An Analysis of Science Communication in the Converged Media Environment of the Big Data Era (Postprint)

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Date: 2023-10-08T00:00:00+00:00

Abstract

In the integrated media environment of the big data era, information dissemination channels have undergone unprecedented transformation. Meanwhile, supported by information technology, the work model of science popularization communication has also been optimized to a certain extent. Compared with the communication methods of traditional media, science popularization communication in the integrated media environment of the big data era has achieved effective enhancement in both communication effectiveness and practical results. However, how to leverage the advantageous role of the big data era' s integrated media environment for science popularization communication, promote in-depth reform of science popularization communication models, and advance the development of domestic science popularization communication are key issues urgently requiring resolution in the current process of China' s science popularization communication work. Based on this, this paper takes the integrated media environment of the big data era as the research background, centers on science popularization communication practice, and grounded in the reform and optimization of science popularization communication models, conducts analysis from aspects including countermeasures, focal points, and platform construction, hoping that the following theoretical research content can provide robust theoretical reference for frontline practitioners in the science popularization communication field.

Full Text

Preamble

An Analysis of Science Communication in the Integrated Media Environment of the Big Data Era

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Abstract: In the big data era, the integrated media environment has fundamentally transformed information dissemination pathways, and concurrently, science communication practices have been significantly optimized through information technology support. Compared to traditional media approaches, science communication in this new environment has achieved marked improvements in both effectiveness and efficiency. However, a critical challenge remains: how to fully leverage the advantages of this integrated media landscape to drive deeper reform of science communication models and advance the development of domestic science communication. This paper examines science communication practices within the big data and integrated media context, focusing on model optimization from the perspectives of strategies, priorities, and platform development, aiming to provide theoretical guidance for practitioners in the field.

Keywords: big data era; integrated media; science communication; resource aggregation
Classification: G206
Document Code: A
Article ID: 1671-0134(2021)12-034-03
DOI: 10.19483/j.cnki.11-4653/n.2021.12.008
Citation Format: Liu Zelin. An Analysis of Science Communication in the Integrated Media Environment of the Big Data Era[J]. China Media Technology, 2021(12): 34-36.

Science communication plays a vital role in enhancing public cognitive levels, as dissemination channels and methods directly influence communication outcomes. Compared to other types of information, scientific knowledge tends to be complex and dry, resulting in relatively low public interest and willingness to actively engage with such content. The big data and integrated media environment has expanded information channels and improved dissemination efficiency. By leveraging integrated media, big data technology, information technology, and online platforms for science promotion, we can optimize domestic science communication structures and enhance the quality of scientific information delivery. Therefore, this theoretical research not only enriches the theoretical framework of science communication in the big data era but also holds practical significance for further optimizing science communication practices.

1. Strategies for Science Communication in the Big Data and Integrated Media Environment

1.1 Promoting the Integration of Traditional and New Media

The integration of traditional and new media approaches is essential for realizing the advantages of integrated media in science communication. While new media has achieved remarkable development alongside rapid IT advancement in China, the role of traditional media in disseminating scientific knowledge remains indispensable. In practice, we should continue utilizing traditional chan-

nels like newspapers and magazines while actively employing big data analytics on existing science content. By encouraging diverse societal forces to participate in science content creation and harnessing the scientific rigor of new media platforms such as WeChat, Weibo, and short-video apps, we can truly achieve "integrated media" and diversify science communication methods.

1.2 Strengthening Administrative and Legal Regulation

Although the proliferation of new media platforms has expanded science communication channels and reach, some platforms with low entry barriers and minimal oversight can lead to false information and declining content quality, or even content overload. False science communication not only fails to improve public cognition but may also cause widespread misunderstanding. The primary goal of science communication is to help the public understand scientific knowledge and correct misconceptions. Therefore, in this integrated media environment, national and regional information security regulatory centers should continuously improve relevant laws and strengthen administrative enforcement to standardize science content on new media platforms, thereby preventing false science communication and controlling information quality to provide a healthier environment for audiences.

1.3 Optimizing Professional Competence of Staff

Effective science communication in the big data and integrated media era requires not only platform, technological, and environmental support but also qualified personnel. Science communication professionals form the human foundation for successful implementation, making it crucial to enhance their competencies. First, staff should be encouraged to use big data technology to analyze audience search patterns across major platforms to identify public science interests, enabling demand-driven content creation and optimal resource allocation. Second, professionals must possess rigorous scientific literacy and solid foundational knowledge, as science communication requires explaining phenomena, processes, and results through videos, images, experiments, or historical examples. Organizations should emphasize content completeness and encourage editors to continuously improve their expertise to provide comprehensive, professional, and well-substantiated information. Third, staff information literacy must be optimized, including abilities in editing and curating information, acquiring information, understanding platform requirements for science content, and effectively interacting with experts and authoritative figures to enhance communication effectiveness.

2. Key Focus Areas for Science Communication

2.1 Content as the Foundation

In the integrated media environment, effective inter-media integration can facilitate scientific knowledge dissemination, with content serving as the critical an-

chor. Media activities must achieve science communication goals while fulfilling social responsibilities, making content quality paramount. The three essential elements of science content are "who communicates," "what is communicated," and "how it is communicated"—referring to the communicator, the content itself, and the communication method. Under the mainstream orientation of promoting science, content should be localized and refined. Localization means developing content based on national conditions, social development status, and regional policies to meet local public needs. Refinement involves eliminating unnecessary narratives to highlight key scientific points and strengthen educational impact.

