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Reflections on Science Popularization and China's Future Development: A Postprint

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Abstract

Science represents a great endeavor for humanity in the pursuit of truth, and science popularization (hereinafter referred to as “sci-pop”) constitutes a crucial foundational undertaking for realizing innovative development. Throughout the course of scientific development, humanity has through sci-pop achieved the openness and sharing of knowledge systems, the application and dissemination of production technologies, the inheritance and development of scientific culture, and the enlightenment and cultivation of civilized rationality. This article analyzes the role and value of sci-pop, noting that sci-pop facilitates benign interaction between science, technology, and society, enhances the efficacy of science and technology governance, improves citizens’ scientific literacy, safeguards citizens’ exercise of their rights to scientific culture, and strengthens the construction of innovation systems and innovation culture. Furthermore, situated within the grand context of Chinese-style modernization construction, it points out that sci-pop holds great potential for contributions in talent cultivation, innovative development, social governance, and opening up to the outside world. Finally, it delineates the responsibilities and mission commitments of scientific and technological workers in sci-pop through adhering to the concept of science and technology for the people, consolidating sci-pop communication platforms, grounding in the value orientation of technology for good, promoting the vigorous development of open science, and facilitating international exchange and cooperation in sci-pop.

Full Text

Thoughts on Science Popularization and China's Future Development

Science is a great undertaking in humanity’s pursuit of truth, and the popularization of science (hereinafter referred to as “sci-pop”) constitutes the essential

foundation for disseminating truth. As Francis Bacon stated in *The Advancement of Learning*, “the power of knowledge depends not only on its intrinsic value but also on whether it is disseminated and the depth and breadth of that dissemination” [1]. Throughout the history of scientific development, humanity has achieved the opening and sharing of knowledge systems, the dissemination and diffusion of advanced production technologies, and the inheritance and development of scientific culture through sci-pop. In today’s era, as science and technology continuously drive innovative development, economic prosperity, and social progress, they are also increasingly permeating every aspect of human production and daily life. The speed of scientific and technological diffusion and application depends largely on the depth and breadth of sci-pop, which ultimately determines the degree of public understanding, application, and participation in science and technology. The functions, roles, and values of sci-pop can be understood at three levels: (1) historically, sci-pop holds the value of disenchantment and enlightenment; (2) contemporarily, it possesses practical utility for societal advancement; and (3) futuristically, it carries the value of lasting legacy [2].

The Value of Science Popularization

Historical Value: Disenchantment and Enlightenment

Since the Industrial Revolution of the 18th century, scientific and technological innovation has increasingly become the core driver of global economic and political development. Each scientific and technological revolution has transformed the world development pattern through new technologies, inventions, products, and supplies that create new demands, industries, and economies, ushering in new lifestyles, ideas, and reforms. In this process, as knowledge flows and technology diffuses, corresponding political, economic, social, and cultural development patterns gradually emerge. With scientific and technological progress, the power of science and technology to transform the material world and revolutionize social production and lifestyles has become unprecedentedly powerful, leading to deep integration and unification between science, technology, and society. Simultaneously, the scientific ideas, spirit, methods, ethics, and norms embedded in science and technology profoundly influence people’s values, thinking, concepts, attitudes, and lifestyles.

Contemporary Value: Practical Utility for Societal Advancement

In the present era, sci-pop and sci-tech innovation are more closely linked than ever before. A nation’s innovation level primarily depends on the smooth operation of its innovation system and increasingly relies on the universal improvement of scientific literacy among its workforce. Sci-pop facilitates the effective diffusion and dissemination of knowledge produced by national innovation systems and enables adequate academic exchange and cooperation within the scientific community, thereby greatly enhancing the efficiency of national innovation systems. Modern experience in sci-tech innovation application demonstrates

that sci-pop is an objective necessity for comprehensive social development, an “accelerator” for productivity improvement, and a “catalyst” for transforming scientific research achievements. In today’s rapidly evolving sci-tech landscape, the extent of science and technology popularization in a country or region fundamentally determines its production and cultural development levels and creative capacity.

