

The Dilemma and Solution Path of Popularizing the Spirit of Scientists in Communities——Based on The Research of J Community in Zhuhai and the Linkage Practice of "Home, University, Society and Politics"

Jinzhi Wen, Xiaoyan Zhou*

School of Physical Science and Technology, Lingnan Normal University, Zhanjiang, Guangdong, 524048, China

ABSTRACT

In the context of the national promotion of the Spirit of Scientists, how to effectively disseminate this ethos within grassroots communities and address the implementation challenges has become a critical issue. This study selected J Community as the case site based on a preliminary investigation of the G Administrative District in Zhuhai City, with selection guided by considerations of representativeness and typicality. Focusing on the community-based popularization of the Spirit of Scientists, this study examines the awareness levels, key challenges, and underlying causes among different community groups through questionnaire surveys and in-depth interviews. Building upon these findings, this study developed an implementation plan to promote the Spirit of Scientists through a coordinated "home-university-community-government" (HUCG) collaborative framework. The preliminary effectiveness of this initiative was evaluated through its practical application and exploratory engagement. This study aims to provide practical pathways and strategic insights for promoting the Spirit of Scientists in grassroots communities, particularly in emerging communities undergoing urbanization.

KEYWORDS

The spirit of scientists; The linkage of "home; University; Society and politics"; Community's popularization of science

1 Research Background and Significance

The Spirit of Scientists represents a precious legacy cultivated by Chinese researchers through decades of scientific practice. This ethos embodies six core dimensions: (1) patriotism with dedication to the nation and service to the people; (2) pioneering innovation in striving for excellence and leading the way; (3) rigorous scholarship grounded in truth-seeking and meticulous study; (4) selfless commitment marked by indifference to fame and fortune, and dedication to research; (5) collaborative teamwork aimed at pooling intelligence and tackling challenges collectively; and (6) a nurturing spirit characterized by guiding and supporting the next generation of scientists. The social value of this spirit has been widely recognized ^[1]. Feng Daojie et al. emphasize that embracing the Spirit of Scientists contributes to fostering positive social norms and an innovative ecosystem, thereby advancing technological progress and modernization. Promoting this ethos is profoundly significant for cultivating a culture that reveres science, enhancing the scientific literacy of youth, and achieving a high level of technological self-reliance ^[2].

The Chinese government has placed a high priority on promoting and popularizing the Spirit of Scientists. There is a growing recognition of the importance of strengthening science education and public engagement with science, particularly in alignment with broader educational reforms aimed at reducing academic burdens on students ^[3]. Concurrently, increasing emphasis has been placed on fostering collective responsibility across all sectors of society to enhance science communication ^[4]. These developments highlight a strategic shift toward integrating scientific literacy into everyday community life, creating new opportunities for the grassroots dissemination of scientific values and the Spirit of Scientists. In December 2024, the newly revised Science and Technology Popularization Law of the People's Republic of China came into effect ^[5]. It reaffirms the equal importance of science popularization and technological innovation and specifically mandates "strengthening science education to improve the scientific literacy of teachers and students", providing a stronger legal foundation for science education initiatives, including the promotion of the Spirit of Scientists.

Despite continuous improvements in top-level design, challenges persist in disseminating this scientific ethos, particularly in its implementation at the grassroots community level. As fundamental social units, communities serve as vital bridges connecting universities, families, and society, and function as key platforms for public engagement with science education and exposure to the scientific spirit. However, current community-level initiatives often face issues such as fragmented resources, monotonous formats, insufficient collaboration, and low residents awareness ^[6]. This is especially true in rapidly urbanizing areas with diverse population structures and varied science communication needs, where developing precise and effective strategies for promoting the scientific ethos remains an urgent challenge.

This study selects Community J in Zhuhai City as a representative case. This community, which includes residents of

* **Corresponding Author:** Xiaoyan Zhou, Email: zhouxiaoyan108@163.com

various age groups and is adjacent to multiple universities, is highly representative. The research aims to thoroughly analyze the current status and challenges in promoting the Spirit of Scientists within this community, explore the establishment and implementation of a collaborative pathway involving "home-university-community-government" (HUCG) stakeholders, and provide empirical evidence and practical solutions to address the existing difficulties in the community-wide dissemination of the scientific ethos.

