

Popularizing Science Among the Grassroots: Development, Existing Problems, and Countermeasures

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Abstract: The issue of improving scientific literacy has always been a social concern, and the formation of science communication teams plays an important role in improving scientific literacy. This paper examines the current state of domestic science communication teams, highlights issues in their construction, and offers suggestions for enhancing these teams. These suggestions include developing a sound management system, strengthening industry communication, enhancing public services, and drawing upon the management expertise of other science communication venues.

Keywords: Science communication; Scientific literacy; Science education

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1. Introduction

The cultivation of science popularization talents and the forming of science communication teams are crucial to the improvement of public scientific literacy. General Secretary Xi Jinping has emphasized the importance of the work of enhancing the public's scientific quality in many public speeches, and General Secretary Xi pointed out that "scientific and technological innovation and popularization of science are the two wings of realizing innovative development, and popularization of science should be put on the same important position as scientific and technological innovation"^[1]. To further enhance public scientific literacy, Shaanxi Province and Xi'an City have successively issued the "Action Plan for Enhancing Scientific Literacy (2021–2035)." The shortage of science communicators, disorganized team structures, and low specialization impede the development of science popularization talent, rendering their role ineffective^[2,3]. Therefore, this paper examines the current state of domestic science communication teams, highlights issues in their construction, and offers suggestions for enhancing these teams within the context of science and technology museums. These suggestions include developing a sound management system, strengthening industry communication, enhancing public services, and drawing upon the management expertise of other science communication venues.

2. Status of science communication teams in China

In 2002, the “Science Popularization Law of the People’s Republic of China” was promulgated and implemented, which was crucial for the popularization of science in our country ^[4]. In March 2006, the State Council issued the “Action Plan for Enhancing Scientific Literacy (2006–2020)” which outlined the direction for promoting scientific literacy over the next 15 years. Under the idea of “government promotion, public participation, improvement of quality, and promotion of harmony,” comprehensive efforts were made to enhance the scientific literacy of the people ^[5]. The goal was to achieve significant development in scientific and technological education, communication, and popularization by 2020. This included creating a comprehensive system for organizing, implementing, infrastructure development, ensuring necessary conditions, monitoring, and assessing the scientific literacy of citizens ^[6]. With these measures, the scientific literacy of citizens would be greatly improved, reaching the level of major developed countries. Key projects included foundational projects for science education and training, the creation and dissemination of science communication resources, building mass media science and technology communication capabilities, and advancing science communication infrastructure. According to national science communication statistics in 2020, the scientific literacy of Chinese citizens reached 10.56 %, and the talent pool for science communication began to take shape ^[7].

In June 2021, the State Council released the “Action Plan for Enhancing Scientific Literacy (2021–2035),” which proposed building a comprehensive and effective system for improving citizens’ scientific literacy. This system would be diverse in subjects and means, offer high-quality resources, and establish effective mechanisms ^[8]. By 2025, the scientific literacy of China is expected to reach 15%; and by 2035, it is expected to reach 25%. Key projects include the dissemination of scientific and technological resources, the enhancement of information technology in science communication, the development of science communication infrastructure, the improvement of grassroots science popularization capabilities, and international exchanges and cooperation in scientific literacy ^[9]. According to national science popularization statistics in 2022, the proportion of Chinese citizens with scientific literacy reached 12.93%, indicating the continuous development and growth of the science communication talent pool.

Over the past 20 years, with the “Science Popularization Law of the People’s Republic of China” and other relevant documents as guidance, diverse departments, organizations, and society have actively engaged in mass science popularization activities. These efforts have yielded a series of achievements in science popularization within our country, leading to a consistent improvement in the overall scientific literacy of the public ^[10].

3. Problems in the construction of science communication teams

3.1. The stark difference between the planning of science communication team construction and the actual situation

Domestic focus on building science communication teams is evident through a range of public policies, and theoretical understanding continues to advance. Nevertheless, practical issues persist.

Table 1. History of China’s science communication planning development

| Content | Policy requirements | Reality |
|----------------|---|---|
| Team formation | Establishing a well-structured team with proficient management, a skilled professional and technical workforce, and an innovative and dynamic high-end research team. | Lack of professional and technical talents. As of 2021, about 1,827,500 people are engaged in science communication across the country, of which 22,400 are full-time scientific content creators and 49,200 are full-time science interpreters |

Table 1 (continued)

| Content | Policy requirements | Reality |
|--------------------------|--|--|
| Talent management system | Implementing a tiered talent management system, enhancing position grading and classification standards, and creating and executing personalized career development plans for staff. | There is no established popular science title series, and a unified and scientific professional and technical title system has not been developed. |
| Talent training channels | Creating proper talent training channels and innovating talent training mechanisms | Universities have yet to set up science communication programs and establish a standardized talent training system |

Data source: National Science and Technology Statistics 2021

3.2. Science communication venues are still in the process of exploring the construction of science communication teams

In 2002, the “Science Popularization Law of the People’s Republic of China” was promulgated and implemented, and the work of improving the scientific literacy of our country began with the promulgation of relevant policies^[11]. Subsequently, relevant policies were issued in 2006. In March 2006, the State Council issued the “Action Plan for Enhancing Scientific Literacy (2006–2020).” In June 2021, the State Council released the “Action Plan for Enhancing Scientific Literacy (2021–2035).” These policies have encouraged the development of science communication venues and the establishment of science communication teams^[12].