Future Value: Lasting Legacy

Sci-pop demonstrates tremendous value in achieving the great rejuvenation of the Chinese nation. By accelerating the transformation of research achievements into real productive forces, sci-pop promotes the integration of science and technology with the economy and society. Its long-term cultivation builds the social foundation for talent as the primary resource. Sci-pop stimulates young people’s interest in science, guides them to set innovation aspirations, and serves as the key to strengthening independent talent cultivation, particularly ensuring future talent supply. The sudden COVID-19 pandemic has put sci-pop to an unprecedented test, fully demonstrating its value and mission in serving human all-round development, modernizing governance systems and capabilities, supporting innovative development, and building a human community with a shared future. The importance, necessity, and urgency of sci-pop have become more prominent, with all sectors of society anticipating high-quality sci-pop. Sci-pop optimizes the innovation ecosystem, fosters a social ethos that values, respects, supports, and participates in innovation, and represents a higher-level requirement for building an open innovation ecosystem and participating in global sci-tech governance through international exchange.

Science Popularization and China’s Future Development

Entering the Era of Open Science: Deep Integration of Sci-Tech Innovation and Sci-Pop

With the rapid advancement of the new round of sci-tech revolution and industrial transformation, interdisciplinary integration and innovation in research paradigms are accelerating. The value chains of sci-tech innovation and sci-pop continuously merge, with sci-pop and innovation breakthroughs and technology diffusion advancing interactively. The traditional boundaries between sci-pop, education, and culture are gradually blurring and intertwining. As the ecological evolution of scientific paradigms unfolds internally and externally, the open science paradigm has emerged. Open science and open-source innovation align with the laws of sci-tech innovation, herald development trends in science and technology, and are increasingly recognized globally. The comprehensive innovation of the scientific research paradigm, characterized by all-dimensional high openness, diverse and inclusive participation, and high transparency, signifies that sci-tech innovation and sci-pop have entered an era of deep integration. With the rapid development of internet and other emerging technologies, the primary orientation of sci-pop has expanded from disseminating scientific knowl-

edge to popularizing scientific spirit, scientific thinking, and scientific methods.

Deep Integration of Scientific Culture with National Culture and the Spirit of the Times: Sci-Pop Enhancing China's Innovation Soft Power

Chinese modernization is both deeply rooted in and closely related to excellent traditional Chinese culture, while also embodying the advanced nature of scientific socialism—absorbing and drawing upon all outstanding achievements of human civilization and pointing toward the future direction of human civilization. As a scientific institution with Chinese characteristics, sci-pop, on the one hand, vigorously promotes advanced global scientific and cultural achievements, facilitating the localization, rooting, blossoming, and fruiting of science as a spirit and civilization in China. On the other hand, it actively cultivates a scientific culture with Chinese national characteristics. In the struggle of older generations of Chinese scientists for national rejuvenation, their spirit deeply integrated with the patriotism-centered national spirit, forming a scientific culture with “Chinese connotation” that is “centered on holding high the banner of science, persisting in truth-seeking and being pragmatic; advocating patriotism and dedication, and adhering to serving the country and benefiting the people” [3].

Sci-Pop as an Important Platform for Promoting Sci-Tech Development and Development Through Sci-Tech: Becoming a Basic Project Empowering Chinese Modernization

Addressing the major issues of talent cultivation, innovative development, social governance, and opening up in the context of Chinese modernization, sci-pop work will assume an even more important mission. Strengthening sci-pop and improving the scientific and cultural literacy of all citizens to build the foundation of innovative human resources and talent resources and create an innovation army constitutes an inevitable choice for achieving innovative development. Strengthening sci-pop to meet people's new needs for a better life at a higher level, further promoting the 普惠 and fairness of science and technology, and achieving sci-tech for good are crucial for improving people's well-being and realizing shared development and common prosperity. Strengthening sci-pop to create a social atmosphere that advocates innovation, embraces tolerance, and promotes understanding is vital for coordinating material and spiritual civilization. Strengthening sci-pop to publicize green concepts of nature conservation and biodiversity protection and guide the public toward low-carbon, green living capabilities and habits represents an important approach for society's green transformation and achieving harmonious coexistence between humanity and nature. Strengthening sci-pop to address global challenges facing humanity and realize common prosperity of world civilizations is an important pathway for achieving open and peaceful development.