2 Study design

2.1 Subjects

This study focuses on residents of Community J, employing a combined approach of questionnaire surveys and in-depth interviews for data collection. The survey utilized the method of random sampling, with electronic questionnaires distributed through the Community Residents' Committee. A total of 276 valid responses were collected, representing residents across diverse age groups, educational backgrounds, and durations of community residency, ensuring sample diversity and representativeness. Furthermore, in-depth interviews were conducted with selected adolescents, parents, and community staff members to obtain richer qualitative insights. The basic demographic information of the respondents is detailed in Tables 1, 2, and 3.

Table 1 Sample basic information - age analysis table

Name	Option	Frequency	Percentage
Age Groups	Youth (under 18)	78	28.2%
	Young and middle-aged (18-60 years)	150	54.3%
	Older (over 60 years)	48	17.4%

Table 2 Sample basic information - education analysis table

Name	Option	Frequency	Percentage
Education	Junior secondary and below	90	32.6%
	High university/vocational university	132	47.8%
	university/Undergraduate	54	19.6%
	Master's degree or above	0	0%

Table 3 Sample basic information - residence duration analysis table

Name	Option	Frequency	Percentage
Duration of Residence	Under 5 years	54	19.6%
	5-10 years	84	30.4%
	10-20 years	96	34.8%
	20 years or more	42	15.2%

2.2 Research methods and tools

This study primarily adopts the questionnaire survey method and the in-depth interview method.

Questionnaire Survey Method: A self-designed "Scientific Spirit Awareness Survey for Residents of Community J" was employed. The questionnaire comprised the following sections: (1) Basic resident information; (2) Overall understanding of the Spirit of Scientists (using a Likert scale, where 0=extremely unfamiliar and 5=very familiar); (3) Recognition of the various dimensions of the Spirit of Scientists (patriotism, innovation, pragmatism, dedication, collaboration, and nurturing); (4) Awareness of local scientists.

In-depth Interview Method: To explore issues identified in the questionnaire survey, a semi-structured interview outline was designed. In-depth interviews were conducted with nine residents from diverse backgrounds (including 3 students, 3 parents, and 3 core staff members of the community residents' committee). This approach aimed to gain insights into their genuine perspectives on the Spirit of Scientists, their motivations and barriers to participating in science popularization activities, as well as their specific suggestions for community science education initiatives.

2.3 Data analysis

Quantitative analysis of the questionnaire data was performed to reveal differences in the cognition of the Spirit of Scientists among different demographic groups. The qualitative interview data were coded and subjected to thematic analysis to extract core viewpoints.

3 Research findings and problem analysis

3.1 Dominant awareness of patriotism and innovation, weak recognition of local and collaborative aspects

The survey indicates that residents of Community J have a moderate overall level of awareness regarding the Spirit of Scientists. Further analysis reveals an imbalance in residents' understanding of its different dimensions (Table 4). The dimensions of "Patriotism" and "Innovation" received the highest recognition, while "Collaboration" and "Nurturing" were less understood.

Table 4 Residents' awareness of different dimensions of the spirit of scientists

Dimension	Percentage of Respondents Familiar with the Dimension
Patriotism	89.1%
Innovation	80.4%
Pragmatism	67.4%
Dedication	73.9%
Collaboration	13.0%
Nurturing	28.3%

Notably, residents generally lack awareness of "local scientists." A question in the survey identified Rong Bosheng, a renowned Guangdong-born structural engineer and academician of the Chinese Academy of Engineering. Only about 10.9% of respondents indicated they were very familiar with him, while a high 76.1% stated they were "basically unfamiliar."

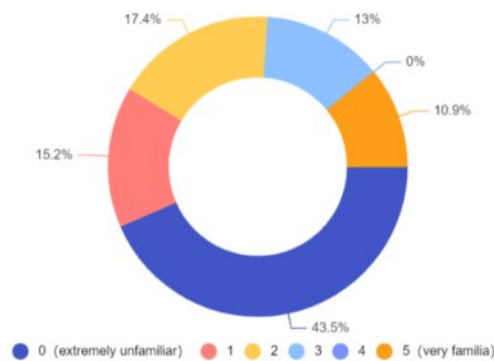


Figure 1 You know the famous local scientists in G District

Most respondents were familiar with the stories of nationally renowned scientists like Qian Xuesen and Yuan Longping.

