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Original Paper

Cross-Platform Content Operation of Children's Science Popularization Journals: Characteristics and Optimization Strategies Based on Social Network Analysis

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Abstract

Against the backdrop of the National Action for Scientific Literacy of the People and the advancement of media convergence strategies, cross-platform operation serves as a vital avenue for children's science popularization journals to overcome transformation bottlenecks and improve the effectiveness of science communication. Adopting social network analysis, this study selects 20 children's popular science journals and 7 new media platforms to construct a journal-platform bipartite matrix. It examines the network characteristics and content synergy logic of cross-platform operation from three dimensions: core-periphery structure, centrality, and correspondence analysis. The results reveal a distinct core-periphery pattern in the network. Many journals suffer from weak intermediary capacity, unsystematic and undifferentiated platform deployment, insufficient operational depth, and low content adaptability. Accordingly, optimization strategies are proposed: implementing differentiated platform layout and establishing a hierarchical operation system, achieving precise content-platform matching, building cross-platform traffic interaction mechanisms, and strengthening journals' operational capacity. This research provides references for children's science popularization journals to develop a synergistic operation system with complementary functions across multiple platforms.

Keywords

Children's science popularization journals, cross-platform operation, social network analysis, media affordance

1. Introduction

The improvement of adolescents' scientific literacy is tied to the country's future scientific and technological competitiveness and the cultivation of innovative talents. Against the backdrop of the growing prevalence of digital reading, children's science popularization journals, an important platform for traditional science education, are confronted with the stark reality of fragmented reading habits and scarce attention resources among readers. At present, new media platforms represented by Douyin and Bilibili have rapidly occupied the fragmented time of children and adolescents by virtue of vivid and intuitive presentation, precise algorithmic recommendation and fragmented communication, emerging as a new frontier for science popularization communication.

Science popularization journals serve as reading materials for informal public science education and act as carriers for disseminating scientific knowledge in a popularized form. As a segmented category of science popularization journals, children's science popularization journals target children and adolescents as their core readership and constitute serial popular journals for minors. Their overall design is adapted to the physiological characteristics and reading psychology of children and adolescents. As an effective medium for popularizing scientific knowledge and disseminating scientific ideas among young people, children's science popularization journals undertake the vital mission of stimulating scientific interest and shaping scientific thinking. They help nurture young people with potential to become scientists and consolidate the talent foundation for accelerating the development of a powerful country in science and technology.

With the continuous implementation of the National Action for Scientific Literacy of the People and the further advancement of the national media integration strategy, children's science popularization publishing is facing unprecedented transformation opportunities and challenges. In this context, targeted cross-platform content operation has become an inevitable choice for children's science popularization journals to break through development bottlenecks. Currently, some children's science popularization journals have begun to build multi-platform matrices covering WeChat Public Platform, Douyin, Bilibili and Xiaohongshu, seeking to achieve complementary advantages between the "in-depth content" of print media and the "traffic" of new media. Nevertheless, numerous difficulties persist in practice. First, content adaptability is inadequate: most operations involve simple reposting across platforms without developing differentiated content tailored to the communication logic and user demands of individual platforms. Second, coordinated mechanisms are absent, and the in-depth content of print media fails to form effective linkage with the traffic-oriented content of new media. Therefore, breaking the industrial barriers between print and new media and exploring cross-platform content operation strategies based on the in-depth integration of content attributes has become a key issue for the children's science popularization publishing industry to improve communication efficiency and achieve sustainable development in the era of integrated publishing. Focusing on the cross-platform content operation practices of children's science popularization journals, this study adopts the social

network analysis method. It aims to clarify the cross-platform layout characteristics of such journals, explore the interaction between journals and platforms as well as the logic of content coordination, and establish an operation system featuring coordination between in-depth content and traffic content and complementary functions of multiple platforms through rigorous quantitative analysis. This research intends to provide references for children's science popularization journals to address industrial transformation dilemmas and enhance the communication effectiveness of science popularization.

2. Literature Review

2.1 Research on the Transformation of Children's Science Popularization Journals amid Media Changes

With the rapid iteration of digital technologies and the profound restructuring of the media ecosystem, integrated development has become an inevitable requirement for children's science popularization journals to break traditional boundaries and adapt to the development of the times. Long Sicheng (2024) argues that traditional children's science popularization journals possess inherent strengths in content authority and systematic knowledge delivery. Nevertheless, alongside the advancement of digital technologies and transformations in the media ecosystem, their inherent limitations have gradually emerged: the communication mode is dominated by one-way output with relatively slow dissemination; the long content production cycle makes it difficult to meet the demands of real-time communication; and real-time interaction and effective feedback mechanisms with readers are insufficient. Tao Na (2025) proposes that short videos, as an emerging interactive medium in the digital era, are characterized by fast dissemination, strong visuality, favorable interactivity and a broad audience base. Their vivid and intuitive expressions demonstrate unique advantages in the field of science popularization and offer a new direction for the transformation of children's science popularization journals. Liao Jianrong and Zhu Xiaohuan (2022) identify that the primary factors affecting the integrated development of children's science popularization journals and short videos include technical support, user demands and communication effects. They put forward countermeasures to facilitate integrated development, such as formulating scientific and rational development plans for converged media, adhering to the principle of "content is king", and leveraging the communication and value-added advantages of short videos.

