Research on Influencing Factors of Communication Effect of WeChat Short Videos by Popular Science Journals

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Abstract

Objective: To investigate the influencing factors of dissemination effectiveness of WeChat short videos for popular science journals, and to provide reference for popular science journals to effectively conduct science communication and enhance their influence through WeChat short videos.

Methods: Using the Elaboration Likelihood Model as the theoretical framework, an empirical analysis was conducted on 762 short videos published on WeChat Channels by 22 outstanding Chinese popular science journals.

Results: Topic, title techniques, presentation format, background music, and source attractiveness have significant effects on the dissemination effectiveness of popular science journals' WeChat short videos, whereas short video duration, source expertise, and source credibility have no significant effect. Furthermore, the geographical location of popular science journals has no moderating effect, while average monthly video publication count and number of new media platforms have moderating effects.

Conclusion: Popular science journals' WeChat short videos should select down-to-earth topics close to users' daily lives; create eye-catching titles to attract users' attention; comprehensively utilize multiple elements such as animation, images, and narration, and reasonably add background music to enhance viewing experience; bravely shoulder the responsibility of science communication and introduce attractive science presenters; diligently operate and build a new media communication matrix.

Full Text

A Study on Factors Influencing the Dissemination Effect of WeChat Short Videos in Popular Science Journals

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Abstract

[**Purpose**] This study aims to explore the factors influencing the dissemination effect of WeChat short videos in popular science journals, providing references for these journals to effectively conduct science communication and enhance their influence through WeChat short videos. [**Methods**] Using the Elaboration Likelihood Model (ELM) as the theoretical framework, an empirical analysis was conducted on 762 short videos published by 22 outstanding Chinese popular science journals on WeChat Channels. [**Findings**] The results indicate that theme, title technique, presentation form, background music, and source attractiveness significantly influence the dissemination effect of popular science journals' WeChat short videos, while video duration, source professionalism, and source credibility show no significant impact. Additionally, the journal' s geographical location does not have a moderating effect, whereas the average monthly video publication count and the number of new media platforms do exhibit moderating effects. [**Conclusions**] Popular science journals should select themes that are down-to-earth and close to users' daily lives; create eye-catching titles to capture user attention; comprehensively utilize multiple elements such as animation, images, and narration; and incorporate background music appropriately to enhance viewing experience. They must also courageously shoulder the responsibility of science popularization by introducing attractive science communicators, diligently manage their operations, and build a new media dissemination matrix.

Keywords: ELM theory; popular science journals; WeChat short videos; dissemination effect

Introduction

At the National Conference on Science and Technology Innovation, Academician Conference, and Ninth National Congress of the China Association for Science and Technology, General Secretary Xi Jinping emphasized that "scientific and technological innovation and science popularization are the two wings of innovation development, and science popularization should be placed on an equal footing with scientific and technological innovation." As an important carrier for disseminating and popularizing scientific and technological knowledge, popular science journals not only serve as a crucial platform for creating a scientific atmosphere and promoting scientific spirit but also shoulder the heavy respon-

sibility of enlightening the public and enhancing scientific literacy. In today' s media landscape where "no video means no dissemination," video has become the new frontier of content marketing, and visualization represents a critical breakthrough for popular science journals to effectively reach audiences and better popularize scientific knowledge. General Secretary Xi Jinping' s important assertion during his inspection of the PLA News Media Center that "where the audience is, where the readers are, where the users are, that is where our work focus should be" is equally applicable to popular science journals seeking to expand their influence.

In practice, popular science journals have actively opened video accounts or entered short video platforms. Children' s science journals such as *Youth Science Pictorial* and *Oriental Baby* have entered Douyin, releasing short videos targeting children for science enlightenment and growth. Agricultural science journals like *New Rural Technology* have launched WeChat Channels to popularize agricultural knowledge from multiple angles and dimensions. *Naval & Merchant Ships* has opened an account on Bilibili, having published 176 short videos and attracting 87,000 followers.

The short video operations of popular science journals have attracted academic attention. Xi Zhiwu et al. examined the necessity and urgency of video transformation for popular science journals, while scholars have also focused on the current status, content construction, and existing problems of short video operations for these journals. Dissemination effect represents the key point and ultimate goal of popular science journals' short video operations. Zhang Bo et al. conducted statistics on the dissemination status of popular science journals on Douyin and found that the dissemination effects of popular science journals' short videos are uneven, with significant differentiation. Researchers have analyzed the influence of narrative strategies, title length, cover types, and other factors on the dissemination effect of popular science journals' short videos. While these studies offer valuable insights, most are descriptive analyses, and the few empirical studies lack theoretical support and theoretical discussion, resulting in insufficient depth.

Essentially, users' behavior of watching popular science journals' short videos is a decision-making process of selecting, processing, and handling information. The Elaboration Likelihood Model (ELM) elaborates on the basic process and internal reaction mechanism of audience attitude and behavior change when facing persuasive information. Based on this analysis, this study attempts to use ELM as the theoretical foundation, take the 2020 Outstanding Chinese Popular Science Journals as research objects, and explore the influencing factors of WeChat short video dissemination effect for popular science journals, thereby providing useful references for these journals to effectively conduct science communication through short videos and promote deep integration of publishing.