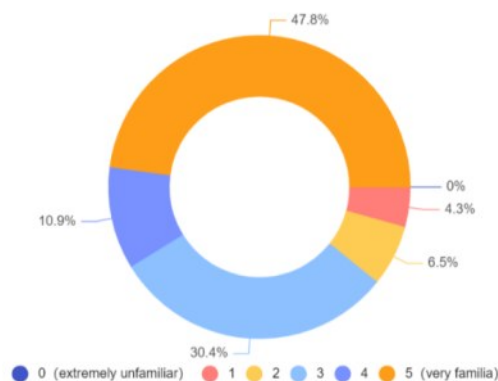


Figure 2 You know at least three famous Chinese scientists and their contributions (such as Yuan Longping, Qian Xuesen, etc.)

One parent remarked, "The scientists we know are mostly from textbooks or frequently featured in the news, like Yuan Longping or Zhong Nanshan. We are not very clear about whether we have any prominent local scientists." This highlights a deficiency in the localized dissemination of the Spirit of Scientists and the identification of nearby role models.

3.2 Significant differences in awareness among groups

Cross-analysis reveals significant differences in the understanding of the Spirit of Scientists among groups of different ages and educational backgrounds. Youth exhibit high enthusiasm but limited knowledge transfer; middle-aged adults show cognitive differentiation; and older adults demonstrate a general weakening of awareness.

Youth Group (Under 18): Generally hold scientists in high regard and show strong enthusiasm for participating in

science popularization activities (78.7% of youth expressed willingness to participate in community science events). However, they often focus more on the interesting aspects of scientific phenomena and the hands-on process of experiments. Their understanding of the deeper meaning of the Spirit of Scientists tends to be superficial, with limited ability to transfer knowledge and connect the spirit to their own learning and growth.

Middle-aged Group (18-60 years): Cognitive differentiation is evident. Highly educated individuals generally recognize the value of the Spirit of Scientists, but their willingness to actively participate in community science events is low (only 42.3% expressed willingness), likely due to work and life pressures. Some less-educated individuals or those not working in science and technology view the Spirit of Scientists as "lofty and grand" but feel it is not closely related to their daily lives. However, they expressed willingness to participate in beneficial science activities with their children.

Elderly Group (Over 60 years): Hold a high level of respect for the social prestige of scientists but have a shallow understanding of the contemporary connotations of the Spirit of Scientists, particularly in areas like innovation and collaboration. Their awareness of local scientists is also relatively weak.

3.3 Bottlenecks in science popularization formats and resources: monotonous activities and difficulty in resource penetration

Previously conducted science popularization activities in Community J were mostly sporadically organized through collaborations between the community residents' committee and volunteers. The formats were predominantly "lecture-style" talks or watching science videos, lacking interactivity and immersive experiences. During interviews, a student reflected, "Sometimes the community's science activities are just playing documentaries or having someone give a talk, which can be a bit boring. It's not as fun as the hands-on science experiments in school."

Furthermore, high-quality science popularization resources struggle to effectively reach the community level. Although the city where Community J is located and its surrounding areas possess resources such as museums and multiple universities, stable channels and mechanisms for connection between the community and these institutions are lacking. A core staff member of Community J stated, "We also want to organize residents to visit museums or invite university teachers to conduct interesting experiments. However, on one hand, the communication channels are not smooth, and on the other hand, there is a lack of dedicated funding and support." This results in uneven quality of community science activities, making it difficult to sustainably attract resident participation.

4 HUCG collaborative practice for popularizing the spirit of scientists in the community

Based on the aforementioned issues, the research team designed and developed diverse forms of science popularization content related to the Spirit of Scientists. An innovative practice was conducted over 15 days to explore and establish a "Home-university-Community-Government" (HUCG) collaborative mechanism for promoting the Spirit of Scientists within the community.

4.1 Building an HUCG collaborative mechanism for popularizing the spirit of scientists

(1) **Government Guidance and Support (Government):** In today's rapidly developing technological landscape, public demand for scientific knowledge is growing. However, science popularization efforts still face challenges, such as uneven resource distribution and the difficulty of effectively delivering high-quality resources to grassroots communities due to a lack of stable connection channels and mechanisms. In this context, government guidance and support are crucial and urgent. Its aim is to integrate resources, innovate popularization formats, enhance the quality and appeal of science activities, and promote the widespread dissemination and deep-rooted understanding of the Spirit of Scientists in communities through multi-party collaboration. Efforts were made to secure support from government departments such as the G District Education Bureau and the Association for Science and Technology. This included incorporating the promotion of the Spirit of Scientists into the community's educational priorities and providing partial funding and resource coordination support, such as facilitating connections with universities and science education bases, and offering policy guidance.