2.2 Research on Cross-platform Content Operation of Publications

International academia also attaches great importance to the impacts of digital media on children's publications. Dresang (1999) points out that digital media acts as a catalyst in children's book publishing. It not only drives dramatic changes in picture-text layout, narrative presentation and meaning construction of children's books, but also profoundly reshapes the interaction between young readers and books. Kânoğlu (2018) further states that the transition from print media to electronic media gives rise to the reconstruction of narratives. Taking the online children's magazine of the

Turkish Radio and Television Corporation as a case, this scholar explores the reconstruction paths and production logic of child-oriented narratives within the digital media context.

In the new media era, cross-media and cross-platform content production has become a crucial approach for traditional publications to enhance competitiveness. Yu Yana (2024) emphasizes that the publishing industry should build a cross-media and cross-platform content ecosystem. By realizing multi-form, multi-channel, three-dimensional and diversified content communication, publishers can expand content coverage and influence. From the perspective of new media, Guo Xin (2024) suggests that traditional publishing can carry out communication activities via diverse distribution channels. Content forms and presentation modes should be adjusted according to the attributes of different channels and platforms to improve the communicability and appeal of content. Focusing on the cross-platform operation of children's publications, Zhang Lei (2025) summarizes the features of the new media environment as the immediacy and universality of information dissemination, interactivity and participation, personalization and customization, as well as multimedia and cross-platform integration. He contends that developing cross-platform communication strategies enables children's periodicals to extend their communication boundaries and improve content visibility and communication outcomes. Xie Ling (2022) notes that most children's periodicals have made fruitful attempts at media convergence by expanding communication channels such as official websites, Weibo accounts and WeChat Official Accounts. Among these channels, WeChat Official Accounts have attracted growing attention and become a priority in channel deployment. Yang Yuxin (2025) indicates that in the converged media era, the integration of children's science popularization journals is plagued by problems including weak linkage among various platforms, insufficient expansion of new media marketing channels, and the absence of effective reader interaction mechanisms. Liu Shengsheng et al. (2023) hold that to pursue inheritance and innovation, children's science popularization journals should make full use of new media technologies. Relying on print journals, they need to explore and deploy new media, emerging technologies and new platforms to construct a three-dimensional communication matrix integrating offline print periodicals and online internet platforms.

Existing studies have yielded abundant findings on the transformation of children's science popularization journals and cross-platform operation of publications, laying a solid foundation for this research. However, there remains room for further exploration. Current research on the cross-platform operation of children's science popularization journals mostly adopts qualitative analysis, such as macro-level development suggestions or case studies of individual journals, while systematic research based on quantitative methods is scarce. Although several studies mention the construction of media matrices and platform synergy, they fail to reveal the characteristics of interactive relationships between journals and platforms from the perspective of network structure. Moreover, prior research cannot precisely quantify the positioning of journals within the cross-platform ecosystem, the correlation strength between platforms, and the effectiveness of synergy mechanisms. Accordingly, this

study comprehensively adopts quantitative social network research methods in line with its research theme to quantitatively analyze the overall layout characteristics of journals and platforms from a network-structure perspective. It is expected to provide references for children's science popularization journals to optimize cross-platform layout, refine content synergy models and improve the efficiency of science popularization communication.

3. Research Design

3.1 Sample Selection and Data Collection

3.1.1 Samples of Children's Science Popularization Journals

In selecting samples of children's science popularization journals, this study first refers to the recommended list of Outstanding Science Popularization Journals and Excellent Science Popularization Columns of Journals issued by the National Press and Publication Administration in 2023, and screens out science popularization journals targeting children and adolescents. To balance the market recognition and popularity among audiences, this study consults the sales ranking of children's science popularization journals on the professional magazine subscription website Zazhipu, as well as the popularity ranking of the Children's Science Popularization category on Zazhi Zhijia. Finally, 20 children's science popularization journals are selected as research samples: *Knowledge is Power*, *We Love Science*, *Juvenile Science Pictorial*, *Hundred Thousand Whys*, *Xiao Ge Bai Ni*, *Aerospace Knowledge Youth*, *Huanqiu Tansuo*, *Open Class Magazines*, *Little Edison*, *Haoqihao*, *How It Works*, *Science Illustrated*, *Storytime*, *Highlights*, *Nature History*, *Around World Kids*, *Popular Science*, *Science Weekly for Children*, *Front Vision*, and *Daylight Science for Kids*.

