

Analysis of the Practice and Value of Science Communication in Water Surface Patrols at Beihai Park

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Abstract: This study takes the work practices of the water surface patrol team at Beihai Park as its research focus, exploring in depth the specific application models, practical outcomes, and social value of science communication within urban park management and services. As an urban public space that integrates profound historical and cultural heritage with significant ecological functions, Beihai Park provides a unique setting for the practice of science communication. The research centers on water surface patrols as a distinctive medium and systematically analyzes multi-dimensional communication practices, including historical and cultural scientific interpretation for visitors, dissemination of water safety knowledge, promotion of ecological and environmental awareness, and cultivation of professional skills and scientific spirit among team members. The findings indicate that deeply integrating science communication into routine patrol and management tasks can significantly enhance visitor experience, improve public safety, promote ecological awareness, and effectively elevate team professionalism and service efficiency. This approach represents an innovative path to activating the public education function of urban parks and strengthening the “soft power” of urban governance.

Keywords: science communication, Beihai Park, water surface patrol, public safety, ecological science popularization, historical and cultural communication, on-the-job training

Introduction

As the role of science communication continues to rise within national strategies, urban parks—owing to their combined ecological landscapes, cultural heritage, and public service functions—are increasingly becoming vital platforms for engaging the public and integrating science communication into everyday life. How to realize the transformation of science communication from concept to practice, and from external activities to internal mechanisms, within frontline positions has become an urgent topic for exploration.

With its profound historical and cultural heritage, unique aquatic ecosystem, and high visitor frequency, Beihai Park has established a science communication environment characterized by openness, interactivity, and contextualization. As a crucial link between park management and visitors, the water surface patrol team, stationed long-term on the front line, possesses the unique advantage of “real-time interpretation and interactive guidance.” In addition to carrying out responsibilities such as safety supervision and emergency response, the team naturally integrates science communication into daily services through water safety education, ecological guidance, and historical and cultural interpretation. At the same time, through training, drills, and continuous knowledge accumulation, the team internalizes scientific spirit as part of its culture, achieving mutual enhancement of professional development and communication effectiveness.

Based on the practical experience of the water surface patrol team at Beihai Park, this paper outlines its multi-dimensional communication practices and team empowerment mechanisms, distills replicable experience of “communication-oriented service positions,” and provides insights for science communication innovation in urban public spaces as well as for the optimization of public services and cultivation of science communication talent.

1. Beihai Park: A Natural Fertile Ground for Science Communication and the Unique Role of Water Surface Patrols

Beihai Park's exceptional resource endowment and strategic geographical location make it an ideal platform for the practical implementation of science communication. As one of the key national parks, it carries not only the weight of historical memory and cultural symbolism but also the social responsibility of popularizing scientific knowledge, promoting civil behavior, and disseminating ecological concepts to the public. In particular, the water surface patrol team, with its frequent interaction with visitors and long-term presence on the water, serves as a natural implementer and role model for science communication.

1.1 Scientific Interpretation of Historical and Cultural Heritage

Beihai Park is one of the most well-preserved imperial gardens in China, originally built during the Liao Dynasty, expanded in the Jin Dynasty, and flourishing through the Yuan, Ming, and Qing Dynasties. The garden features meticulously designed architecture and profound cultural significance. Centered around Qionghua Island, Beihai forms the classic imperial garden layout of “one pool and three hills,” embodying traditional Chinese philosophical systems such as the harmony between man and nature and the theory of yin-yang and the five elements. Iconic structures within the park—such as the White Pagoda, the Nine-Dragon Screen, and the Five-Dragon Pavilions—are not only visually striking landmarks but also rich in scientific significance. For instance, the White Pagoda, situated atop Qionghua Island, employs a hollow-core structure to enhance earthquake resistance, and its body is bonded using a mixture of lime, glutinous rice, and other materials, reflecting ancient craftsmen’s deep understanding of structural mechanics and material properties. The Nine-Dragon Screen integrates techniques of ceramic firing, glaze formulation, and brick carving, serving as a valuable physical example for the study of Ming Dynasty ceramic craftsmanship^[1].

