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

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Abstract: *Abstract: The work practice of the water-surface patrol team at Beihai Park is the research subject of this paper, and it explores in detail the particular application models, practical results and social values of science communication in urban park management and services. Beihai Park is an urban public area with rich historical and cultural heritage and good ecological conditions; thus, it provides a good place for the implementation of science communication. Water surface patrols are an ideal research subjects, and several aspects of communication need to be addressed in detail, such as historical and cultural scientific interpretation for tourists, dissemination of water safety knowledge, promotion of ecological and environmental awareness, and cultivation of professional skills and a spirit of science among team members. The above results show that incorporating science communication into daily patrol and management work can enhance the experience of visitors, improve public safety, promote environmental awareness, and boost the professionalism and service efficiency of the team. This way will promote the development of the public education function in urban parks and enhance 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

With the increase in the role of science communication according to national strategies, urban parks, due to their rich ecological environments, cultural resources and public service functions, have become indispensable places for interaction with the public and integration of science communication into daily life. How to achieve the transformation of science communication from concept to practice and from external activities to internal mechanisms at the front line positions has become an urgent problem that needs to be addressed.

Beihai Park has a long history and rich culture, a special aquatic ecosystem, and is popular among many tourists; thus, it is a good place for open, interactive and context-based science communication. As the first link between park management and visitors, the Water Surface Patrol Team will be at the front of providing "real-time interpretation and interactive guidance". In addition to the regular work of safety supervision and emergency response, the team will also carry out daily science communication activities, such as water safety education, ecological guidance, historical and cultural interpretation, etc. At the same time, through training, drills and continuous learning, the team has absorbed the spirit of science as part of its culture and achieved mutual improvement in professional development and communication efficiency.

Based on the actual experience of the water surface patrol team at Beihai Park, this paper presents all kinds of communication and team empowerment, extracts the replicable experience of "communication-oriented service positions", and offers ideas for science communication innovation in urban public spaces as well as improvements in public service optimisation and cultivation of science communication talent.

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

Beihai Park has good resources and is in a good area; therefore, it is a suitable place to organise

science communication activities. As one of the country's top national parks, we have the heavy responsibility of inheriting the historical memory and cultural connotations of this place, and we also need to actively spread scientific knowledge, promote good civil behaviour and ecological awareness among the public. The water-surface patrol team frequently interacts with visitors and has been working on the water for a long time; thus, it is a natural subject and model for science communication.

1.1 Scientific Interpretation of Historical and Cultural Heritage

Beihai Park is one of the better-preserved imperial gardens in China, and it was first constructed during the Liao Dynasty, then expanded in the Jin Dynasty, and flourished under the Yuan, Ming and Qing dynasties. There are many good buildings and rich cultures in the garden. Qionghua Island is in the middle of Beihai, and it has the typical imperial garden layout of "one pool and three hills", in line with traditional Chinese philosophy, harmony with nature and the theory of yin and yang. Iconic buildings in the park, such as the White Pagoda, the Nine-Dragon Screen and the Five-Dragon Pavilions, are beautiful places that have accumulated a large number of scientific values. For example, the White Pagoda on Qionghua Island has a hollow core to increase its earthquake resistance, and its body is bonded with a mixture of lime, glutinous rice and other materials; thus, it can be seen that the ancient craftsmen had a profound understanding of structural mechanics and material properties. The Nine-Dragon Screen is a work that combines the techniques of ceramic firing, glazing and brick carving, and serves as an excellent reference for the study of Ming Dynasty ceramic art[1].

In their daily rounds, the water-surface patrol officers frequently hear the visitors' questions, such as: "Why is the White Pagoda so high, and will it fall?" or "Is the Nine-Dragon Screen made of only one brick?". At this time, the patrol officers can give simple and easy-to-understand answers, and then expand on the topic according to the interests of the visitors and share the scientific basis of the cultural heritage. Therefore, they have changed the idea of heritage from something to be "seen" to that of being "known" and "felt".

1.2 The Value of Real-Life Education in Natural Ecology

Beihai Park has a large area of water, and about two-thirds of the whole space is aquatic habitat for many kinds of plants and animals. It is a very rare urban ecosystem in Beijing. Many kinds of birds live in the park, such as ruddy shelducks, grey herons and cormorants; many kinds of phytoplankton, aquatic plants and fish also help to maintain the ecological balance of the lake. Over the years, the water body has changed somewhat, and now it is relatively cool in the city and also a place for young children to learn.