3.1.2 Samples of Communication Platforms

Seven communication platforms are selected for this study: WeChat Public Platform, Weibo, Xiaohongshu, Zhihu, Bilibili, WeChat Channels and Douyin. These platforms feature obvious differentiation: relying on social ties and strong-tie connections, WeChat Public Platform is suitable for in-depth content archiving and private-domain user operation; Weibo serves as a public opinion arena with strong potential for viral topics, facilitating the expansion of brand influence; Xiaohongshu is well known for graphic recommendations and lifestyle sharing, which fits parent-child education scenarios. As a knowledge Q&A community, Zhihu gathers highly educated parents and supports the dissemination of in-depth science popularization content. Characterized by medium-and-long videos and bullet-screen culture, Bilibili is an important gathering place for adolescent science interest communities. Backed by the WeChat ecosystem, WeChat Channels benefits from dual driving forces of social recommendation and algorithmic recommendation. Centered on short-video algorithmic distribution, Douyin reaches the largest group of child and adolescent users. These seven platforms basically cover the main venues for the current cross-platform operation of children's science popularization journals and conform to the real practice of their cross-platform science popularization

operation.

3.1.3 Period and Criteria for Data Collection

To quantify the ties in the bipartite "journal-platform" network, this study adopts a binary coding scheme with the following judgment criteria for ties: if a Children's Science Popularization Journal runs an official account on a given communication platform and maintains steady content updates within the statistical period, a tie is coded as **1** in the adjacency matrix; if the journal has no official account on the platform, or the account exists but has been inactive for a long time, no tie is identified and coded as **0**. The data collection period spans from November 2025 to May 2026. A combination of platform retrieval and manual verification is adopted to check the presence and activity status of the 20 sampled journals across the seven platforms one by one.

3.2 Construction of the Bipartite "Journal-Platform" Tie Matrix

Based on the aforementioned data collection criteria, this study constructs a binary "journal-platform" tie matrix. The 20 children's science popularization journals are set as row variables and the seven new media platforms as column variables, with each matrix element taking a value of either 0 or 1. The constructed matrix is presented in Table 1.

Table 1. Bipartite Tie Matrix for Cross-platform Operation of Children's Science Popularization Journals

Journal Name	WeChat Public Platform	Weibo	Xiaohongshu	Zhihu	Bilibili	WeChat Channels	Douyin
Knowledge is Power	1	1	0	0	0	1	1
We Love Science	1	0	0	0	0	1	0
Juvenile Science Pictorial	1	1	1	0	1	1	1
Hundred Thousand Whys	1	0	0	0	1	1	1
Xiao Ge Bai Ni	1	0	1	0	0	0	1
Aerospace Knowledge Youth	1	1	1	1	1	1	0
Huanqiu Tansuo	1	0	0	0	0	0	0
Open Class Magazines	1	0	1	0	0	0	0
Little Edison	1	0	1	0	0	1	0
Haoqihao	1	1	1	0	0	1	0
How It Works	1	1	1	1	1	1	1
Science Illustrated	1	0	1	0	0	1	1
Storytime	1	0	1	0	0	1	0
Highlights	1	0	1	0	0	0	0

Nature History	1	1	1	1	1	1	1
Around World Kids	1	1	1	0	0	1	0
Popular Science	1	0	0	0	0	0	0
Science Weekly for Children	1	0	0	0	0	1	1
Front Vision	1	0	1	0	0	0	0
Daylight Science for Kids	1	0	0	0	0	0	0

Note. A value of "1" in the matrix indicates that the journal has launched an official account on the corresponding platform and maintains active updates. "0" means the journal has no presence on the platform or its account has been inactive for a long time.

4. Empirical Analysis

The constructed bipartite "journal-platform" tie matrix is imported into UCINET, and NetDraw is adopted for visualization. Multidimensional scaling (MDS) is used to map the network graph of journals and platforms. In the network graph, nodes stand for journals or platforms, and edges represent the ties between them. The spatial distance between nodes indicates the similarity of their platform layout strategies. As shown in Figure 1, the overall network exhibits an obvious hierarchical structure. Some journals cluster in the central area of the network and form dense connections with multiple platforms; others are scattered in the peripheral region and only establish weak ties with a small number of platforms.