During their routine patrols, water surface patrol officers often encounter visitors’ questions such as, “Why is the White Pagoda so tall and yet doesn’t topple?” or “Is the Nine-Dragon Screen carved from a single block of brick?” In these moments, patrol officers not only provide clear and accessible explanations but also extend the discussion based on visitors’ interests, conveying the scientific knowledge behind cultural heritage. In doing so, they transform heritage from something merely to be “seen” into something to be “understood” and “contemplated.”

1.2 The Value of Real-Scene Education in Natural Ecology

Beihai Park features an extensive water surface, with aquatic areas covering two-thirds of its total space, providing a habitat for various aquatic plants and animals. It serves as a rare urban ecosystem within Beijing. The park consistently attracts a wide range of bird species, including ruddy shelducks, grey herons, and cormorants, while numerous phytoplankton, aquatic plants, and fish species help maintain the ecological balance of the lake. The water body undergoes noticeable seasonal changes, functioning not only as a regulator of the urban climate but also as a vivid natural classroom for ecological education.

The stability of Beihai’s aquatic ecosystem is sustained through a combination of scientific management and manual maintenance. Patrol officers regularly monitor water quality, observe the conditions of waterfowl habitats, and remove floating debris. These routine duties also serve as a public-facing demonstration of ecological protection efforts. For example, during the spring and autumn bird migration seasons, patrol officers observe bird activity through binoculars and record data, which contributes both to the establishment of ecological archives and to real-time interpretation for visitors. By explaining bird migration patterns and ecological significance, they enable the public to appreciate the complexity and fragility of ecosystems while enjoying the scenic interplay of birds and water.

In addition, the growth and management of aquatic plants provide an entry point for science communication. During summer, dense aquatic vegetation covers the lake surface. While beneficial for water purification, excessive growth can obstruct waterways and degrade water quality. Patrol officers, working with technical staff, manually remove excess vegetation and explain the rationale to visitors with messages such as “More aquatic plants are not always better” and “Ecological balance requires dynamic adjustment,” thereby enhancing public awareness of environmental protection and fostering rational ecological understanding.

1.3 A Model Platform for Public Safety Management

Beihai Park, with its expansive water surface and large number of boats, is one of the most densely used parks for water activities in Beijing. Water safety management concerns not only the protection of visitors' lives and property but also serves as a crucial component of science communication in the form of public emergency education. Water surface patrol officers, through their around-the-clock presence, are responsible for patrolling, monitoring, advising, and performing rescues. Their visibility not only provides a sense of safety but also creates opportunities for knowledge dissemination.

For instance, during periods of extreme heat or thunderstorms, patrol officers actively explain the risks of engaging in water activities under such conditions, guide visitors to leave the water promptly and avoid hazardous areas, and provide brief educational insights into meteorological knowledge and risk-avoidance techniques. This form of real-scenario-based education proves to be more compelling and persuasive than traditional classroom instruction.

Additionally, the patrol team continuously builds a resource base for “educating through real events” by combining on-site incident response with informative explanations. For example, when a visitor enters a deep-water area without wearing a life jacket, the patrol officer intervenes and immediately offers a brief safety talk on the spot: “In case of falling into the water, a life jacket is your first lifeline,” followed by an explanation of the critical time window for rescue based on real cases. This approach not only addresses the immediate risk but also serves a preventative educational function.

As such, the Beihai water surface patrol team has become a frontline force in the dissemination of safety knowledge, serving as a representative example of integrating proactive science communication with public service management.

2. Multi-Dimensional Science Communication Practices Oriented Toward Visitors

As the frontline position with the most direct and routine contact with visitors in Beihai Park, the water surface patrol team has gradually developed a science communication practice path based on the concept that “communication is service, and service is communication” through daily patrols, services, advisories, and rescues. By tailoring communication content to local conditions, organizing context-based communication methods, and implementing a collaborative mechanism involving multiple media and roles, patrol officers not only maintain park order but also serve as a vital force in enhancing public scientific awareness, ecological consciousness, and civic literacy^[2].