Theoretical Framework

In 1986, American psychologists Richard E. Petty and John T. Cacioppo first proposed the ELM theory, suggesting that according to the degree of elaboration likelihood that information receivers undertake when facing persuasive information, the audience' s information processing follows two basic routes: the central route and the peripheral route. Specifically, the central route refers to the process where audiences carefully and elaborately process and evaluate the true value of received information to form cognition and attitude. The true value of information mainly involves a series of traits related to information quality, such as topic, authenticity, and objectivity. The peripheral route refers to the process where audiences rely on peripheral cues in the persuasive context (such as credible sources) without elaborately processing the information itself to influence cognition and attitude. Peripheral cues in persuasive contexts are mainly related to source characteristics. For example, during the COVID-19 pandemic, doctors' advice for the public to wear masks outdoors—their professionalism and authority could serve as peripheral cues to cause attitude and behavior change. Since its establishment, this theory has been widely applied to research on the process and mechanism of information dissemination and audience attitude change. This study draws on this theory to examine the influence of central and peripheral routes on the dissemination effect of popular science journals' WeChat Channels and further investigates the moderating role of popular science journals' characteristics.

2.1 Central Route

The central route primarily explores quality factors related to information content in popular science journals' short videos. Information content includes two attributes: theme and content quality. Drawing on Jin Yan et al.'s research, this study divides content quality into title technique, video duration, presentation method, and background music application.

2.1.1 Theme Based on the positioning and content presentation of popular science journals, their short videos contain various themes, including social science, medicine, astronomy, physics, geography, etc. A content analysis of government affairs short videos on Douyin showed that videos spreading positive energy, knowledge popularization, and thematic propaganda are popular among users and have strong dissemination power. Wang Yan' s research on Bilibili science interactive short videos revealed that social science-themed short videos significantly positively affect dissemination effect, while astronomy and earth science-themed short videos have no significant impact on dissemination effect. Based on the above analysis, the following hypothesis is proposed:

H1: Different themes have significant differences in influencing the dissemination effect of popular science journals' WeChat short videos.

2.1.2 Title Technique Titles provide brief summaries of short video content, offering main information and clues that help users understand video gist and affect their comprehension. Titles are also the first trigger point for attracting users. Deng Lüxiang et al. found that using rhetorical questions and other rhetorical devices in academic journal short video titles to create suspense can stimulate user interest, resulting in higher likes and forwards. Zhang Lan et al.' s research on social science academic journals' WeChat official account articles also found that techniques such as exclamation marks, question marks, and rhetorical devices significantly improve article read counts. The use of rhetorical questions and other techniques can attract user attention to short videos, stimulate viewing interest, and achieve better dissemination effects. Based on the above analysis, the following hypothesis is proposed:

H2: The application of short video title production techniques significantly positively influences the dissemination effect of popular science journals' WeChat short videos.

2.1.3 Video Duration Duration is an important indicator of short video content completeness. Generally, longer videos contain more information and are more likely to gain user recognition. Existing research has not reached consensus on the impact of duration on short video dissemination effect. A study on knowledge dissemination in social short video platforms showed that video duration has no significant impact on comment or forward volume. Zhang Fang et al.' s experimental research indicated that short videos with low information capacity and clear themes 反而 achieve better user cognitive effects. However, a study on Weibo information forwarding showed that duration positively correlates with forwarding volume. Considering the characteristics of social media application scenarios and user behavior in watching popular science short videos, this study proposes the following hypothesis:

H3: Popular science journals' WeChat short videos of different durations have significant differences in dissemination effect.

2.1.4 Presentation Form Traditional popular science journals typically use text and images. Media technology development has brought about media form evolution, making information presentation in popular science journals more diverse and rich. Popular science journals' short videos integrate multiple media methods, comprehensively using text, images, subtitles, audio, video, and animation. Different presentation forms create different user experiences. Particularly in the social media context of user choice diversity and attention fragmentation, the richness of short video presentation forms can effectively enhance immersive and engaging viewing experiences. Research shows that the use of multiple form materials such as text, images, and audio significantly positively correlates with government short video users' information adoption effect. Based on the above analysis, the following hypothesis is proposed:

H4: Presentation form diversity significantly positively influences the dissemination effect of popular science journals' WeChat short videos.

2.1.5 Background Music Sound can trigger visual associations. Background music can depict images, create atmosphere, express spirit, enhance short video narrative ability, and attract user attention. Through integration with short video visuals, it provides users with immersive experiences, enhances understanding of popular science knowledge, and even achieves empathy effects, ultimately gaining high user recognition of dissemination content. An eye-tracking experimental study on the impact of background music on college students' reading effects showed that background music affects reading experience and effectiveness by inducing emotional valence and arousal. Based on the above analysis, this study proposes the following hypothesis:

H5: The presence of background music creates significant differences in the dissemination effect of popular science journals' WeChat short videos.