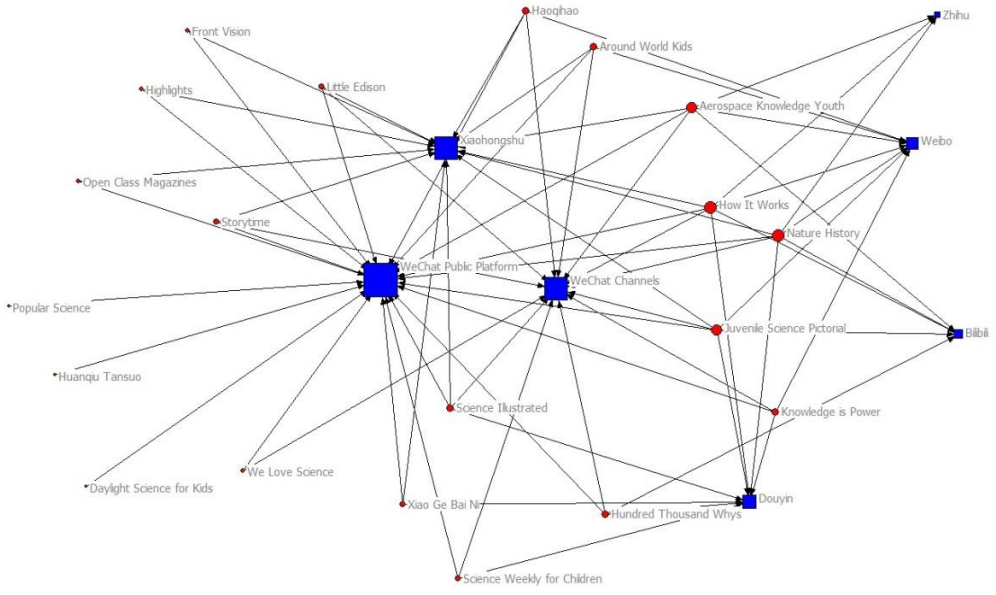


Figure 1. Network Structure Diagram of Cross-platform Operation of Children's Science Popularization Journals

4.1 Core-Periphery Structure Analysis

UCINET is employed to calculate the parameters related to the core-periphery structure of the bipartite social network. The results show that the final fitness of the core-periphery analysis is 0.889, indicating that the bipartite "journal-platform" social network conforms to an ideal core-periphery structure. Specifically, the core-core density of this bipartite network is 0.867, which suggests tight connections between journals and platforms within the core region. Most core journals have deployed their accounts on the majority of core platforms, forming a stable cross-platform communication matrix with wide coverage. The density of ties between core journals and peripheral platforms is 0.548, demonstrating that journals occupying the core positions have acquired certain capabilities for channel expansion. While consolidating their presence on core platforms, they have also established interactive ties with peripheral platforms. The density of ties between peripheral journals and core platforms is 0.630, which reveals that journals in peripheral positions mainly rely on a small number of core platforms for content dissemination. Their channel layout is relatively homogeneous, and they lack the capacity for multi-platform collaboration.

Table 2. Density Matrix of Core-Periphery Structure

	1	2
1	0.867	0.548
2	0.630	0.000

Note. "1" denotes the core block. "2" denotes the periphery block.

Three core platforms and eleven core journals are identified in the core region. The three core platforms are WeChat Public Platform, Xiaohongshu and WeChat Channels. The eleven core journals account for 55% of all journal samples.

4.2 Centrality Quantitative Analysis

Centrality serves as a core indicator in social network analysis for measuring the significance of nodes within a network. From three dimensions of the bipartite network, namely degree centrality, closeness centrality and betweenness centrality, this study conducts quantitative analysis on the 20 children's science popularization journals and seven communication platforms respectively, so as to reveal the positional characteristics and functional differences of each node in the cross-platform operation network.

4.2.1 Degree Centrality Analysis

Degree centrality is one of the most intuitive centrality measurements. It quantifies the number of direct ties possessed by an actor and reflects the activity level, influence and importance of a node in the social network. Within a social network, an actor that maintains direct connections with other actors

occupies a central position and holds greater "power" in the network. A higher degree centrality indicates that the node is more centrally located in the social network.

