Content, Form, and Value: The Post-Print Evolution of Popular Science Short Video Communication

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Abstract

The development of popular science short videos has provided an important vehicle for science communication. At the content production level, relying on vertical domain content production and updates aligned with current events and hot topics, popular science short videos have achieved professional expression; the visual medium, unique IP, and regular update frequency have facilitated their dissemination. At present, content creators should further promote the healthy development of popular science short videos through optimization.

Full Text

Preamble

Content, Form, and Value: The Evolution of Science Popularization Short Video Communication

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Abstract: The development of science popularization short videos has provided an important vehicle for science communication. At the level of content production, science popularization short videos have achieved professional expression through vertical domain content creation and timely updates on current hot topics. Visualized carriers, unique IPs, and regular update frequencies have facilitated their dissemination. Today, creators should further promote the healthy development of science popularization short videos through continuous optimization.

Keywords: science popularization short videos; professional production; operational strategy; integrated communication

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Introduction

In June 2021, the State Council issued the "Outline for National Scientific Literacy Action (2021-2035)" (hereinafter referred to as the "Outline"). The Outline emphasizes that vigorously developing short videos and other forms of science popularization works to achieve multi-channel, all-media dissemination of scientific content represents a crucial pathway for deepening the supply-side reform of science popularization and constructing a scientific literacy development system [1]. According to data from iiMedia Research, China's short video user base continues to grow rapidly, exceeding 700 million in 2020 and projected to reach 809 million in 2021 [2].

Among short video platforms, Douyin commands the largest user base in the short video domain, representing a force that cannot be ignored in promoting science popularization. By August 2020, Douyin's daily active users had surpassed 600 million. The "Douyin Youth Mode Data Report" released in May 2021 indicated that science popularization creators were the most popular in youth mode, with @I'm Not Eating for Nothing, @Infinite Small Light's Science Daily, and @Modern Nature ranking as the top three favorite creators among young users. With major short video platforms vigorously promoting science popularization, it has become an important content category receiving broader attention.

1.1 Deep Cultivation of Vertical Fields and Professional Content Production

Science popularization short videos, aimed at promoting scientific spirit and improving national quality, have demanded extremely high standards of scientific rigor and accuracy since their inception. In this context, professional content backed by specialized disciplinary knowledge and data support from professional institutions gains greater recognition and achieves better communication effects.

1.1.1 Professional Institutions Building Audience Trust

For institutions providing public services, brand represents recognition and discourse power. In the process of science communication, it symbolizes authority and quality, making information more persuasive and credible [3]. Endorsement from professional institutions signifies accurate sourcing, providing audi-

ences with more authoritative content amidst the vast sea of short videos and enhancing the dissemination power of science popularization content.

Currently, official institutions such as @China Science Popularization, @Voice of CAS, @Institute of Physics, CAS, and @National Astronomical Observatories have established presence on Douyin. Against the backdrop of certification by professional research institutions like the Chinese Academy of Sciences, @Voice of CAS and @China Science Popularization have each accumulated over one million followers.

@China Science Popularization is an official science popularization brand created by the China Association for Science and Technology, backed by a diverse and collaborative scientific community [4]. With enormous science popularization resources and capabilities, @China Science Popularization can achieve unity of professionalism, rigor, and credibility. In its latest video "Plants Actually Have Blood Types," the video explains the origin of plant blood type discovery and the biological reasons behind it in an accessible and thorough manner, organizing complex scientific knowledge into a clear and understandable narrative that enhances the video' s logical coherence.

1.1.2 Professional Scientific Personnel Ensuring Content Quality

Advances in media technology have not only broken through the spatial and temporal boundaries of information dissemination but also decentralized public discourse power, making public space the primary venue for science popularization information flow [5]. In the traditional media era, science popularization media could build and accumulate authority and credibility through years of content output. In the converged media era, however, an increasing number of content consumers have transformed into content producers, significantly lowering the threshold for participating in scientific knowledge dissemination. Coupled with inadequate platform supervision, this has allowed "pseudoscience" to gain entry.