2.2 Peripheral Route

The Elaboration Likelihood Model posits that when information involvement is low and users lack motivation and ability to process information, they activate the peripheral route, relying more on external cues not directly related to content to process information and change attitudes or behaviors. External cues mainly refer to source characteristics. Following the classification methods used by most scholars, this study divides source characteristics of popular science journals' WeChat short videos into source professionalism, source credibility, and source attractiveness.

2.2.1 Source Professionalism Popular science journals' short videos mainly revolve around journal positioning, created and disseminated by teams or individuals to popularize scientific knowledge. In the information reception process, source professionalism is not the actual professional ability of the source but the audience' s subjective perception and evaluation of the source' s professional capability. Existing research conclusions on the relationship between source professionalism and dissemination effect are inconsistent. Lai Shengqiang' s research showed that communicator professionalism is not significantly correlated with users' Weibo forwarding behavior. Xu Xiaojuan et al.' s research indicated that intangible cultural heritage short videos featuring professionals or authoritative figures result in higher user satisfaction and search intention for similar information. Based on the above analysis, the following hypothesis is proposed:

H6: Source professionalism significantly positively influences the dissemination effect of popular science journals' WeChat short videos.

2.2.2 Source Credibility Source credibility refers to the degree of trustworthiness users perceive in communicators and their disseminated information.

Source credibility was confirmed as early as 1951 in Hovland and Weiss' s persuasion research. Numerous studies have confirmed that source credibility significantly influences audience attitude change. With identical information content, individuals are more easily persuaded by sources with higher credibility, while persuasion success rate decreases with lower credibility. Online word-of-mouth source credibility positively influences consumers' purchase intention. A study on Chinese public preferences for receiving climate change information showed that public-perceived source credibility significantly positively correlates with climate information dissemination power. Based on the above analysis, the following hypothesis is proposed:

H7: Source credibility significantly positively influences the dissemination effect of popular science journals' WeChat short videos.

2.2.3 Source Attractiveness Source attractiveness is the audience' s comprehensive evaluation of the source' s external image and content characteristics. Specifically for popular science journals'short videos, source attractiveness refers to the speaker's image characteristics, language style, and interaction techniques. McGuire' s persuasion theory considers source attractiveness another important factor influencing audience attitude and behavior change. Research indicates that higher advertising source attractiveness leads to more positive brand attitudes and stronger purchase intention. Influencer source attractiveness positively and significantly influences consumers' perceived hedonic shopping value, thereby stimulating purchase intention. Based on the above analysis, the following hypothesis is proposed:

H8: Source attractiveness significantly positively influences the dissemination effect of popular science journals' WeChat short videos.

2.3 Moderating Variables

The effects of central and peripheral routes on the dissemination effect of popular science journals' WeChat short videos may be moderated by variables such as the journals' influence, video publication frequency, and number of publication platforms. First, given that all surveyed popular science journals are 2020 Outstanding Chinese Popular Science Journals with homogeneous influence, this study distinguishes their influence by geographical location. Generally, first-tier cities have better publishing environments and more advanced publishing concepts, making them more aware and capable of using the latest communication technologies to promote brands and attract more users through improved content quality and forms, thereby expanding journal influence. Second, in the social media era, popular science journals that excel in management emphasize the transformation of popular science achievements and enhance journal influence through new media communication such as short videos. The number of published videos reflects the probability of videos being discovered, clicked, and watched by users. Since video account opening times are inconsistent, this study uses the average monthly video publication count to reflect update frequency.

Third, Weibo, WeChat, Bilibili, and other platforms are currently popular new media platforms whose mobility, ease of use, and strong interactivity facilitate the dissemination of popular science journals'short videos. More new media platforms for popular science journals make it easier to form a comprehensive and diversified brand matrix and more likely to drive traffic to WeChat short videos. Therefore, the number of other new media platforms may have a moderating effect. Based on the above analysis, the following hypotheses are proposed:

H9: The influence of antecedent factors on the dissemination effect of popular science journals' WeChat short videos is moderated by the journals' geographical location.

H10: The influence of antecedent factors on the dissemination effect of popular science journals' WeChat short videos is moderated by the journals' average monthly video publication count.

H11: The influence of antecedent factors on the dissemination effect of popular science journals'WeChat short videos is moderated by the number of the journals' other new media platforms.

2.4 Dependent Variable: Dissemination Effect

Following Zhang Bo et al. and Zhang Fang et al.' s research, likes, forwards, and comments are used as indicators of short video dissemination effect. Larger values for likes, forwards, and comments indicate better dissemination effect. The model of influencing factors for popular science journals' WeChat short video dissemination effect constructed in this study is shown in Figure 1 [Figure 1: see original paper].

Figure 1. Model of influencing factors for popular science journals' WeChat Channels dissemination effect
Note: Arrows indicate the influence of independent variables (central route, peripheral route) on the dependent variable (dissemination effect), and the moderating effect of moderating variables (popular science journals' WeChat Channels characteristics) in the relationship between independent and dependent variables.