In the bipartite "journal-platform" network of this study, for journals, a higher degree centrality means the journal has settled on more platforms and built a broader all-media layout. As shown in Table 3, among the 20 sampled journals, *How It Works* and *Nature History* achieve a degree centrality of 1.000, which indicates that these two journals have covered all seven platforms and possess the most comprehensive cross-platform communication layout compared with other journals. *Juvenile Science Pictorial* and *Aerospace Knowledge Youth* have a degree centrality of 0.857, suggesting that they remain active on most investigated platforms, maintain an extensive new media layout, and enjoy strong content distribution capacity. In addition, *Knowledge is Power*, *Hundred Thousand Whys*, *Haoqihao*, *Science Illustrated* and *Around World Kids* record a degree centrality of 0.571. This demonstrates that these journals have deployed science popularization content on various new media platforms, yet their overall layout is not extensive. Several journals register a degree centrality of merely 0.143, showing that they are present on only a small number of new media platforms and perform poorly in cross-platform operation.

For platforms, by contrast, a higher degree centrality represents that more journals have settled on the platform, and the platform plays a more important role in the science popularization communication ecosystem. According to the data in the table, WeChat Public Platform obtains the highest degree centrality of 1.000. All sampled journals in this study have launched official accounts on it, demonstrating that WeChat Public Platform occupies a core position in the current science popularization communication for children and adolescents and acts as the primary venue for children's science popularization journals to carry out science popularization dissemination. Xiaohongshu and WeChat Channels have a degree centrality of 0.650, forming key content distribution channels for graphic and video content respectively. By comparison, Zhihu has the lowest degree centrality. Only a tiny fraction of children's science popularization journals maintain active official accounts and publish content on Zhihu.

Table 3. Centrality Measurement Results of Children's Science Popularization Journals

Journal Name	Degree	Closeness	Betweenness
Knowledge is Power	0.571	0.882	0.014
We Love Science	0.286	0.818	0.002
Juvenile Science Pictorial	0.857	0.957	0.038
Hundred Thousand Whys	0.571	0.882	0.017
Xiao Ge Bai Ni	0.429	0.849	0.008

Aerospace Knowledge Youth	0.857	0.957	0.050
Huanqiu Tansuo	0.143	0.789	0.000
Open Class Magazines	0.286	0.818	0.002
Little Edison	0.429	0.849	0.005
Haoqihao	0.571	0.882	0.013
How It Works	1.000	1.000	0.066
Science Illustrated	0.571	0.882	0.012
Storytime	0.429	0.849	0.005
Highlights	0.286	0.818	0.002
Nature History	1.000	1.000	0.066
Around world kids	0.571	0.882	0.013
Popular Science	0.143	0.789	0.000
Science Weekly for Children	0.429	0.849	0.007
Front Vision	0.286	0.818	0.002
Daylight Science for Kids	0.143	0.789	0.000

Table 4. Centrality Measurement Results of Communication Platforms

Platform Name	Degree	Closeness	Betweenness
WeChat Public Platform	1.000	1.000	0.490
Weibo	0.350	0.552	0.023
Xiaohongshu	0.650	0.696	0.135
Zhihu	0.150	0.485	0.002
Bilibili	0.250	0.516	0.009
WeChat Channels	0.650	0.696	0.121
Douyin	0.400	0.571	0.039

4.2.2 Closeness Centrality Analysis

Closeness centrality measures the extent to which an actor in a social network is connected to others and reflects the degree to which the actor is free from the control of other actors. A higher closeness centrality of a node means that the node is closer to other nodes, and information dissemination faces fewer obstacles, and vice versa. *How It Works* and *Nature History* have the highest closeness centrality of 1.000, featuring the shortest propagation paths and the fastest information reach within the network.

Juvenile Science Pictorial and *Aerospace Knowledge Youth* achieve comparable communication efficiency and also function as highly efficient communication nodes. *Huanqiu Tansuo, Popular Science* and *Daylight Science for Kids.* Show relatively weak communication efficiency, yet their values still reach 0.789, indicating that the overall communication efficiency of the sampled journals remains relatively high. Among the seven selected new media platforms, WeChat Public Platform has the highest closeness centrality of 1.000, which means it owns the shortest propagation path and the highest communication efficiency in the network and is thus indispensable in the science popularization communication chain. Xiaohongshu and WeChat Channels are less efficient than WeChat Public Platform but outperform the rest of the platforms.

4.2.3 Betweenness Centrality Analysis

Betweenness centrality measures the degree to which an actor controls resources. In a social network, if an actor lies on the paths between numerous pairs of other actors, this actor is considered capable of controlling the interactions between those actors. The more such structural positions an actor occupies in the network, the more actors have to rely on it to establish connections, which corresponds to a high level of betweenness centrality. The distribution of betweenness centrality values for journals is highly consistent with that of degree centrality. *How It Works* and *Nature History* register the highest betweenness centrality (0.066). It suggests that journals with full-platform layout not only enjoy broad coverage, but also act as content transfer stations in cross-platform communication. In other words, they can adapt and transform in-depth content such as print articles and long texts into traffic-oriented content including short videos and graphic posts, so as to realize resource exchange across different platforms.