2.1 Scenario-Based Popularization of Water Safety Knowledge

2.1.1 Problem-Oriented, Real-Time Intervention

Beihai Park experiences high visitor density and frequent water-based activities, placing significant pressure on safety management. Adhering to the principle of “detection equals communication,” the water surface patrol team treats every safety hazard as an opportunity for science education. For example, when encountering high-risk behaviors such as visitors not wearing life jackets, engaging in horseplay near docks, or leaving children unsupervised, patrol officers go beyond issuing warnings. They deliver concise and vivid “micro-explanations,” such as clarifying the golden self-rescue time after falling into water, the principles of life jacket buoyancy, and the risk index of water areas for children. These explanations are often supported by real-life examples or live demonstrations, enabling visitors to gain knowledge while being guided through safety management.

2.1.2 Focused Presentations to Strengthen Awareness

During holidays such as Labor Day and National Day, as well as peak summer periods, the patrol team collaborates with the park's Safety Department and volunteer service groups to set up “Safety Knowledge Mini-Classrooms” in high-traffic visitor areas such as the Qionghua Island dock and Tuancheng. These classrooms are equipped with display boards featuring simulated water environments, standard life-saving equipment models, and emergency procedure diagrams, and include the following activities:

Life Buoy Throwing Experience: Visitors are invited to practice throwing life buoys at designated “overboard targets,” learning basic throwing techniques and how to control their center of gravity;
Child Rescue Interaction: A simulated “child overboard emergency” scenario is used to explain the correct rhythm and pressure points for artificial respiration and cardiopulmonary resuscitation (CPR);

Safety Knowledge Q&A with Prizes: A “knowledge plus reward” approach boosts visitor engagement and reinforces retention of safety information.

These focused activities are led by rotating patrol officers, enhancing the effectiveness of science communication while also developing team members’ verbal communication and guidance skills. Through immersive and interactive safety education, the goal of “prevention before incidents” is effectively achieved, resulting in significantly improved visitor satisfaction and heightened safety awareness.

2.2 Immersive Guidance on Ecological and Environmental Protection Concepts

2.2.1 Behavioral Guidance and Internalization of Concepts

The ecological system of Beihai Lake is vulnerable to disturbances, with common behaviors including indiscriminate feeding of birds, littering, and uprooting aquatic plants. The patrol team has established a three-stage strategy of “light intervention—gentle persuasion—intensive science communication.” Initially, officers intervene with eye contact or gesture cues; if the behavior continues, they gently persuade visitors while explaining the consequences; if ineffective, they proceed with in-depth explanations, such as “Long-term feeding causes wild birds to become dependent on humans and lose their migratory abilities,” “Throwing garbage into the lake leads to eutrophication, ultimately affecting water quality and bird survival,” and “Uprooting aquatic plants destroys the lake’s micro-ecosystem and may impair water filtration functions.”

Through repeated persuasion efforts, patrol officers found that “telling stories” proves more effective than “lecturing.” Consequently, they have compiled a set of “ecological storybooks,” including titles such as “The Ruddy Shelduck’s Brood,” “Migration Map of the Grey Heron,” and “The Fate of Three Aquatic Plants,” which serve as vivid materials for on-site communication^[3].

2.2.2 Experiential Interaction to Enhance Identification

Science communication should not only involve “telling” but also “allowing visitors to experience firsthand.” During the spring and autumn “migratory bird seasons,” the patrol team collaborates with ecological science volunteer groups to launch the “Lake Observation Day” event. The event process includes patrol officers piloting electric patrol boats carrying volunteer interpreters and visitors into designated water areas; visitors use binoculars to observe birds and record species and behaviors; volunteer interpreters simultaneously explain bird ecological habits, such as how ruddy shelducks rear their young and why cormorants dive in groups. After the event, visitors complete an “Ecological Observation Diary,” which can be exchanged for a “Beihai Junior Ecological Guardian” commemorative badge.