Methodology

3.1 Data Source

The 2020 Outstanding Chinese Popular Science Journals (hereinafter referred to as popular science journals) were selected as research objects based on three considerations: first, strong authority, as they were selected by the China Popular Science Writers Association; second, broad coverage, including both general public and segmented professional audiences in terms of target groups, and involving astronomy, medicine, geography, aviation, etc. in terms of content; third, strong representativeness, as the short video dissemination influence of these selected journals represents a microcosm of new media operation status for

popular science journals. Popular science journals were searched and followed by real name on WeChat Channels. As of 14:00 on August 26, 2023, 22 of the 50 outstanding popular science journals had opened Channels, accounting for 44%. Videos published by each journal from opening date to deadline were browsed sequentially and numbered by publication time. Videos with tail numbers 1 and 6 were selected, yielding 762 short videos as analysis samples. This study used SPSS 26.0 software for data management and analysis.

3.2 Variable Measurement and Coding

Data on theme, title presence, title technique application, video duration, presentation form, background music, geographical location, average monthly video publication count, likes, forwards, and comments were obtained through video viewing or statistics. The number of other new media platforms mainly counted the opening status of popular science journals on Weibo, WeChat, and Bilibili. Variables such as source professionalism, source credibility, and source attractiveness were coded as high or low by three professionally trained research assistants. Coding consistency reached 94.5% during the pre-test phase, indicating good reliability. Individual controversial cases were discussed with the author to reach consensus.

The 22 popular science journals' WeChat short videos were categorized into five themes: medicine, astronomy, geography, aviation, and others. Titles were divided into no title and with title, with titled videos further subdivided by technique application. Video duration was divided into four categories: under 30 seconds, 30-60 seconds, 61 seconds-3 minutes, and over 3 minutes. Presentation forms included text, images, animation, and narration, with 1 point for each form used, coded as 1-4. Background music was coded as present or absent. Geographical location was divided into first-tier and non-first-tier cities. Average monthly video publication count was calculated as total videos from opening date to end of statistical period divided by number of months. Results showed maximum average monthly publication of 22.79, minimum of 0.25, and median of 7.08, with high and low frequency groups divided by the median. For other new media platforms, 1 point was assigned for each platform opened on Weibo, WeChat, and Bilibili, coded as 0-3.

3.2.2 Dependent Variable and Coding

Likes, forwards, and comments for the 762 short videos were counted separately. Based on weights assigned by invited communication and metrology experts to each indicator and combined with relevant research, the dissemination effect calculation formula is:

$$C_n = 0.40 \times L_n + 0.31 \times F_n + 0.19 \times R_n$$

where C_n represents dissemination effect, L_n represents likes, F_n represents

forwards, and R_n represents comments. Larger C_n values indicate better dissemination effect of popular science journals' WeChat short videos.

Results

4.1 Descriptive Data Analysis

The descriptive statistical analysis of popular science journals' WeChat short videos shows the distribution across various categories. In terms of themes, medical and geographical topics account for significant proportions, reflecting user interest in health and environmental content. Title usage shows that most videos include titles, with a notable percentage employing rhetorical techniques to enhance appeal. Duration analysis reveals a concentration of videos in the 30-second to 3-minute range, suggesting optimal length for engagement. Presentation form diversity varies, with many videos using 2-3 different media elements. Background music is present in a substantial portion of videos, indicating its recognized importance. Geographic distribution shows representation from both first-tier and non-first-tier cities, while publication frequency demonstrates considerable variation across journals.

4.2.1 Effects of Central and Peripheral Routes on Dissemination Effect

Since the dependent variable (dissemination effect) is continuous, multiple linear regression analysis was used to test influencing effects. Before regression analysis, multicollinearity tests were conducted, with VIF values all far below 10, indicating no collinearity issues. Since explanatory variables such as theme and title are discrete, they were converted to dummy variables before regression analysis. The reference groups were: "other" for theme, "no title" for title, "1 form" for presentation, "over 3 minutes" for duration, "no background music" for music, "low" for source characteristics, "non-first-tier city" for location, "less than 7.08" for monthly publication frequency, and "0 platforms" for other new media platforms.

Regression analysis results for popular science journals' WeChat short video dissemination effect are shown in Table 2 . The results show that the model can well explain the dissemination effect, with central and peripheral routes jointly explaining 84.2% of total variance in dissemination effect. Specifically, in Model 2, compared with the reference group, astronomy and aviation categories show no significant difference in dissemination effect, while medicine and geography categories show extremely significant differences, indicating that different themes significantly affect dissemination effect, thus verifying H1. Data show that medical and geography short videos' dissemination effects are approximately 10.19% and 14.45% higher than the reference group, respectively. Regarding video titles, compared with the reference group, both titles without techniques (β=0.335, p<0.001) and titles with techniques (β=0.452, p<0.001) show significant relationships with dissemination effect, with effects approximately

39.79% and 57.15% higher, respectively, verifying H2. For duration, compared with the reference group, videos under 30 seconds (β=0.016, p>0.05), 30-60 seconds (β=0.011, p>0.05), and 61 seconds-3 minutes (β=0.014, p>0.05) show no significant differences in dissemination effect, failing to verify H3. For presentation form, compared with the reference group, videos with 2 forms (β=0.087, p<0.01), 3 forms (β=0.093, p<0.001), and 4 forms (β=0.137, p<0.001) show significant differences, with effects approximately 9.09%, 9.75%, and 14.68% higher, respectively, verifying H4. Videos with background music (β=0.095, p<0.05) show significant differences from those without, with approximately 9.97% higher effect, verifying H5.