In the vast cyberspace, how can audiences ensure source credibility to protect themselves from "pseudoscience" ? Beyond professional institutions, a group of professional scholars on Douyin provides stable science popularization content for audiences. Due to the inherently high threshold of science popularization, scholars with professional knowledge backgrounds naturally possess a "halo" in this domain. Under Douyin' s official certification, such scholars can often gain audience trust at minimal cost.

@TechApe_{YuanLanfeng} is certified on Douyin as an associate researcher at the University of Science and Technology of China and was named one of the top ten science communication figures in 2018, focusing primarily on physics. With strong professional disciplinary knowledge and university background certification, he stands out among numerous physics science popularization short videos, attracting over three million followers and more than ten million total likes. @Teacher Lu Who Plays with Bones is an associate researcher at the Insti-

tute of Vertebrate Paleontology and Paleoanthropology, CAS, and a specially appointed expert of China Science and Technology Publishing House. With her gentle personality, she presents the unique landscape of the institute to viewers. Under professional identity certification, despite posting only about 60 videos, Teacher Lu has gained over 300,000 followers, with her most popular work receiving over one million likes.

Additionally, scholars such as @Dr. Chen Zheng—Science Experiment Player and @The Palace Lord Who Only Shows His Voice have opened accounts on Douyin to conduct science popularization in their professional fields, providing audiences with more options.

Professional institutions and background-based science popularization creators gain audience trust, but this trust originates from confidence in the creators' scientific capabilities. Therefore, even without professional backgrounds, accounts with sustained creative capabilities can gain popularity by relying on the creators' own cognitive frameworks and knowledge accumulation. Science popularization short videos, with short videos as the carrier and scientific knowledge as the core, require creators to prioritize scientific accuracy, which demands extensive and detailed literature support.

1.2 Following Current Events and Hot Topics to Capture Users' Demand for Knowledge

Whenever major issues emerge online and trigger widespread attention and discussion, science popularization short video creators seize the opportunity to conduct science popularization on these hot events to meet audience demand. When hot events occur, public attention focuses on them, generating substantial attention and discussion. By capturing timeliness and explaining scientific principles related to hot events, the dissemination power of science popularization short videos can be significantly enhanced.

At the 2021 Tokyo Olympics, 16-year-old Guan Chenchen won gold, and her gymnastics move resembling a "kangaroo shaking hands" charmed numerous netizens. On August 10, Guan posted a video on her Douyin account asking @Infinite Small Light' s Science Daily, "Can kangaroos really bend backward?" That same day, Zhang Chenliang immediately responded in his video "Online Popular Biology Identification 33,"receiving enthusiastic audience reception with over 1.8 million likes.

After the COVID-19 outbreak, to prevent virus spread, all residents complied with national epidemic prevention policies and stayed home. Faced with an unknown virus, people began searching online for information about COVID-19, fundamentally changing how they obtained information. The rapidly growing demand for science popularization during the pandemic made numerous science popularization short videos viral hits. Additionally, major platforms quickly integrated resources and established epidemic-themed sections, providing excellent conditions for disseminating science popularization short videos.

In the first half of 2020, the medical health science popularization account @MedicalForward_{GaoWei} posted 477 short videos, with the most concentrated content about COVID-19 published between January and February 2020. Gao Wei, wearing a white coat and serving as an emergency surgery physician at Miyun Hospital affiliated with Peking University First Hospital, released numerous science popularization videos through Douyin during the early stages of the pandemic, including content on epidemic prevention measures and COVID-19 rumor debunking. Currently, @MedicalForward_{GaoWei} has over 20 million followers on Douyin with more than 200 million cumulative likes.

@Infinite Small Light' s Science Daily has over 18 million followers on Douyin, making it a top-tier influencer. Zhang Chenliang, the person behind the account, holds a master' s degree in entomology from China Agricultural University and serves as deputy editor-in-chief of *Nature* magazine. With extremely detailed knowledge of animal and plant categories and characteristics, his "Online Popular Biology Identification" series answers netizens' questions about strange flora and fauna in each episode. With rich biological knowledge and humorous language, Zhang' s videos frequently receive millions of likes.