This “immersive plus task-oriented” science popularization activity significantly enhances visitors’ environmental identification, with particularly high participation from parent-child families, facilitating early cultivation of ecological awareness among children.

2.3 Scientific Interpretation of Historical and Cultural Heritage

2.3.1 Mobile Interpretation to Activate Resources

Water surface patrol officers cover the entire lake area during their daily routes, leveraging the advantages of “scenery nearby, presence on site, and live narration” to transform patrol routes into “mobile interpretation lines.” For example, when stopping the boat on the north side of the White Pagoda, officers introduce its construction period, internal structure, and seismic resistance mechanisms; while passing the Nine-Dragon Screen area, they guide visitors to observe the variations in glaze color depth and explain ancient ceramic temperature control principles; in front of the Five-Dragon Pavilion, they interpret the ancient imperial outing system and its spatial layout design.

To enhance interpretation effectiveness, the patrol team has developed an internal “Water Surface Perspective Interpretation Manual” equipped with photographs, maps, and key narration scripts, and regularly conducts training sessions to ensure a balance between scientific accuracy and engaging presentation.

2.3.2 Knowledge Base Construction and Standardized Expression

To ensure content consistency and accurate communication, the patrol team has compiled internal materials such as Ten Lectures on Beihai Culture and A Concise Encyclopedia of Imperial Garden

Architecture Knowledge. These materials cover topics including the physical and mechanical principles behind landscape architecture; geometric symmetry and feng shui theories in garden design; and the evolution of ancient water management systems compared to modern dredging engineering. Team members are required to pass regular assessments to ensure mastery of core interpretive content. This approach not only improves communication quality but also fosters the team's professional pride and cultural confidence.

3. Internal Team: Empowering Team Growth through Science Communication

Science communication should extend beyond the public to the organization itself, serving as a crucial means of shaping professional ethics, strengthening technical competence, and enhancing service effectiveness. The Beihai Park water surface patrol team regards this as an internal cultivation process, integrating it into technical training, emergency drills, and cultural development, thereby gradually fostering an organizational atmosphere characterized by the internalization of scientific spirit and the externalization of communication abilities^[4].

3.1 Systematic Training on Equipment Operation and Maintenance Knowledge

The smooth execution of water surface patrol work relies on the efficient operation of various mechanical devices, including electric patrol boats, water pumps, intercom systems, rescue rope throwers, and emergency paddle boats. The team has established a systematic training mechanism that emphasizes the completeness of knowledge structure and the practicality of operational skills.

During the spring and autumn "maintenance periods," a specialized training camp called the "Equipment Operation Intensive Training Camp" is held annually for several days before the spring opening and after the autumn lake closure. Led by experienced senior members, the camp provides systematic instruction on equipment principles, operation standards, fault diagnosis methods, and emergency response procedures.

The "one person, one boat" responsibility system assigns each team member a fixed piece of equipment, requiring regular completion of usage logs and maintenance records, as well as submission of improvement suggestions based on operational status.

Practical and theoretical dual assessments are conducted through simulated fault diagnosis, parameter identification, emergency shutdown drills, and closed-book exams to test knowledge mastery, promoting the transition from "operational" skills to "comprehensive understanding."

Throughout this process, team members not only master "how to operate" but also understand "why the design is as it is" and "what consequences arise from malfunctions." Equipment ceases to be a cold tool and instead becomes a medium for knowledge dissemination and a reflection of technical comprehension.

3.2 Specialized Drills for Water Rescue and Emergency Response

As the first responder for water safety within the park, the water surface patrol team regularly organizes intensive, realistic drills. The exercises are based on actual conditions and feature scenarios closely aligned with daily situations, aiming to enhance practical capabilities to "deploy quickly, respond promptly, and execute effective rescues."

Routine drills include precision training in life buoy throwing, emergency boat turning, towing uncontrolled vessels, and paddle-advance rescue techniques.

Complex scenario simulations involve situations such as "child rescue during thunderstorms," "visitor seizure leading to water immersion," and "communication breakdown due to boat malfunction," strengthening psychological adaptability, team coordination, and command execution.