Regarding the peripheral route, both source professionalism (β=0.024, p>0.05) and source credibility (β=0.033, p>0.05) have no significant impact on popular science journals' short video dissemination effect, while source attractiveness (β=0.050, p<0.01) shows significant differences, with approximately 5.13% higher effect than the reference group. Thus, H6 and H7 are not verified, while H8 is verified.

4.2.2 Moderating Effect Analysis

To test the moderating effects of popular science journals' geographical location, average monthly video publication count, and number of other new media platforms on the relationship between antecedent factors and dissemination effect, multiple linear regression analysis was used after collinearity diagnosis. Results are shown in Table 3 .

Table 3 shows that in Model 3, geographical location (β=-0.214, p>0.05) has no significant effect on WeChat short video dissemination effect, with R^2 of 0.077, indicating that location explains only 7.7% of variance. Average monthly video publication count (β=0.058, p<0.05) and other new media platform counts of 1 (β=0.128, p<0.01), 2 (β=0.167, p<0.001), and 3 (β=0.912, p<0.001) all significantly affect dissemination effect, with explanatory power increasing to 21.7% and 63.2% in Models 4 and 5, respectively.

To test H9, H10, and H11, explanatory variables with significant effects on short video dissemination effect (theme, title, etc.) were first included in the model. Hayes' PROCESS macro Model 1 was used to test the moderating effects of geographical location, average monthly video publication count, and other new media platform count. Bias-corrected bootstrapping with 5,000 samples and 95% confidence intervals was applied. Moderating effect test results show that regression coefficients for interaction terms between independent variables and location range from -4.8656 to 3.3096, with all confidence intervals containing 0, indicating that location has no moderating effect in the relationship between antecedent factors and dissemination effect, failing to verify H9. Data show that except for 4 presentation forms, interaction terms between independent variables such as theme and title technique and monthly video count significantly affect dissemination effect, with confidence intervals not containing 0. Therefore,

average monthly video publication count partially moderates the influence of antecedent factors on dissemination effect, partially verifying H10. Interaction terms between independent variables and other new media platform count all significantly affect dissemination effect, with confidence intervals not containing 0, indicating that other new media platform count moderates the influence of antecedent factors on WeChat Channels dissemination effect, verifying H11.

Discussion

5.1 Interpretation of Results

Regression analysis results in Table 2 show that the central route (79.2%) explains more variance in popular science journals' WeChat short video dissemination effect than the peripheral route (5%). This not only empirically confirms the theory' s correctness—that when audiences process information, both routes coexist, with one becoming dominant in certain contexts—but also strongly refutes the view that "in the era of emerging platforms, content value has been greatly diluted and content is no longer king."

5.1.1 Down-to-Earth Science Themes Receive More Attention Regression results in Table 2 show that popular science short videos related to daily life, such as medicine and geography, have better dissemination effects than other categories. This indicates that users pay more attention to and prefer down-to-earth, practical popular science short videos. This differs from other short video categories—for instance, Zhang Yan et al. found that current affairs and economic videos have higher dissemination heat among news short videos, while Huang Yan et al. found that patriotic education and "ghost animal" videos are more popular among university students.

5.1.2 Diverse Presentation Forms Yield Better Results First, compared with no title, having a title and using techniques can effectively improve dissemination effect, consistent with findings in references [15][16]. "A good title is half the battle"—excellent titles can quickly attract users. Second, presentation form diversity significantly positively affects dissemination effect. The investigation found that poorly performing videos mostly use single forms like images or text, while high-performing videos typically comprehensively use animation, PPT, narration, etc. Rich presentation forms not only stimulate user interest but also help them understand popular science content. Third, background music application significantly positively affects dissemination effect. Reasonable and appropriate background music can evoke immersion and emotional resonance, enhance viewing mood, strengthen understanding of popular science content, and increase participation.

5.1.3 Peripheral Path Findings Results show that in the peripheral path, both source professionalism and credibility have no significant impact on dissemination effect. Traditionally, due to the "centralized" nature of science popular-

ization, sources such as scientists, technical workers, and traditional media had unquestionable professionalism and credibility. Social media has empowered ordinary citizens with more voice, lowering the threshold for science popularization in the "decentralized" network context. Science communication is no longer the exclusive domain of scientists; participation by science enthusiasts, writers, and knowledge bloggers has diversified and broadened science popularization subjects. This diversification reduces source credibility and authority, and with popular science information, "pseudo-science" information, and rumors mixed together, users find it difficult to distinguish authenticity. This explains why source professionalism and credibility do not improve dissemination effect. Conversely, source attractiveness significantly positively affects dissemination effect. Attractive sources can impart popular science knowledge through accurate and witty language, appropriate gestures, suspenseful setups, and well-designed experiments, making science no longer dry and obscure, thereby stimulating audience interest, immersion, and resonance.