2.2 Resource Integration

Science communication in this environment should emphasize resource integration, adopting a "common integration" model based on the "unification" concept through data resource libraries. Organizations should embrace the philosophy of "creating what others don' t have, perfecting what others do have," using big data to integrate resources and information technology to explore innovative communication formats. Platforms should serve as primary communication venues, such as developing programs like "Science Every Day"for public transport and buildings, science screens in parks and communities, and "Micro-Science" WeChat accounts.

3. Platform Development for Science Communication

3.1 Resource Aggregation Platforms

"Integration"is key in this media environment. Platform developers should adopt aggregation thinking to promote resource sharing among diverse media. First, efforts should focus on convening government agencies, media organizations, and public welfare groups, leveraging the educational function of aggregation platforms to encourage positive public interaction. This mobilizes civic participation while guiding various stakeholders in managing blogs and social media accounts, creating social synergy to expand science communication reach. Second, to address the problem of fragmented operations among different entities, interactive spaces should be opened to break down channel barriers, integrating various platforms into a unified resource aggregation system. When searching for scientific knowledge, audiences can navigate through the main platform to different "sub-platforms" for related content, with Weibo, blogs, and WeChat accounts serving as subsystems within the larger government-media-public welfare framework. This enables genuine integration among the public, subsystems, and main system while optimizing resource allocation. Finally, O2O operational models should be implemented, combining online media promotion with offline activities. Notable successes include the "China Association for Science and Technology" collaboration with Baidu, Tencent, Xinhua, and other media companies to create "Science China,"a comprehensive resource aggregation platform. Zhejiang Province' s "Science Plus" brand campaign, featuring collaborations like "Science Plus Huashu Digital TV" and "Science Plus Zhejiang News Client,"

along with initiatives such as "Strongest Science Plus" and "Science Training Camp," provides valuable models for regional platform development.

3.2 Authoritative Content Platforms

If the internet is viewed as an ecosystem, it exhibits decentralized and flattened characteristics where the public holds greater agency and participation rights. However, this has created a mixed environment with numerous science-themed accounts and media, particularly regarding pseudoscientific content on health and longevity. While the internet provides resources and channels for all types of content, authoritative, professional, and scientifically credible content ultimately determines communication effectiveness. Therefore, developing authoritative content platforms is essential to enhance impact and counter pseudoscience. First, such platforms should gather authoritative authors, including experts and senior practitioners, assigning them to appropriate science sections based on their expertise and cultivating them as "science communication influencers."Second, these authors should interact with the public to answer questions and dispel doubts. Content presentation should incorporate diverse expressive elements and simulation technologies to create vivid, engaging materials that enhance audience experience. Finally, platforms should leverage cloud computing and big data to provide precise services by categorizing audiences by age and interests, delivering authoritative content through preferred channels to maximize impact. Additionally, these platforms should play a crucial role in addressing emergencies and mitigating public opinion crises, with experts providing timely clarification to dispel panic and misinformation, as demonstrated by professionals on the "Science Squirrel" website during major scientific incidents.

3.3 Social Sharing Platforms

Unlike traditional one-way communication, social sharing platforms enable ideal interactive channels for audience participation. If "I transmit, you receive" represents unidirectional communication, these platforms facilitate bidirectional interaction where audiences hold substantive positions. Through comprehensive two-way activities, audiences may become content creators and communication practitioners themselves, with science communication gradually shifting from the platform to audiences' social circles, achieving exponential dissemination effects. In the big data era, "UGC" (User-Generated Content) has become prevalent, giving audiences broader activity spaces to receive information, create content, share, and disseminate. Audiences are no longer merely consumers but also producers and distributors of network information. UGC not only holds intrinsic value for science communication but also enables audiences to realize their social value in this domain. For example, Taobao' s buyer Q&A feature allows potential customers to ask questions about products, with previous buyers providing answers based on experience—sellers can also clarify product details. This internet thinking applies across domains. Similarly, on platforms

like "Zhihu" and "Guokr," audiences can obtain science knowledge through Q&A activities. Participants include not only experts but also general users who serve as both recipients and disseminators. The greatest advantage of social sharing platforms lies in creating a public scientific spirit atmosphere that transforms 单向互动 into bidirectional interaction.

3.4 Practical Experience Platforms

Practical experience is the most effective way to engage audience senses and deepen impressions, making experience platforms a powerful tool for enhancing science communication effectiveness. These platforms transform dry scientific principles into engaging activities, allowing audiences to experience scientific charm while subconsciously expanding their knowledge. Creativity and 趣味性 are crucial in platform development. Recent research suggests that 情境-based science communication in the big data and integrated media environment can optimize effectiveness, similar to 情境 teaching in education. Technicians can use VR, H5, AR, and other technologies to create virtual experience platforms with scenarios tailored to different scientific topics, enabling immersive experiences from home. For example, China' s Digital Science and Technology Museum uses science animations, virtual museums, and experience centers with interactive concepts to achieve edutainment effects. The "Find the Strongest Brain H5 Game" transforms scientific knowledge into intelligence challenges, mobilizing public participation, while the "Please Challenge" online quiz enables both answering and scientific discussion. These cases exemplify virtual experience, online interaction, and intelligence challenges in platform development. Overall, the key lies in maximizing audience participation and experience to subtly enhance communication effectiveness.

Conclusion

This paper has analyzed science communication in the big data and integrated media environment from three perspectives: strategies, priorities, and platform development. The analysis reveals that optimizing science communication requires focusing on concept integration, media convergence, resource aggregation, platform development, and communication innovation. Additionally, practitioners should continuously improve their information literacy, while organizations should emphasize talent integration by recruiting experts and encouraging public participation in science communication.

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(Responsible Editor: Zhang Xiaojing)

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