Beihai will maintain the stability of the aquatic ecosystem by means of scientific management and manual labour. Periodically, patrol officers will check the water quality and observe whether there are any waterbirds or floating rubbish. This is the daily life of the people involved in ecological protection work. Patrol officers can use binoculars to observe the birds and collect data on bird migration in the spring and autumn; thus, an ecological archive will be built and real-time ecological information will also be available for visitors. By explaining the migration habits and ecological functions of birds, we can help the public feel the richness and fragility of nature and enjoy the scenery of birds over water.

The development and progress of aquatic plants are also subjects of research in science communication. Dense Aquatic Plants are in the water in summer. Good for purifying water, but too dense will block the stream and pollute the water. Patrol officers and technical staff manually pull back some of the excessive vegetation and inform the visitors of the reasons for removal via message; for example, they may be told that "Too many aquatic plants are not always beneficial" or "Ecological balance needs to be adjusted dynamically".

1.3 A Model Platform for Public Safety Management

Beihai Park is quite large and has a relatively large number of boats; therefore, it is one of the popular areas in Beijing for water activities. The aim of water safety management is to safeguard the lives and property of the people, and at the same time, it can also be a way to spread scientific knowledge through public emergency education. Water surface patrol officers work around the clock to patrol, monitor, advise on and carry out rescue operations. They give the people a sense of security and are also sources of information.

For example, in hot and humid or stormy weather, patrol officers will inform the people about the

danger of water activities, tell them to get out of the water quickly, avoid dangerous places, and provide some knowledge on weather and risk avoidance. The Form of the actual teaching is more attractive and interesting for the students than traditional classroom teaching.

At the same time, the patrol team is also extending the idea of "education through real events" by adding informative explanations of the incident at the scene. For example, if a visitor enters a deep-water area without a lifejacket, a patrol officer will step in at that time to give a short safety talk, saying, "In case of falling into the water, a lifejacket can offer some help," and then explain that due to the actual circumstances, the window for rescue will be relatively small. Therefore, the current problem has been solved and the next generation will also be better educated.

Thus, the Beihai Water Surface Patrol Team has been at the forefront of spreading safety knowledge and is now a typical case of integrating proactive science communication with public service management.

2. Multi-dimensional Science Communication Practices Orientations for Visitors

As the front-line post with the most direct and frequent contact with visitors in Beihai Park, the water surface patrol team has gradually established a science communication practice path based on the idea that "communication is service, and service is communication" through daily patrols, services, advisories and rescues. Adjust the content of communication according to the local situation, organise context-based communication activities, and establish a collaborative mechanism among all media and roles so that patrol officers can maintain public order and promote the enhancement of public scientific awareness, ecological consciousness and civic literacy[2].

2.1 Scenario-Based Popularisation of Water Safety Knowledge

2.1.1 Problematic and Serious

Beihai Park is popular among many people, frequently has water activities, and therefore needs to be safe. In accordance with the idea of "detection is communication", all safety hazards in the water-surface patrol are regarded as learning opportunities for science education. For example, if the patrol officers see that some visitors are not wearing life vests, there is horseplay near the docks, or children are left unsupervised, they will issue a warning. Briefly explain the "golden self-rescue time" after falling into the water, the principle of life jacket buoyancy, and the risk index of water areas for children in a simple way. Most of the above explanations are based on actual cases or live demonstrations to help the visitors learn about the safety management in a pleasant way.

2.1.2 Focused Presentations to Grab Attention

During the holidays of Labour Day and National Day, and also in the middle of summer, the patrol team will cooperate with the park's Safety Office and volunteer service groups to hold "Safety Knowledge Mini-Classrooms" in popular places for visitors, such as the Qionghua Island dock and Tuancheng. Classrooms have display boards with pictures of virtual water environments, models of standard life-saving equipment, diagrams of emergency procedures, etc., and the following activities will be organised.

Lifebuoy Throwing Experience: Visitors will be able to try throwing life buoys at some "overboard targets" and learn some basic throwing skills and how to control the centre of gravity.

Child rescue interaction: Create an artificial "child overboard emergency" situation and teach children when and how to perform artificial respiration and cardiopulmonary resuscitation (CPR).

Safety Knowledge Q&A with Prizes: A "knowledge + reward" model to increase the participation of visitors and improve the learning effect of safety rules.

Patrol officers will be rotated among themselves to lead the focused activities, improve the efficiency of science communication, and help team members learn how to speak and lead. The goal of the immersive and interactive safety education has been achieved, and it has helped prevent accidents by making the visitors feel more satisfied and secure.

2.2 Immersive Guidance on Ecological and Environmental Protection Concepts

2.2.1 Behavioural Guidance and Internalisation of Concepts

Many disturbances can occur in the ecological environment of Beihai Lake, such as indiscriminate feeding by birds, littering and uprooting of aquatic plants, etc. The three links of the patrol team's plan are to reduce disturbance, lead gently and spread scientific communication. First, the officers will contact the visitors by looking at them or using hand gestures; if this behaviour continues, they will gently advise the visitors and explain the reasons for doing so, such as prolonged feeding of animals will cause them to lose their wild nature and migratory habits, and throwing trash in the lake will lead to water pollution, harm aquatic life, reduce the diversity of living things in the lake, and thus disrupt the natural ecological cycle of water purification.