As can be seen from the table data, on the platform side, WeChat Public Platform has a markedly higher betweenness centrality than other platforms (0.490). It serves as a core hub within the cross-platform communication network of children's science popularization journals. As a critical node connecting different journals and user groups across platforms, it undertakes the key function of traffic diversion in cross-platform content dissemination. Xiaohongshu ranks second with a betweenness centrality of 0.135, followed by WeChat Channels. These two platforms act as important auxiliary bridges for science popularization content dissemination. By contrast, Zhihu and Bilibili exhibit distinctly lower betweenness centrality.

4.3 Correspondence Analysis

Correspondence analysis is a multivariate measurement method developed on the basis of factor analysis. It identifies the relationships between two categories of a bipartite network mainly through the frequency distribution of two-way contingency tables. The foundation of correspondence analysis is to convert chi-square values into measurable distances: the smaller the distance, the closer the two categories are plotted on the map.

UCINET is adopted to conduct correspondence analysis on the association structure between children's science popularization journals and platforms in the sample. The results show that the correspondence analysis yields six dimensions in total. The first factor accounts for 26.2% of the variance, and the cumulative explanatory power of the first three factors reaches 73.8%, which demonstrates strong explanatory capacity. The two-dimensional scatter plot visually presents the association distribution of journals and platforms. A shorter distance between points signifies a stronger association between them. That is to say, journals located closer to one another on the plot share more similar platform layout strategies.

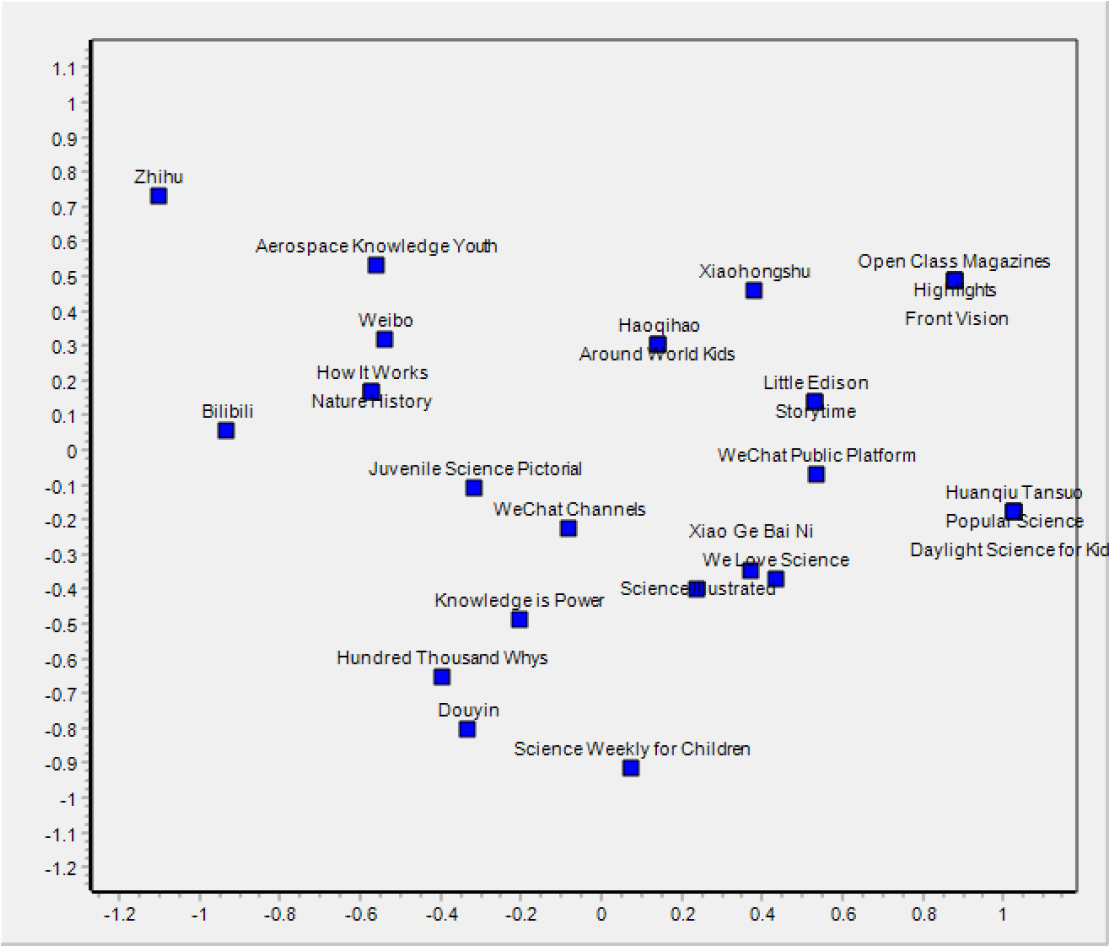


Figure 2. Correspondence Analysis Scatter Plot of Children's Science Popularization Journals and Communication Platforms