5.1.4 Diligently Managed Video Accounts Gain More User Trust Regarding popular science journals' WeChat Channels characteristics, geographical location advantages do not bring better dissemination effects. However, both average monthly video publication count and other new media platform count significantly positively affect dissemination effect. Both indicators reflect diligent management and operation.

First, higher average monthly video publication creates a "media as companionship" effect, effectively improving video open rates, cultivating user reading habits, and enhancing fan stickiness. Second, more other new media platforms can drive traffic to WeChat short videos, resulting in better dissemination effect. In the big data era, popular science journals building multi-channel dissemination matrices can not only deeply explore potential audiences but also leverage advantages of various media forms for precise service, thereby enhancing journal brand influence.

5.2 Implications

5.2.1 Science Themes: Deeply Research User Needs and Select Life-Relevant Topics Despite massive online information, users have differential preferences for popular science short video themes based on their needs. Empirical research shows that geography and medicine short videos closely related to daily life have significantly better dissemination effects than other categories. Therefore, popular science journals' WeChat short videos should deeply research user needs and stay close to life. They can publish short videos around issues users care about, hot topics, difficulties, pain points, and controversial issues in daily life, guiding users' lives and becoming important references for audiences to learn science knowledge, master scientific skills, and identify "pseudo-science." For example, *Family Doctor*' s WeChat Channel "China Family Doctor" has columns such as disease signals, food identification, fatal traps, and self-rescue

guides, with all short videos related to healthy living, becoming an important channel for users to obtain health science knowledge. Meanwhile, other popular science journals such as astronomy and aviation can leverage current news events to seamlessly link netizen concerns with science knowledge to increase attention. *China National Astronomy* timely launched a series of short videos using the successful launch of "Tianwen-1" as an opportunity, triggering tens of thousands of likes.

5.2.2 Presentation Form: Carefully Arrange Videos to Enhance Viewing Experience Popular science journals' WeChat short videos should leverage their professional and authoritative advantages in science communication to carefully arrange content, transforming obscure text into understandable and enjoyable short videos.

First, excel at title creation. Users need time and effort to select needed content from massive online information. In the swipe-screen era, attention is extremely fleeting. An excellent short video with a mediocre title may be scrolled past, while a vivid and fascinating title greatly increases click probability. *China Family Doctor*' s short video titled "U.S. 'Poison Gas Explosion' Aftermath: Simply 'Digging One's Own Grave'—Residents'Lips Change Color, Faces Develop Red Spots" received 95,000 likes, 100,000+ forwards, and 5,284 comments. The three-line title not only uses analogy but also employs different fonts, sizes, and colors to attract attention.

Second, in video production, popular science short videos should not be limited to dry theoretical explanations, monotonous text presentation, oral broadcasting, or graphic presentations. They should scientifically and reasonably integrate visual and audio elements such as text, images, audio, video, and animation to transform abstract, dry, and obscure science theories into concrete, 通俗化, and contextualized short videos that are easy for ordinary people to understand and accept, thereby bridging the gap between science and the public. *National Geography*' s short video "Figs Have Not Only Flowers But Also Insects?" comprehensively uses animation, video, and narration to intuitively and vividly explain the process of fig wasps pollinating figs. Through multiple expression methods, it enhances the breadth and depth of science knowledge dissemination, thereby "forming value overflow and diffusion appreciation effects to enhance the power and value of science communication itself."

Third, in post-production editing, adding appropriate background music creates science popularization contexts, giving users immersion and enhancing viewing experience. *China National Geography* understands the magic of music, using majestic, quiet, passionate, or ethereal music that blends seamlessly with geographical landscape visuals, allowing users to accept geographical science knowledge in an aesthetic audio-visual enjoyment.

5.2.3 Communication Subject: Shoulder Science Popularization Responsibility and Introduce Attractive Science Communicators The

diversification of science popularization subjects has diminished source professionalism and credibility. Popular science journals are important subjects in China' s science popularization and play a pivotal role in science communication. Therefore, they should courageously shoulder heavy responsibilities and hold high the banner of science popularization. Research finds that source attractiveness significantly positively affects dissemination effect. Thus, popular science journals' short videos should introduce attractive science communicators who should break away from serious stereotypical images and formal interpretation postures. Their language style and interaction techniques should align with audience aesthetic demands, achieving civilian narrative in science short videos. *National Geography*' s videos typically begin with "Some netizens @mentioned me." When introducing avocados, the expert says: "Of course, this avocado not only resembles butter—it really contains over 15% fat, 'oilier' than eggs and chicken." This lifelike, vivid, and interesting discourse style narrows the distance with netizens. Similarly, *China Family Doctor* communicators often use rhymes, clapper talk, and jingles to popularize self-rescue knowledge, achieving good dissemination effects.