@DXY, a matrix account under the medical health institution DXY, has over nine million followers on Douyin. As a "heavyweight" account in the medical health field, demonstrating professionalism and enhancing content credibility are crucial means to increase its dissemination power. To enhance content authenticity, @DXY obtains support from authoritative literature and presents it through animation, video, and other forms. In its program "What Happened to Those Who Drank Coke Long-Term?" it cited a 2010 foreign literature piece "Caffeine Intake and Semen Quality in a Population of 2,554 Young Danish Men" to demonstrate that drinking Coke does not affect sperm vitality.

2. Channels and Forms: Integrated Communication of Science Popularization Short Videos

In practice, science popularization short videos often prioritize scientific accuracy while overlooking visual experience and communication effectiveness. With the development of internet technology, various forms of science popularization carriers have emerged, gradually lowering the threshold for science popularization. Faced with a "hundred flowers blooming" in science popularization short videos, audiences have more options. Science popularization short videos should follow this trend, enhance video watchability, and improve dissemination power through measures such as carrier visualization, creating unique IPs, and maintaining regular update frequencies.

2.1 Visual Forms Attracting Audience Interest

With the advancement of internet and computer technology, digital media technology has gradually matured. Digital media technology is an emerging discipline encompassing numerous fields with wide applications, primarily including

multimedia databases, web design and production, computer graphics and image processing, character design, and multimedia post-processing, playing important roles across various industries [6]. In the science popularization field, the advantages of digital media technology have gradually become prominent, with various graphic-rich videos becoming new favorites on platforms.

Given the wide distribution of science popularization short videos across fields, videos with different themes and subjects adopt different formats. Currently, science popularization short videos on Douyin mainly include lecture-style, documentary-style, animation-style, and Vlog-style formats. The rapid progress of digital media technology has continuously developed the video production industry, enabling science popularization short videos to iterate and update their carriers.

Douyin account @OrangeBeauty excels at science popularization through animation, explaining common yet overlooked knowledge in daily life through animated forms. In the video "Why Are Most European Countries' Flags So Similar?" it anthropomorphizes European countries like Russia, the Netherlands, and France, presenting the reasons for flag similarities through animated characters' arguments, making it highly engaging and watchable. Consequently, this video received strong popularity on Douyin with over 1.7 million likes and more than 100,000 shares. Unlike traditional science popularization methods, animation can construct landscapes that cannot be presented in daily life, possessing unique advantages in visualization. Science popularization through animation can reduce costs and enhance interest and fun.

Beyond animation, the use of industrial software such as C4D and 3DMAX continuously raises the ceiling for science popularization short videos, providing alternative perspectives. The former industry benchmark @PaperclipPaperClip extensively employed 3D modeling and three-dimensional animation in its science popularization videos. In its video "How to Make a Sensible Streetlight," the use of digital media technology amazed netizens, who exclaimed it had "million-dollar special effects" [7].

2.2 Unique IP Formation Creating Memorability

With the rise of numerous science popularization accounts on Douyin, audiences enjoy diverse choices while science popularization gradually shows homogenization trends. To stand out, creators must establish unique IPs through personalized settings. By crafting visual presentation, language style, and persona development, science popularization accounts can be revitalized and made "come alive."

IP (Intellectual Property), also understood in today's online environment as a cultural symbol with high recognizability and strong acceptance, represents a mature case of IP development on Douyin. Using his surname "Yuan", which sounds like the word for "ape", the account developed an ape image. Its Douyin profile picture features an animated ape wearing glasses and a shirt,

bearing remarkable resemblance to Yuan Lanfeng. Moreover, elements of "Tech Yuan" and the animated ape appear alternately in videos, creating a relatively complete IP. Beyond Douyin, @TechApe_{YuanLanfeng} actively expands to other media platforms such as Toutiao and Bilibili, forming an IP matrix.

