality of exhibition engagement. Grounded in empirical data and theoretical analysis, the study employs methods such as cultural probes, user testing, and prototype iteration to systematically develop the guide system. The research process encompasses the full cycle of service design—from problem identification to solution development.

Response to research objectives:

(1) Information design strategies for enhancing spatial recognition and wayfinding efficiency.

In terms of spatial organization, this research project adopts a “zoning” principle by dividing the Biology Museum into nine primary areas based on function and theme, with further subdivisions within each zone to support more detailed content guidance and interactive arrangements. To support orientation and engagement, a museum guide map was designed that emphasizes clarity, hierarchy, and playfulness, balancing both aesthetic appeal and functional utility. Through intuitive spatial visual language, the map significantly enhances visitors’ understanding of the exhibition layout, optimizes path-planning efficiency, and, in particular, supports adolescent users in forming clearer spatial memory and a stronger sense of autonomous exploration. The logical structure of the zones also helps users quickly comprehend the museum’s overall layout and grasp the specific roles of each area.

Building on this, a color-coding strategy was implemented to further strengthen zone recognition. Each area is assigned a distinct thematic color, consistently applied across the guide map, signage, and wayfinding system to establish a unified and coherent visual language. This approach not only enhances the readability of information but also improves visitors' understanding and recall of the content associated with each zone.

(2) The cartoon character "Xiao Rongbao" enhances emotional interaction and cultural identity within the navigation system.

The integration of local cultural identity is another distinctive feature of this research project. By designing and introducing the original cartoon character "Xiao Rongbao," which symbolizes Fuzhou's local culture, the study successfully embeds a character-based navigation mechanism into the information communication process. Each zone of the museum reflects local cultural characteristics both visually and narratively. Xiao Rongbao serves not only as a guiding "ambassador" leading visitors through different areas, but also as a "learning companion" and "cultural messenger" engaged in educational activities, thereby enhancing interactivity and emotional resonance with visitors. This approach effectively improves information recognition, participatory engagement, and emotional affinity—especially among adolescent audiences. Moreover, it strengthens young visitors' sense of cultural identity and immersive experience during study tours. The character functions beyond wayfinding; it also establishes a cultural connection and a sense of identity between users and the spatial environment.

(3) The development of the "Biology Museum Information Guidebook" significantly enhanced knowledge dissemination and user engagement.

By integrating the navigation map and the character design, this study created a visually rich, task-oriented handbook. The handbook combines exhibit information, spatial guidance, and interactive tasks to guide users through a "See - Think - Do" learning process, fostering active participation and greatly improving comprehension

and memory retention. Experimental testing showed that the handbook performed well in encouraging observation, reflection, and cultivating an interest in exploration.

Furthermore, in order to achieve the goal of effectively guiding visitors into different zones, the system takes into account factors such as visitor flow, sightlines, and the layout of directional signage, ensuring both efficient information delivery and smooth spatial circulation. One of the key theoretical outcomes of this study is the development of a “Wayfinding Design Framework.” This framework integrates principles of information design, cultural probe research, and user experience testing to construct a guide system model tailored to youth-oriented educational settings. It holds significant reference value and potential for broader application in the planning of content and development of wayfinding systems in public educational spaces such as museums, study tour bases, and themed exhibitions.

In summary, this study not only achieved an optimized reconstruction of the biology museum’s navigation system but also provided a practical example of integrating "Local culture + Character IP + Information design" into educational communication design. In the future, this approach could be further extended to the development of digital navigation platforms, multilingual versions, and cross-school adaptable templates.

5.2 Limitations of the study

During the implementation of this study, several limitations became evident. The research and testing were primarily conducted with local middle school students, which may limit the representativeness of the data. Moreover, the project currently relies on a printed handbook as its main medium, with little exploration of interactive digital formats. The expression of local culture also remains largely at the level of visual symbols, lacking a coherent narrative structure and deeper integration with the overall design content.

These reflections not only help clarify the boundaries of the current study but also lay a foundation for future expansion and in-depth exploration.

5.3 Future Development Directions and Recommendations

The outcomes and limitations of this study together highlight the potential for further development in the next phase. Building on the existing foundation, future efforts can be expanded and deepened in the following four directions:

(1) Expansion of the Character Content Ecosystem

As the core element of the navigation system, the cartoon character "Xiao Rongbao" demonstrates strong communicative potential. Future developments may include the creation of picture books, interactive animations, voice content, and educational activities centered around the character. These efforts aim to gradually build a diverse content ecosystem, extend the character's lifecycle, and strengthen emotional connections with users.

(2) Digital Upgrade of the Navigation System

It is recommended to incorporate smart technologies such as AR navigation, voice recognition, and mini-program interactions to seamlessly integrate printed handbooks with digital platforms. This approach enhances real-time user feedback and engagement, advancing the navigation system toward a more intelligent and user-friendly interactive experience.

(3) Establishing Interdisciplinary Collaboration Mechanisms

Future design work can be strengthened through collaboration with disciplines such as education, biological sciences, and psychology. This will enhance the scientific rigor and structural coherence of the content, further improving cognitive adaptability and educational functionality for young audiences.

(4) Cross-Context Application of Design Methods

The navigation design process and toolkit proposed in this study possess strong transferability. In the future, they can be piloted in various educational venues such as science museums, art museums, and history museums to validate their universality and adaptability, and to promote the development and dissemination of modular design models.

Through the systematic practice conducted in this study, the effectiveness of combining information design with character-led guidance in optimizing navigation systems for educational museums has been preliminarily validated. With the continued development of character-based content, the integration of digital technologies, and the deepening of interdisciplinary collaboration, this strategy has the potential to evolve into a versatile communication design solution applicable to various educational settings, offering new possibilities for the innovation of public education spaces.



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