5.2.4 Media Operation: Adapt to Convergence Trends and Build Dissemination Matrix Research shows that geographical location has no significant impact on dissemination effect and no moderating effect in the relationship between antecedent factors and effect. However, both average monthly video publication count and other new media platform count significantly positively affect dissemination effect and have moderating effects in both central and peripheral routes. This 启示 us that popular science journals should adapt to media convergence trends, diligently manage operations, deploy forces on new media platforms, build dissemination matrices, create multi-channel and multi-dimensional science short video marketing systems, occupy the initiative in science popularization, maintain continuous content output, effectively enhance video account activity and visibility through large volumes of high-quality content, and build science popularization brands. Through like and forward functions on short video platforms, they can establish word-of-mouth among users and, with matrix systems and algorithms, precisely target users, deliver brand value, provide valuable science content, and enhance user stickiness to science brands. *China National Geography* has established beachheads on multiple platforms, excels in operation, maximizes the dissemination advantages of text, images, and short videos, radiates to different levels and needs of audiences, and creates mutual platform traffic guidance, building an exceptional geography science brand.

Conclusion

The combination of popular science journals and short videos can not only improve the coverage and penetration of science popularization but also promote deep integration of journal publishing. This study takes 762 short videos published by 22 popular science journals among the 2020 Outstanding Chinese

Popular Science Journals that opened WeChat Channels as objects, uses ELM as the theoretical foundation, conducts in-depth research on influencing factors of WeChat short video dissemination effect, and proposes targeted countermeasures and suggestions to provide references for improving dissemination effect.

Due to space limitations, this study does not present the separate influence of central and peripheral routes on user likes, forwards, and comments. Users' like-forward-comment behavior after watching popular science short videos is a comprehensive and complex process that may be influenced by their perceived usefulness or interestingness. Future research will reveal the influencing mechanism through user surveys. Since WeChat short videos do not provide follower data, this study does not include follower count as a potential variable. Additionally, user age levels and knowledge levels may also affect dissemination effect. Future research will select more comprehensive explanatory variables to make the study more scientific and conclusions more generalizable.

References

[1] Xi Jinping. Strive to Build a World Science and Technology Power—Speech at the National Conference on Science and Technology Innovation, Academician Conference, and Ninth National Congress of the China Association for Science and Technology[M]. Beijing: People' s Publishing House, 2016: 8.

[2] Xi Zhiwu, Li Shanshan, Shen Lu. Exploration of New Forms of Science Popularization and Transformation Paths for Short Video Communication of Science Popularization Journals[J]. Publishing Wide Angle, 2022, 411(9): 11-16.

[3] Yu Miao, Zhao Jinhuan. Current Status and Optimization Paths of Short Video Platform Operations for Science Popularization Journals[J]. Chinese Journal of Scientific and Technical Periodicals, 2023, 34(1): 50-58.

[4] Zhao Xin, Han Ruilin, Li Qi. Paths and Countermeasures for Short Videos to Assist Brand Operations of Science Popularization Journals[J]. Chinese Journal of Scientific and Technical Periodicals, 2022, 33(7): 909-916.

[5] Shen Jianhong. Preliminary Exploration of Short Video Communication for Children' s Science Popularization Journals[J]. Publishing and Distribution Research, 2020(9): 34-40.

[6] Zhang Bo, Chen Wei. Short Video Communication Power and Improvement Strategies of Science Popularization Journals in China[J]. Chinese Journal of Scientific and Technical Periodicals, 2022, 33(7): 892-900.

[7] Li Yang, Ke Ruifeng, Lin Zhi. Analysis of Narrative Optimization Strategies for Publishing Institutions Creating Health Science Popularization Short Videos[J]. Science-Technology & Publication, 2022(6): 83-88.

[8] Chen Weichao, Zhou Yangling. Empirical Study on Influencing Factors of Short Video Communication Effect of Science Popularization Journals on

Douyin—Taking Excellent Chinese Science Popularization Journals as Examples[J]. Chinese Journal of Scientific and Technical Periodicals, 2022, 34(12): 1616-1622.

[9] Petty R E, Cacioppo J T. The Elaboration Likelihood Model of Persuasion[J]. Advances in Experimental Social Psychology, 1986, 19(1): 123-205.

[10] Petty, R E. Two Routes to Persuasion: State of the Art[J]. International Perspectives on Psychological Science, 1994(2): 229-247.

[11] Jin Yan, Yang Kang. Research on Information Quality Evaluation Index System Based on User Experience—Analysis from User Cognitive Needs and Emotional Needs Perspectives[J]. Information Theory and Practice, 2017, 40(2): 97-101.

[12] Wang Chengwei, Ma Liang. How Government Short Videos Can Explode Influence: Content Analysis Based on Government Douyin Accounts[J]. E-Government, 2019, 199(7): 31-40.

[13] Wang Yan. Empirical Study on Influencing Factors of Information Communication Effect of Science Popularization Interactive Videos—Taking Bilibili as an Example[J]. Science Popularization Research, 2022, 17(3): 26-37.

[14] Deng Lüxiang, Shen Huige. Research on Encoding Strategies of Academic Journal Short Videos from the Perspective of Encoding Theory[J]. Chinese Journal of Scientific and Technical Periodicals, 2023, 34(3): 305-314.