@I' m Not Eating for Nothing, with the slogan "One Hilarious Food Fact Daily," features a cartoon character named "Bu Bai Chi" (Not Eating for Nothing) with pink cheeks bearing the word "eat" and eyebrows connected in an "M" shape. This classic character appears in every video, leaving a strong impression. In terms of content, each video focuses on food knowledge, maintaining extremely stable content output. Thanks to its exquisite visuals and the cute "Bu Bai Chi" image, the account has gained over 20 million followers.

Film and television packaging can enhance the value of science popularization texts, making video content differentiated and recognizable. Personified IPs can also satisfy audiences' emotional experience needs. Furthermore, IP settings can break communication boundaries, potentially converting those originally uninterested in science popularization into audiences attracted by cute cartoon characters, significantly enhancing dissemination power.

2.3 Regular Updates Maintaining Visibility

Against the backdrop of technological development, short video platforms have gradually formed their own logic and algorithms. Technological advances continuously empower content production, giving rise to more refined video texts. In the short video domain, algorithms control the traffic of every video. Under digital logic operations, science popularization short videos that meet audience psychology and maintain high quality are recommended to more viewers.

Each video upload enters the platform' s traffic pool and is personalized and distributed to users. The traffic received varies based on video performance. Therefore, when video quality is constant, increasing update frequency can secure more traffic and thus increase video exposure time. @I 'm Not Eating for Nothing maintains a fixed update frequency, with daily videos ensuring regular appearance in viewers' sightlines and obtaining relatively stable, continuous attention.

After numerous self-media creators entered short video platforms, intense competition emerged. If science popularization short video creators cannot maintain stable update frequencies and continuous content output, they will be forgotten by users in the information flow. Especially after the COVID-19 outbreak, more users entered short video platforms. During this period, numerous medical health science popularization accounts seized the opportunity, continuously outputting quality content and maintaining stable updates, such as @DXY and @MedicalForward_{GaoWei}, thereby gaining audience recognition.

3. Suggestions for Continuous Optimization and Development of Science Popularization Short Videos

With the rapid development of the science popularization industry, factors affecting short video communication effectiveness have gradually emerged. The tremendous value of short videos in science popularization compels us to grasp their development patterns and avoid risks. Science popularization creators should strengthen industry self-discipline, improve the scientific authority of short videos; establish user thinking to construct affinity in content; and improve operational strategies to leverage platform advantages. Short video platforms should also strengthen supervision and review mechanisms to keep content that does not meet scientific standards "outside the door."

3.1 Adhering to Scientific Core and Improving Quality

Scientific content is the lifeblood of science popularization short videos. Texts that lose their scientific core will inevitably be neglected. In the pan-entertainment internet environment, science popularization short videos should maintain the boundary between entertainment and science, prioritizing content scientific accuracy while balancing interest and fun. They must never lose the scientific bottom line. Achieving this requires strengthened self-discipline in the short video industry, creators raising their standards, and platforms strengthening supervision. In the information-mixed online environment, they should persist in guiding audiences with correct, scientific, and authoritative information to promote the development of science popularization.

3.1.1 Strengthening Industry Self-Discipline Under the temptation of traffic, science popularization short video creators should act as their own gatekeepers, breaking the "traffic supremacy" concept and rejecting clickbait, pseudoscience, and video plagiarism. Creators should aim to improve citizens' scientific literacy, strictly control content sources, and not produce any content that violates professional ethics or social morality.

The development of self-media has brought certain troubles to the science popularization industry. Uneven video quality forces audiences to spend time discerning video scientific accuracy. Under the packaging of animation, graphics, and other carriers, text discrimination becomes even more difficult. During the COVID-19 pandemic, numerous rumors spread through short video platforms, such as "Smoking can prevent novel coronavirus infection" and "Pets can spread novel coronavirus," causing significant negative impacts on social order and public life.