After many tries to convince them, the patrol officers found that "storytelling" was more effective than "lecturing", so they have created a series of "ecological storybooks", such as "The Ruddy Shelduck's Brood", "Migration Map of the Grey Heron" and "The Fate of Three Aquatic Plants", to serve as vivid teaching materials in the field[3].

2.2.2 Experiential Interaction and Identity Formation

Science communication should inform people of new discoveries and help them experience the magic of science themselves. In the spring and autumn migration seasons of birds, the patrol team and ecological science volunteer groups will organise the "Lake Observation Day" activity. The course of the activity will be as follows: Patrol officers will drive electric patrol boats, and with the help of volunteer interpreters and visitors, go to a specific area in the water body; visitors can use binoculars to observe the birds and note down what kinds of birds they see and how they behave, and at the same time, volunteer interpreters will explain the ecological habits of birds, such as the breeding behaviour of ruddy shelducks and why cormorants gather in groups. After the event, the visitors can fill in the "Ecological Observation Diary" and trade it for a "Beihai Junior Ecological Guardian" souvenir badge.

The "immersive plus task-oriented" science popularisation activity can arouse people's environmental awareness and is especially popular among parent-child families; thus, it can help foster an early sense of ecological responsibility in children.

2.3 Scientific Interpretation of Historical and Cultural Heritage

2.3.1 Mobile Interpretation of Resource Activation

Water surface patrol officers make daily rounds of the whole area of the lake and make full use of the advantages of "nearby scenery, on-site presence and live narration" to turn their patrol routes into "mobile interpretation lines". For example, when stopping a boat on the north side of the White Pagoda, officers will introduce the construction time, internal structure and seismic resistance features of the pagoda; at the area of the Nine-Dragon Screen, they will have visitors observe variations in glaze colour depth and learn about the principles of ancient ceramic temperature control; in front of the Five-Dragon Pavilion, they will explain the old imperial outing system and its spatial layout design.

To improve the effect of interpretation, the patrol team has developed its own "Water Surface Perspective Interpretation Manual" that includes pictures, maps, necessary narration scripts, etc., and regularly holds training sessions to ensure both the scientific accuracy and the interest of the presentations.

2.3.2 Knowledge Base Construction and Standardised Expression

To ensure the uniformity and accuracy of the information in communication, the patrol team has prepared some internal materials, such as "Ten Lectures on Beihai Culture" and "A Concise Encyclopedia of Imperial Garden Architecture Knowledge". The contents will be the physical and mechanical foundation of landscape architecture, geometric symmetry and Feng Shui in garden design, as well as the development of ancient water conservancy works compared with modern dredging engineering. Periodically check if the team members have grasped the main ideas of the interpretation correctly. Improve the quality of communication and strengthen the sense of professional pride and cultural confidence in the team.

3. Internal Team: Building the Team with Science Communication

Science communication should also go from the public to the organisation to promote the development of professional ethics, strengthen technical ability and improve service quality. The Beihai Park Water Surface Patrol Team believes that this is an internal training process, and will gradually promote an organisational culture with a scientific spirit and excellent communication by incorporating it into technical education, emergency drills, cultural activities, etc.[4]

3.1 Systematised Training in Equipment Operation and Maintenance Knowledge

For good operation of water-surface patrol work, all kinds of mechanical devices must work effectively, such as electric patrol boats, water pumps, intercom systems, rescue rope throwers and emergency paddle boats. A structured training system has been set up by the team to cover all aspects of the knowledge and is also practical in operation.

In the spring and autumn "off-season", a special training camp called the "Equipment Operation Intensive Training Camp" will be organised for several days before the spring opening and after the autumn lake closure. Under the guidance of experienced senior staff, the camp will organize classes in the basics of knowledge, operating rules, fault-finding, etc., for the equipment.

According to the "one person, one boat" responsibility system, each team member will be in charge of a particular piece of equipment, need to record its operation and maintenance regularly, and provide improvement suggestions based on actual working conditions.

Based on the simulated fault diagnosis, parameter identification, emergency shutdown drills and closed-book examinations will be carried out to evaluate the learning results of the students and promote all-round development of their skills through joint practical and theoretical tests.

At the same time, the team members will learn how to operate the equipment and why it has been designed this way; they will also know what will happen if it malfunctions. Thus, it will be a source of learning material and not just a cold thing.