Table 2. Development of China’s science communication talent nurturing system

| Period | Content of focus | System |
|--------------------------------------|--|---|
| Initial exploration stage: 2002–2006 | Science communication venues built with government financial investment were equipped with necessary full-time personnel | Only requirements of full-time staff were outlined, rather than establishing a comprehensive system for building a science communication team. |
| The development stage: 2006–2020 | Strengthening the construction of the teaching force, cultivating a team consisting of both full-time and part-time. The teams were reasonably structured the team members were competent | A two-tiered approach was implemented, connecting the development of science communication talent with that of science communication educators to create an initial cultivation system. |
| Mature stage: 2021–present | Promoting the robust development of a full-time science communication talent team across various sectors, including science communication venues, science centers, science and technology publishing, new media, and research. Encouraging higher education institutions, research organizations, and businesses to create science communication positions. Formulating a college and university alliance for nurturing science communication talents, enhancing the training of expert science communicators, and supporting the establishment of science communication programs. | A multi-level strategy was adopted, specifying the construction requirements for a science communication talent team and mandating the formation of talent management and training systems. |

3.3. Increased public expectation of science communicators

As scientific literacy advances, the science communication talent team must adapt. The public, once passive recipients of information, now seeks interactive engagement with communicators who possess professional backgrounds, modern education expertise, and the skills to convey comprehensive and in-depth scientific knowledge^[13]. The public’s expectations of science communicators are mainly reflected in the following aspects. (1) Professional knowledge: Science communicators are expected to have professional knowledge

and to be able to provide true and accurate scientific knowledge to them. Every science communicator should have a wide range of knowledge of their field so that they can convey their knowledge to the general public. (2) Ability to educate people ^[14]: Science communicators are expected to have good teaching skills, and to be able to convey complex scientific knowledge to them in a simple way. They should be able to express themselves well and understand the cognitive level and the needs of the public so that they can convey scientific knowledge to them effectively. (3) Creativity: Science communicators should have innovative skills so that they can create new ways of scientific communication and improve the efficiency and quality of scientific knowledge ^[15]. Science communicators must stay attuned to scientific frontiers, grasp emerging fields and technologies, and foster innovative approaches in science communication. Furthermore, the science communication team should embody a sense of purpose, demonstrating dedication and a willingness to contribute positively toward the advancement of science and culture dissemination ^[16]. Obviously, the simplistic, unsystematic way of training science communicators in the past is no longer applicable due to the growing demands of the people.

4. Research on countermeasures

4.1. Establishing a sound management and supervision system

In recent years, the cultivation of science communicators has not only been based on theoretical guidance but also driven by practical needs. Through continuous practice, valuable experience has been gained, and various regions have paid attention to and provided suggestions for effective strategies in building such talent teams. In 2018, Beijing issued the “Opinions on Deepening the Reform of the Professional Title System,” which clearly proposed the establishment of a professional title for science communication. In 2019, Beijing granted its initial set of senior professional titles in science communication. In 2020, a comprehensive evaluation of senior, intermediate, and junior professional titles in science communication was conducted ^[17]. The reform of the professional title system in science communication in Beijing has served as a model, inspiring provinces and cities like Tianjin, Henan, Gansu, Zhejiang, and Anhui to adopt professional title systems for science communication. Notably, in 2023, the China Association for Science and Technology released a notice initiating the evaluation of professional titles in natural science popularization for central units in Beijing, an effort aimed at encouraging science communication professionals to play a more significant role.

4.2. Establishing industry organizations to enhance communication and exchange

Establishing a science communication venues alliance has become a shared goal among science communication professionals. This initiative not only fosters synergy and resource sharing among popular science venues, including exhibits and teaching materials, but also encourages inter-industry collaboration. It elevates the development of science communication talent teams by enhancing industry communication. For example, a high-end science communication forum can be carried out to encourage practitioners to speak freely and obtain detailed data, so that the talent cultivation system can be improved ^[18]. This will help create a system for science communication venues to communicate and share resources effectively, which is a key factor in building a strong team of science communicators.

4.3. Making science communication people-oriented

Science communication is a way of teaching science to the public and spreading scientific knowledge to improve scientific literacy. In the current era of informatization, the role of science communication is becoming more and more important, because it can enhance the public’s knowledge and understanding of science, thus promoting the development of science and technology and social progress ^[19]. However, science communication

has to be more personalized and people-oriented in order to achieve sustainable development. Personalized science education means that educators are able to tailor the content and form of science education to the needs and characteristics of different groups. Educators should adjust to the diverse interests, routines, and knowledge levels of the public. They should customize science education programs to make them more engaging and useful. Differentiated popular science education means that educators innovate educational forms to make popular science education more personalized and diversified. Science communication can be done in various ways like games, interactive science exhibitions, science classes, etc ^[20]. By constantly innovating and improving the forms of science communication, more people will be interested in science and technology. Sustainable science education means creating a lasting system that ensures the stable and ongoing progress of science education. Educators should enhance coordination, build a network of science education across different sectors and levels, and assume a primary role in science education. This will enable the continued development of education efforts. As more scientists devote themselves to science communication, it will bring a qualitative leap for the popularization of science. Scientists will guide the majority of science communicators to improve the quality of their work from in terms of education and scientific research. The stronger the talent pool, the more robust the science communication efforts, and the better they can meet the public's demand for increasing scientific literacy.

5. Conclusion

It can be seen that the development of science communication team building in China has undergone a long process, with the content expanding from the cultivation of science communicators to the research and construction of science communication teams. People have realized the importance of informal learning in promoting public scientific literacy. Therefore, it is necessary to improve the construction system of science communication teams by perfecting the management system, strengthening industry communication, and enhancing public services.

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