The former industry benchmark "PaperclipPaperClip," once renowned for its rigor and scientific accuracy, attracted numerous fans with its exquisite videos and unique content. However, in its June 1, 2018 video "Where Does Tap Water Come?" it used a Chinese map that did not meet national standards at the 3:01 mark, leading to its removal and widespread online discussion. The team also

faced substantial questioning and criticism, and by July 2021, the account was banned across the entire network in another controversy.

Unlike other short video industries, science popularization short videos bear enormous social responsibility. When society faces major public crises, science popularization information can play roles in dispelling rumors and maintaining social stability. Therefore, science popularization creators should strengthen industry self-discipline and deliver scientific information to audiences.

3.1.2 Improving Platform Supervision Achieving healthy development of science popularization short videos also requires platform supervision. Platforms should establish standards and norms for science popularization short videos to guide healthy industry development. Platform resource integration played a tremendous role during the COVID-19 pandemic, and Douyin' s "DOU Knowledge Plan"also provided vast creative space for knowledge creators. While providing fertile ground for creators, short video platforms should also prevent pseudoscience disguised as science popularization. By establishing unified industry standards, guiding creators toward more standardized and rigorous scientific creation; strengthening science popularization content review mechanisms; and establishing reward and punishment systems, platforms can leverage their advantages to ensure quality.

3.2 Establishing User Thinking and Constructing Affinity

Science popularization is oriented toward the public. The gap between communicators and recipients during the process reduces the effectiveness of science popularization short videos. Content created by creators may not be accepted by audiences. Creators should address this issue, narrow the distance between teachers and learners, and establish user thinking. They should conduct science popularization creation with users as the orientation, making it approachable and relatable.

Creators can face audiences directly through video comments and live streaming, narrowing the distance with viewers. By moving from behind the scenes to the front stage, they can interact directly with audiences. Science popularization creation should stay close to audiences, actively dialogue with them, listen to their needs, and timely adjust creative directions. Short video platforms' strong social attributes make users accustomed to providing feedback through various mechanisms. Two-way communication channels such as likes, comments, and live interactions enable real-time interaction between creators and audiences. Science popularization creators should not isolate themselves but should adhere to an audience-centered approach to meet public demand for science popularization.

3.3 Improving Operational Strategies and Leveraging Platform Advantages

When creators conduct science popularization on Douyin, utilizing platform rules can expand video dissemination power. Adding relevant topic tags when publishing content can expose videos to more people interested in those topics. Major science popularization influencers on the platform can also collaborate on video production, interacting with other creators through videos to expand influence.

@An Senyao is a science popularization creator on Douyin who, driven by his passion for humanities and history, focuses on history, life, and other cultural fields. Because of his close content exchanges with physics science popularization creator @Yan Bojun, netizens "shipped" them as a CP. @An Senyao immediately collaborated with @Yan Bojun to produce a video titled "Did Newton Believe in God in His Later Years?" featuring both creators sitting side by side, presenting the connection between scientists and religion in a crosstalk-like manner. The video received 290,000 likes, far exceeding the average level. Additionally, in his video "Have Japanese People Forgotten Chinese Culture?" An Senyao appeared together with @Yan Bojun and @Teacher Gou Sheng in a joint creation. Collaborative creation expands video dissemination reach, combining the followers and traffic of each creator to achieve "circle-breaking" communication and broaden influence.

Beyond joint creation, enhancing user interaction, maintaining update frequency, and regularly hosting live streams can also make accounts more disseminative and influential. Short video platforms have their own ecosystems and rules, and science popularization creators should actively adapt and adjust operational strategies, leveraging platform rules to turn them into advantages.

Conclusion

The rapid development of science popularization short videos has powerfully promoted science popularization. Professional content production and communication practices in science popularization short videos have met audience demand for science popularization. However, there remains room for optimization. Science popularization creators should adhere to the scientific core, adopt a user-oriented approach, and actively adjust operational strategies to promote the healthy development of science popularization short videos.

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