(2) **University Professional Support (university):** Leveraging the professional team from the Science Education program at Lingnan Normal University, support was provided in content development, activity design, and volunteer training. University student volunteers regularly entered the community, bringing fresh scientific concepts and activity formats.

(3) **Community Implementation Platform (Community):** The Community J Residents' Committee was responsible for organizing activities, coordinating venues, and mobilizing residents. The promotion of the Spirit of Scientists was integrated into daily community cultural development. A community "Science Corner" was established to showcase the stories of scientists and popular science reading materials.

(4) **Family Participation Extension (Family):** Through youth classes and parent-child science activities, parents' awareness of the Spirit of Scientists and science education was enhanced. Parents were encouraged to accompany their children in participating in science practices, fostering a family atmosphere conducive to science.

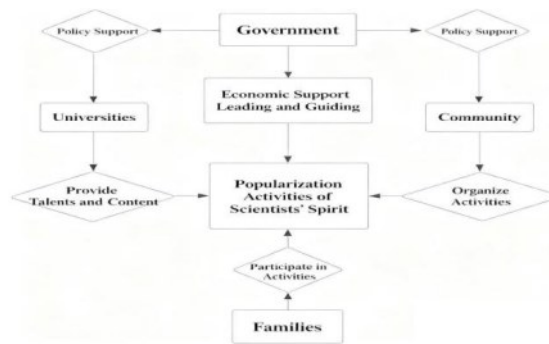


Figure 3 Innovative practice mechanism for HUCG collaborative popularization of spirit of scientists

4.2 Innovation in formats for popularizing the spirit of scientists

The implementation plan emphasized "situational immersion" and "interactive experiences," moving away from a single lecture-based model.

(1) "Spirit of Scientists" Themed Series Classes: Focusing on pivotal life decisions of scientists such as Huang Xuhua (nuclear submarine expert), Qian Xuesen (father of aerospace), and Rong Bosheng (local academician), "situational deep storytelling" classes were designed. These allowed community youth to experience the spiritual essence of patriotism, dedication, and truth-seeking through role-playing and listening to stories.

(2) Interactive Experimental Exploration: Low-cost, high-participation science experiments were designed, such as "Balloon Rockets" (to experience innovation and exploration) and "Earthquake-Resistant Structure Building" (to experience collaboration and pragmatism). Participants could understand the importance of scientific methods and teamwork through hands-on practice.

(3) Exploration and Promotion of Local Scientists' Stories: The growth journeys and contributions of local scientists like Rong Bosheng were systematically organized and vividly told. This enhanced the relatability and approachability of science popularization and boosted residents' cultural pride in their locality.

(4) Utilization of Digital Resources: A science popularization official account was established by the university team to push content such as mini-classes on scientists' stories, short science experiment videos, and event announcements, thereby expanding the reach and timeliness of science popularization.

4.3 Effect analysis

Following a two-week practice cycle (with a total of 5 events held and over 75 residents participating directly), feedback questionnaires and interviews revealed the following:

(1) Increased Awareness: Participating youth demonstrated a more comprehensive understanding of the Spirit of Scientists. Post-activity questionnaires showed a significant improvement in awareness of "Collaboration" and "Nurturing." Knowledge of the local scientist Rong Bosheng increased notably, from 15.4% to 92%.

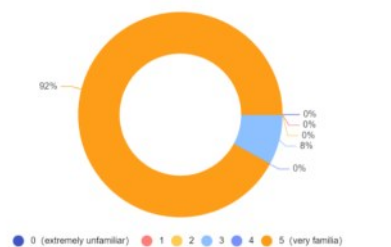


Figure 4 Level of understanding of local scientists

(2) High Participation and Satisfaction: The activity formats were widely welcomed, with over 90% of participants expressing they were "very interested" or "somewhat interested."

(3) Initial Formation of a Community Science Atmosphere: Community residents began to actively discuss community science activities and expressed expectations and suggestions for future events.