To improve rescue skills, the team collaborates with the park medical clinic to conduct lectures and hands-on training on CPR, AED use, and trauma hemorrhage control, ensuring every member can perform life-saving measures during the critical "golden three minutes."

Additionally, a dedicated "review and discussion" session follows each drill, where the lead rescuer explains decision-making logic and other members evaluate execution details, creating a learning cycle of "review—reflection—optimization." This mechanism significantly enhances team members'

scientific decision-making abilities while fostering a stronger sense of responsibility and professional sensitivity.

3.3 Cultivation and Integration of Scientific Spirit and Learning Culture

3.3.1 Monthly Sharing Meeting Mechanism

The team holds a monthly “learning and sharing meeting,” with members taking turns as presenters. The content is not limited to specific tasks but may include equipment knowledge, service reflections, rescue experiences, ecological observations, or even a book review or reflection on a particular interpretation session. For example, one member shares “how to conduct safe guidance in the rain,” another explains “the causes of aquatic plant growth this month,” and an analysis of an operational error focuses on “how to avoid repeating mistakes.”

These sharing sessions stimulate a team culture where “everyone can communicate and every matter contains knowledge,” breaking the limitation of experience being passed only orally or through senior-to-junior mentorship, thus fostering a positive cycle of organizational learning.

3.3.2 Building a Knowledge Repository for the Position

The team is gradually establishing a “Water Surface Patrol Knowledge Repository,” which includes equipment maintenance flowcharts, safety blind spot maps for patrol routes, collections of interpretation scripts, emergency drill case studies, and quick-reference manuals on historical and cultural topics. Every member is encouraged to participate in organizing, supplementing, and revising the repository, facilitating a shift from “using knowledge” to “producing knowledge” and stimulating intrinsic organizational motivation^[5].

3.3.3 Promoting Scientific Values and Professional Identity

During daily morning meetings or year-end reviews, the team leader frequently shares the connotations of the “scientific spirit,” such as seeking truth from facts, pursuing excellence, respecting data, and honoring processes. This spirit gradually transforms into behavioral norms, reflected in every inspection, every explanation, and every reflection. Team members no longer regard their work merely as “task completion,” but rather as a process of “knowledge service,” “cultural dissemination,” and “public empowerment,” thereby strengthening their professional identity.

Conclusion

The science communication practices of the Beihai Park water surface patrol team demonstrate how grassroots positions can transform abstract concepts into warm and effective public service actions, forming a new urban science popularization path characterized by “presence, interactivity, and contextualization.” Communication is not only embedded in daily patrols, becoming an organic part of “behavioral education,” “process inculcation,” and “real-scene experience,” but also promotes the transition of science communication from a peripheral to a core function. The study summarizes three major functional dimensions: constructing a multi-layered communication matrix for visitors through safety education, ecological guidance, and historical interpretation; fostering internal professional growth ecology through training, drills, review sessions, and team building; and achieving mutual enhancement of management effectiveness and public literacy under a mechanism integrating service and communication.

This model is notably characterized by: first, situational communication, with patrol officers stationed long-term at the frontline, achieving routine expression through “scenario-driven and problem-oriented” approaches; second, interactive communication, enhancing effectiveness through real-time interaction, emotional engagement, and contextual extension; third, systematic communication, ensuring quality through institutionalized training, standardized scripts, and collective action. More importantly, patrol officers gradually develop multiple identities as managers, service providers, communicators, cultural narrators, and ecological guardians, with significant improvements in their awareness of science communication and expressive abilities.

Currently, science communication still faces challenges such as traditional formats, fragmented content, and insufficient resources. Future improvements may be realized through digital empowerment, systematic content integration, refined incentive mechanisms, and expanded collaborative networks. Overall, the “Beihai Model” extends the park’s function from landscape tourism to a knowledge

platform and transforms the role of frontline personnel from management executors to knowledge guides, providing an innovative and exemplary paradigm for science communication in urban public spaces.

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