3.2 Specialised Drills for Water Rescue and Emergency Response

As the first responders to water safety in the park, the Water Surface Patrol Team regularly organises all kinds of practical training. The exercises are based on real cases and the situations are close to life; thus, they can improve the speed of deployment and quick response in rescue operations.

Some of the usual drills are lifebuoy throwing, emergency boat turning, towing of uncontrolled vessels and paddle-advance rescue techniques.

Complex Scenario Simulations include "child rescue in a thunderstorm", "visitor seizure and water immersion", "communication failure due to a boat malfunction", etc., in order to strengthen psychological resilience, teamwork, leadership and so on.

To improve the rescue ability of the team, they will cooperate with the medical staff at the park to organise training courses and practical exercises in CPR, use of AED devices and control of severe bleeding for injuries.

There is also a special "review and discussion" time after each drill, and the lead rescuer will explain the reasons for the decisions made; at this time, other members can also evaluate the execution details to create a learning cycle of "review - reflection - optimisation".

3.3 Cultivation and Integration of Scientific Spirit and Learning Culture

3.3.1 Monthly Sharing Meeting Mode

The team has a monthly "learning and sharing meeting", and all the members are present. It does not have to be related to any particular task; it can be knowledge of equipment, reflections on services, rescue experiences, ecological observations, a book review and reflection on a specific interpretation session, etc. For example, one member can post "how to carry out safe guidance in the rain", another can explain "why there has been an increase in aquatic plants this month", and the analysis of an operational error can focus on "how to avoid making the same mistake again".

A sharing session will promote a culture of open communication among the team members;

everyone will be free to share their thoughts, and we can address all the problems together. Therefore, experience will no longer be transmitted by word of mouth or top-down distribution, and a good cycle of organisational learning has been established.

3.3.2 Building a Knowledge Base for the Position

The team is currently in the process of building the "Water Surface Patrol Knowledge Repository" in stages, and so far, it has created 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. All members are welcome to participate in the organisation, addition and revision of the repository to promote a shift from "using knowledge" to "creating knowledge" and inspire intrinsic motivation for the organisation[5].

3.3.3 Cultivating Scientific Spirit and Professional Identity

The team leader often brings up the idea of "scientific spirit" in the morning meeting and year-end review, asking employees to seek truth from facts, strive for excellence, respect data and process, etc. This spirit has gradually become a behaviour norm and is now evident in all the inspections, explanations and reflections. Team members no longer believe that their work is only about achieving "tasks", but rather a process of "knowledge service", "cultural dissemination" and "public empowerment", so they are more professional.

Conclusion

The science communication activities organized by the water-surface patrol team of Beihai Park have shown that grassroots organizations can transform abstract scientific knowledge into warm and effective public service activities, creating a new form of urban science popularisation based on "presence, interactivity and contextualisation". Communication is now part of the daily work of patrol staff and has also become an organic part of "behavioural education", "process inculcation" and "real-scene experience", so science communication is no longer an external task but an essential need. The three goals of this paper are to build a multi-level communication network for guiding visitors in safety education, ecological knowledge and historical explanation; to promote the development of a professional team in the organisation by organising training, drills, review meetings and team-building activities; and to strengthen the joint construction of management efficiency and public awareness through the creation of a joint service and communication model.

The three attributes of the model are as follows: First, it is situational communication; for a long time, patrol officers have been at the forefront and have created routine expressions in a "scenario-driven and problem-oriented" way. Second, there is the problem of interaction; to address this, we can add real-time interaction, emotional participation and contextual expansion. Third, hold regular meetings; organise training on the quality of communication, standardise scripts, and promote collective action. More importantly, patrol officers have gradually taken on all kinds of roles, such as managers, service providers, communicators, cultural storytellers and ecological guardians, and have shown good progress in learning about and applying science communication and expression.

Science communication still has the problems of the old type: scattered materials and lack of funds. In the future, we will increase digital empowerment, organise content integration systematically, improve incentive policies, expand cooperation channels, etc. In short, the "Beihai Model" has added a knowledge platform to expand the functions of the park, changed the role of frontline staff from management implementers to knowledge leaders, and created a new, excellent model for science communication in urban areas.

References

[1] Liu, Huajie. Three Models and Three Stages of Science Communication. Popular Science Research, 2009(02): 19-25.
[2] Zhai, Jiequan. Science Communication: Concepts, History, and Value. Science, Technology and Dialectics, 2005(03): 109-112.
[3] Beijing Park Management Center. Beihai Park Chronicles. Beijing: China Forestry Publishing House, 2018.
[4] Wu, Guosheng. The Course of Science. Beijing: Peking University Press, 2002.
[5] General Office of the State Council. Action Plan Outline for National Scientific Literacy

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