5 Recommendations

To further promote the grassroots popularization of the Spirit of Scientists, this study proposes the following recommendations:

5.1 Strengthen policy guidance and resource guarantees

It is recommended that grassroots governments integrate the promotion of the Spirit of Scientists into community governance and the public service system. This includes establishing special funds and creating regular liaison mechanisms between communities, science education bases, universities, and research institutes, ensuring that high-quality resources can effectively reach the community level.

5.2 Deepen content development and innovate formats

Efforts should continue to explore and tap into the resources of local scientists and tell the stories of role models in the community. The promotion of situational, experiential, and interactive science popularization models should be encouraged. Utilizing digital technologies can expand communication channels and enhance the attractiveness and engagement of science popularization activities.

5.3 Promote precision science popularization and targeted guidance for different groups

Science popularization content and activities should be designed to be differentiated based on the characteristics and needs of different groups, such as teenagers, young and middle-aged adults, and the elderly. For teenagers, the focus should be on experience and enlightenment; for young and middle-aged adults, on relevance and value recognition; and for the elderly, on integration and respect.

5.4 Improve the "home-university-community-government" (HUCG) collaboration mechanism

It is crucial to further clarify the roles and responsibilities of all stakeholders to solidify the collaborative model. Encouraging universities and professional teams to continuously empower communities will enhance their inherent capacity for science communication. Stimulating family participation enthusiasm by integrating the cultivation of the scientific spirit into daily life is also key.

6 Conclusions

Through field research and practical implementation in Community J, this study identifies key challenges in promoting the Spirit of Scientists within grassroots communities: uneven public awareness, significant disparities among demographic groups, insufficient identification of local role models, limited diversity in science communication formats, and difficulties in integrating resources. To address these issues, a "Home-university-Community-Government" (HUCG) collaborative program was developed. By enhancing institutional coordination, innovating content delivery methods, and optimizing implementation approaches, this initiative has demonstrated initial effectiveness in fostering scientific literacy across diverse community segments. Cultivating the Spirit of Scientists is a long-term, systematic project that requires sustained effort, multi-party collaboration, and targeted initiatives. This study provides a regional case study for addressing challenges in community science communication. Looking ahead, it is essential to further test and refine these collaborative mechanisms through broader practical applications, ultimately enabling the Spirit of Scientists to truly resonate with the public and nourish society's innovative ecosystem.

Funding

Lingnan Normal University 2025 College Students' Innovation and Entrepreneurship Training Program Project: "Research on Science Education Popularization in Doumen District, Zhuhai City (NO: 123); 2024 Lingnan Normal University Scientific Research Project "The Theoretical Logic and Practical Pathways for Cultivating Students' Scientific Spirit in Science Education" (NO: KX2405); 2025 Lingnan Normal University High-Level Talent Special Project "The Integration Mechanism and Practical Pathways of Infusing the Spirit of Scientists into Science Education" (NO: KX2561); 2025 Lingnan Normal University Curriculum Ideology and Politics Demonstration Project "Curriculum Ideology and Politics' Teaching Research Demonstration Center of the School of Physics (Lingnan Normal University Academic Affairs Document [2025] No. 81)" (NO: 20250603)

References

- [1] Wang, Changming. The Historical, Theoretical, and Practical Logic of the Scientist Spirit[J]. Hubei Social Sciences, 2024(2), 5-19.
- [2] Dong Daojie, Cheng Enfu. Cultivating the Spirit of Scientists in the New Era [J]. Journal of Shanghai Jiao Tong University (Philosophy and Social Sciences Edition), 2022, 30(3): 103-111.
- [3] Xing, Peng, and Lijie Lyu. [J]Cultivating Students' Scientist Spirit through Science Education.[J]Hubei Social Sciences, 2024(3), 11-17.
- [4] Zhou, Xiaoyan. A Study on Science Popularization Practical Ability and Its Influencing Factors Among Science Teacher Candidates. [J]Science Communication, 2023(9), 28-33.
- [5] China People's Congress Network. «The Law of the People's Republic of China on Science and Technology Popularization»[EB/OL]. (2024-12-25)[2025-09-22]. http://www.npc.gov.cn/npc/c1773/c1848/c21114/kxjspjfxd/kxjspjfxd002/202412/t20241226_442115.html
- [6] Wu Yafei. Innovative Practices of Popular Science Journals in Cultivating Young Readers' Scientific Spirit[J]. New Reading, 2024(Supplement): 92-93.