As shown in Figure 2, journals represented by *Huanqiu Tansuo*, *Popular Science*, *Daylight Science for Kids* and *Highlights* cluster at the extreme right side of the plot. Spatially, they are far away from in-depth content platforms such as Zhihu and Bilibili, as well as short-video platforms including Douyin, and lie only close to WeChat Public Platform or Xiaohongshu. This indicates that the new

media content operation of these journals is highly dependent on a single platform. They lack the capacity for multi-platform collaboration and achieve low cross-platform communication efficiency. By contrast, journals such as *How It Works*, *Nature History* and *Aerospace Knowledge Youth* are located in the central area of the plot and maintain short spatial distances from multiple platforms, which demonstrates the balance and synergy of their cross-platform layout.

5. Conclusion and Discussion

5.1 Characterization of Journals' Content Operation Problems Based on Network Structural Features

5.1.1 Remarkable Discontinuity in Journals' Brokerage Capacity Restricting the Exchange between In-depth and Traffic-oriented Content

Journals including *How It Works* and *Nature History* obtain a betweenness centrality of 0.066, occupying absolute core positions in the network with full-platform coverage capacity and content brokerage functions. By contrast, most journals register far lower values, presenting an obvious numerical gap. The vast majority of journals fail to occupy critical paths connecting other nodes in the network and lack the function of content brokers. Hence, they struggle to convert science popularization content between in-depth and traffic-oriented forms in accordance with platform characteristics and user preferences. Specifically, journals with high betweenness centrality can adapt in-depth print content into traffic-oriented content such as short videos and graphic posts to realize resource exchange across different platforms. Journals with low betweenness centrality, however, can only release homogeneous content on a single platform or a small number of platforms. They cannot form cross-platform content circulation and audience migration. Consequently, in-depth content can hardly reach traffic platforms, and traffic content fails to be converted into sustained in-depth reading.

5.1.2 Lack of Systematic and Differentiated Platform Layout and Absence of Traffic Diversion Mechanisms

The overall density of the cross-platform operation network of children's science popularization journals is 0.493. This indicates that the overall cross-platform layout of children's science popularization journals remains sparse, and the network demonstrates a distinct core-periphery structure. WeChat Public Platform, Xiaohongshu and WeChat Channels constitute the core platform cluster, while journal nodes show striking disparities in centrality. The channel matrix of journals presents clear core-periphery differentiation, and cross-platform operation manifests the Matthew Effect. Leading journals seize core ecological niches, whereas peripheral journals are characterized by highly homogeneous layout. They rely heavily on core platforms and underinvest in vertical platforms with great potential for in-depth science popularization such as Bilibili and Zhihu. Between-platform betweenness centrality varies sharply. Only WeChat Public Platform serves as an effective bridge for traffic diversion, while other platforms have limited capacity for cross-platform connection. Most science popularization journals attach QR codes of Xiaohongshu, WeChat Channels and other platform

accounts to posts on WeChat Public Platform to guide users to access event information or watch live streams, yet effective diversion methods are generally absent on other platforms. Such a structure makes it difficult for journals to build a closed-loop operation system of "public domain traffic acquisition + private domain retention".

5.1.3 Insufficient Operation Depth, Inactive Accounts and Marketing Bias

New media accounts of some journals lack substantive operation. The survey reveals that although several journals have launched official accounts on self-media platforms, their content updates are extremely infrequent or have been suspended for a long time; some accounts have not released new content for years. These inactive new media accounts fail to sustain platform engagement, rendering the corresponding nodes dysfunctional in actual communication. Moreover, some new media accounts merely function as online promotion and subscription channels for printed magazines. Instead of leveraging the affordances of new media platforms to actively disseminate science popularization content, such accounts render the nodal function of journals on new media platforms nominal and fail to realize the value of cross-platform communication.