[15] Zhang Lan, Chen Xinling. Empirical Study on Influencing Factors of Communication Effect of Social Science Academic Journals' WeChat Official Account Articles—Taking CSSCI Source Journals (2019-2020) as Examples[J]. Chinese Journal of Scientific and Technical Periodicals, 2019, 30(9): 1014-1021.

[16] Li Yongning, Wu Ye, Yang Puyu, et al. Content is King: Research on Knowledge Communication Mechanism of Social Short Video Platforms[J]. News and Writing, 2019(6): 23-32.

[17] Zhang Fang, Yang Ying. Experimental Research on Fragmented Communication Effect of Mobile Government Videos[J]. Press Circles, 2021(1): 46-56.

[18] Liu Z, Liu L, Li H. Determinants of information retweeting in microblogging[J]. Internet Research, 2012, 22(4): 443-466.

[19] Shen Yuxiao, Ji Xuemei, Wang Fang. Research on the Influence of Entertainment-oriented Content of Government Short Videos on Users' Information Adoption Effect[J]. Modern Information, 2019, 43(7): 85-95.

[20] Yu Juncheng, Li Qiushi, Hu Min, et al. Influence Mechanism of Background Music Types on College Students' Reading Effect: Evidence from Eye Tracking[J]. Library and Information Service, 2023, 67(15): 67-79.

[21] Ohanian R. Construction and Validation of a Scale to Measure Celebrity Endorsers' Perceived Expertise, Trustworthiness, and Attractiveness[J]. Journal

of Advertising, 1990, 19(3): 39-52.

[22] Lai Shengqiang. Research on Factors Influencing Users' Weibo Information Forwarding Behavior[J]. Library Work and Study, 2015, 234(8): 31-37.

[23] Xu Xiaojuan, Zhao Zerui, Wu Manli, et al. Research on Influencing Factors of Intangible Cultural Heritage Information Search Behavior on Short Video Platforms—Based on Hierarchical Regression and Fuzzy-set Qualitative Comparative Methods[J]. Modern Information, 2022, 42(11): 121-134.

[24] Hovland C I, Weiss W. The Influence of Source Credibility on Communication Effectiveness[J]. The Public Opinion Quarterly, 1951, 15(4): 635-650.

[25] Kelman H C, Hovland C I. Reinstatement of the communicator in delayed measurement of opinion change[J]. Journal of Abnormal and Social Psychology, 1953(48): 327-335.

[26] Erkan I, Evans C. The Influence of eWOM in Social Media on Consumers' Purchase Intention: An Extended Approach to Information Adoption[J]. Computers in Human Behavior, 2016(61): 47-55.

[27] Li Yujie. Source, Channel, Content—Research on Chinese Public Climate Communication Strategy Based on Survey[J]. International Press, 2013(8): 67-83.

[28] McGuire W J. Attitudes and Attitude Change[J]. The Handbook of Social Psychology, 1985(2): 233-346.

[29] Patzer G L. Source Credibility as a Function of Communicator Physical Attractiveness[J]. Journal of Business Research, 1983, 11(2): 229-241.

[30] Liu Fengjun, Meng Lu, Chen Siyun, et al. Research on the Influence and Mechanism of Internet Celebrity Live Streaming on Consumers' Purchase Intention[J]. Journal of Management, 2020, 17(1): 94-104.

[31] Zhang Lan, Chen Xinling. The Success of Science Communication on Social Media—Taking Guokr WeChat Official Account as an Example[J]. Youth Journalist, 2019(18): 68-69.

[32] Hu Bing, Feng Caijun. Influencing Factors of Science Popularization Short Video Communication Effect from a Cognitive Perspective[J]. Studies in Science of Science, 2023, 41(10): 1789-1798.

[33] Hayes A. Introduction to Mediation, Moderation, and Conditional Process Analysis[J]. Journal of Educational Measurement, 2013, 51(3): 335-337.

[34] Guo Quanzhong. Clearly Oppose "Content is King" [J]. Media, 2015, 4(Upper): 22-23.

[35] Zhang Yan, Wei Xinyi, Yin Yan. Exploration of Content and Influencing Factors of Communication Heat of "Xinwen Lianbo" Kuaishou Short Videos[J]. TV Research, 2020(8): 73-76.

[36] Huang Yan, Wang Xiaoyu. Empirical Study on Influencing Factors of Short Video Communication Effect of University Communist Youth League on Douyin —Based on Content Analysis of 100 University Communist Youth League Douyin Accounts[J]. China Youth Social Science, 2022, 41(2): 43-55.

[37] Wang Guoyan, Tang Shukun. Image Communication Paradigm of Frontier Scientific Achievements[J]. Journal of University of Science and Technology of China, 2014, 44(9): 785-792.

[38] Pan Ximing. Analysis of Narrative Differences Between Contemporary Chinese Science Popularization TV Programs and Science Popularization Short Videos[J]. Journal of Jiangxi Normal University (Philosophy and Social Sciences Edition), 2020, 53(5): 96-103.

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