Responsibilities and Mission of Science and Technology Workers in Science Popularization

Upholding the People-Centered Concept of Sci-Pop: Adhering to a Human-Oriented Approach

Science and technology workers engaged in sci-pop must adhere to the principle of sci-tech for the people and the idea of delivering science to the people. Focusing on promoting human all-round development, they should not only enhance public mastery of scientific knowledge and methods but also foster scientific concepts, cultivate scientific spirit, and nurture innovative spirit, striving to make science the basic logic and conscious habit of public rational thinking and action. With a humanized, civilian, and life-oriented approach, they should go deep into communities and stay close to the public. Addressing personalized and diversified sci-pop needs, they should adopt sci-pop methods full of humanistic care and enlightenment, apply digital, networked, and intelligent information technologies, and provide matching high-quality sci-pop resources to effectively satisfy public senses of participation, gain, and identity.

Demonstrating the Leading Role of Scientific Spirit: Consolidating the Public Opinion Environment for Sci-Pop

Science and technology workers engaged in sci-pop should strive to shape the spirit of the times, vigorously promote the scientific culture with “Chinese connotation” centered on “holding high the banner of science, persisting in truth-seeking and being pragmatic; advocating patriotism and dedication, and adhering to serving the country and benefiting the people,” and vigorously advocate and develop a scientific culture with Chinese characteristics of “self-reliance, independent innovation, courageous exploration, and tolerance of failure.” They should resolutely resist feudal superstitious ideas, refute “pseudoscience” and “anti-science,” as well as smearing campaigns and ideological erosion conducted under the guise of sci-pop. They must ensure the authenticity of disseminated information, not distorting the original meaning of sources to avoid falsehood and misleading; ensure the traceability of disseminated sci-tech information, guaranteeing accurate and reliable professional sources; and ensure the timeliness of disseminated information, keeping pace with sci-tech development trends [6].

Grounding in the Value Orientation of Sci-Tech for Good: Promoting Healthy Interaction Between Science and Society

Science and technology workers engaged in sci-pop should take social and public interests as the starting point and serving society and benefiting humanity as the goal. They should abide by the basic ethical principles of human society and ecology, follow sci-tech ethics norms in research processes, cherish and respect nature and life, and respect human value and dignity. They must avoid inappropriate application of scientific knowledge, assume responsibility for assessing the consequences of science and technology, and timely predict and inform so-

ciety of potential risks and drawbacks of scientific research, contributing to the public's comprehensive and correct understanding of science [7]. They should promote two-way communication and dialogue between the scientific community and the public, forming a benign interactive relationship between science and technology and society, and promoting societal awareness and response to science and technology. They should actively publicize scientific development concepts to the public, enabling them to understand science, sci-tech issues, and research work, and comprehensively and objectively disseminate sci-tech information so that the public understands not only the enormous benefits that science and technology may bring but also the uncertainties, promotion costs, potential risks, and possible conflicts of interest in sci-tech innovation.

Promoting Universal Fairness: Advancing Open Science

Science and technology workers engaged in sci-pop should face the people and unremittingly promote universal fairness. They should attach importance to improving scientific literacy among groups of different ages, genders, regions, and education levels, vigorously assist groups in impoverished and backward areas to narrow the scientific literacy gap with economically developed regions, and provide open and high-quality sci-pop resources and rich and diverse opportunities for scientific participation for the whole society. They should promote the concept of open science, build an open science culture, and advance the open science movement so that scientific data, knowledge, facilities, and achievements can be widely accessed and more reliably utilized, making scientific research and education more inclusive, sustainable, and equitable. They should maintain the legal rights of scientific openness, establish balanced and appropriate open principles, and protect personal privacy, data security, and intellectual property.

Maintaining an International Perspective on Open Development: Promoting Collaboration in Sci-Pop

Science and technology workers should establish a global view of sci-pop, pay close attention to issues such as climate change, resource depletion, biodiversity loss, and pandemic disease transmission brought by rapid global economic and social development, and increase the dissemination and sharing of the latest sci-tech innovation achievements worldwide, telling China's sci-tech innovation stories well and contributing Chinese wisdom to promoting global public scientific literacy. They should enhance cooperation and exchange with sci-pop workers from different cultural backgrounds in research and practice, adopt a more open global perspective, draw upon international excellent sci-pop development experience, utilize global high-quality sci-pop resources, contribute Chinese solutions for sci-pop development, enhance mutual learning among civilizations, and serve the building of a human community with a shared future.

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Note: Figure translations are in progress. See original paper for figures.

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