5.1.4 Inadequate Content Adaptation and Absence of Differentiated Cross-platform Operation

At present, the cross-platform content operation of most children's science popularization journals is still confined to simple content reposting. They fail to recreate and adapt content according to the media affordances of different platforms. WeChat Public Platform is suitable for long articles and in-depth interpretation, but some journals only use it to release brief previews of print issues or information about research and study activities. Video platforms such as Douyin and Bilibili require rich media formats including short videos and animations. Nevertheless, most journals lack professional video production teams and content adaptation capabilities. Their released videos are merely graphics overlaid with AI-generated voice, lacking visual appeal and interesting elements. Even on Bilibili, a platform featured by medium-and-long videos, some journals mechanically repost short videos originally produced for WeChat Channels or Douyin. The lack of adaptation prevents journals from fully unlocking the communication potential of each platform and meeting the diverse information demands of users on different platforms.

5.2 Optimization Strategies for Cross-platform Content Operation of Children's Science Popularization Journals

5.2.1 Implement Differentiated Platform Layout and Build a Hierarchical Operation System

Cross-platform content operation is an emerging operation model developed under the context of media convergence. It refers to an integrated workflow of content production, distribution and user management, in which operators integrate multiple communication carriers including print media, new media and social platforms. In practical operation, content differentiation acts as the core principle of cross-platform operation. Operators need to recreate, adapt and restructure original content based on platform attributes to achieve high compatibility among content forms, styles and communication

channels. Differentiated layout strategies should be adopted for children's science popularization journals at different development stages. Leading journals such as *How It Works* and *Nature History* should consolidate their advantages in full-platform deployment, strengthen the content brokerage function, and explore a three-stage conversion path: "in-depth print content — new media traffic content — retained private-domain content". Peripheral journals, by contrast, should avoid homogeneous layout by blindly following the trend of settling on WeChat Public Platform or Xiaohongshu. Instead, they should adopt a vertical intensive strategy based on their own science popularization positioning, prioritize deployment on vertical platforms with in-depth science popularization potential such as Bilibili and Zhihu, and cultivate differentiated competitive advantages through distinctive vertical content.

5.2.2 Leverage Divergent Platform Affordances to Achieve Precise Content Adaptation

According to the theory of media affordances, platforms differ significantly in technical features and user ecosystems. Journals should activate corresponding affordances tailored to each platform. On WeChat Public Platform, the strength of in-depth graphic reading should be exerted by launching serialized, themed long science popularization articles and interactive Q&A sessions to facilitate private-domain user retention. For instance, *Nature History* publishes long graphic articles combined with trending social topics on its official WeChat Public Platform and sets up voting interactions in posts to communicate with readers. On short-video platforms including Douyin and WeChat Channels, rich media content such as animated science clips, experimental demonstrations and scientist interviews should be developed to fit fragmented viewing habits. As an example, *Science Weekly for Children* releases the *Three-Minute Home Experiments* series on WeChat Channels and hosts Q&A sessions with readers, which effectively boosts adolescent engagement. The official Bilibili account of *Aerospace Knowledge Youth*, namely Aerospace Knowledge Magazine, releases elaborately produced series such as *China's Civil Aircraft: From Vision to the Blue Sky*, with detailed science narration. On Xiaohongshu, operators can focus on parent-child education scenarios and launch integrated "science popularization + parenting" content to activate social affordances.

5.2.3 Establish Traffic Diversion Mechanisms and Form Integrated Cross-platform Collaborative Links

To address the lack of traffic diversion mechanisms across content platforms for children's science popularization journals, journals should build a cross-platform content collaboration and traffic diversion system. First, WeChat Public Platform can serve as the core hub. Via menu bar links and embedded QR codes in articles, operators can continuously guide children and adolescent science popularization audiences from public-domain platforms such as Douyin, Xiaohongshu and Weibo to private-domain spaces including WeChat Public Platform and WeChat groups for user retention. Furthermore, cross-platform content linkage mechanisms can be established to realize traffic guidance through differentiated content forms. For example, short preview clips can be released on Douyin to redirect audiences to WeChat Public Platform for full-length in-depth graphic articles. When releasing

serialized science popularization videos on Bilibili, journals can synchronously publish eye-catching graphic notes on Xiaohongshu to form a communication matrix effect through complementary content.

5.2.4 Enhance Operational Capacity to Resolve Inactive and Overly Commercialized Accounts

To tackle inactive operation and excessive marketing bias existing in the new media accounts of children's science popularization journals, journals can improve operational capacity from the perspectives of organizational structure, talent teams and content production mechanisms. First, dedicated new media operation teams should be set up with assigned persons in charge for each platform. Assessment criteria for update frequency and content quality should be formulated to avoid long-term suspension and guarantee stable and sustainable operation of all platform accounts. Second, operation concepts need to be transformed. New media platforms should be positioned as venues for science popularization communication rather than auxiliary marketing channels for printed magazines. Original content production should be carried out in line with platform characteristics instead of simple reposting of magazine content, so as to strengthen the science popularization function of new media platforms.

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