Research on the Formulation of Data Policies for China's Scientific Journals

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Abstract

Objective: To propose a hierarchical template for associated data deposit and sharing policies applicable to Chinese scientific journals, providing references for basic elements, structural frameworks, and main contents for the formulation of data policies for Chinese scientific journals. Methods: Through literature research, empirical research, and other approaches, to analyze China's scientific data management normative system, review and synthesize international publishers' journal data policies, international organizations' framework recommendations for journal data policies, China's scientific data management system, and other related contents, and analyze the basic elements of data policies for Chinese scientific journals. Results: Based on the aforementioned research and analysis, to propose a universal hierarchical template for scientific journal data policies that can be freely combined and customized according to the actual needs of individual journals, providing references for different journals in formulating their data policies. Conclusion: Currently, 44 journals have adopted this template, helping some scientific journals complete the transformation of data policies from "none to existence", which is beneficial for the open sharing and long-term storage of data associated with research papers.

Full Text

Research on Data Policy Formulation for Science and Technology Journals in China

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Abstract

[**Purpose**] This study proposes a graded template for data deposit and sharing policies applicable to paper-related data in China's science and technology journals, providing reference for the basic elements, structural framework, and main content of journal data policy formulation. [**Methods**] Through literature review, empirical research, and other approaches, we analyze China's scientific data management normative system, examine international publisher journal data policies, review framework recommendations for journal data policies from international organizations, and identify the fundamental elements of data policies for Chinese science and technology journals. [**Results**] Based on this investigation and analysis, we propose a universal graded template for science and technology journal data policies that can be freely combined and customized according to actual journal needs, offering a reference for various journals in formulating their data policies. [**Conclusions**] Currently, 44 journals have adopted this template, which has helped some science and technology journals achieve a fundamental transition from having no data policy to establishing one, thereby facilitating the open sharing and long-term storage of paper-related data.

Keywords: Scientific Data; Paper-Related Data; Data Policy; Data Repository; Science and Technology Journal

Author Contributions:
Zhang Zeyu: Data policy template development and manuscript writing; Jiang Lulu: Data policy template development and manuscript writing; Gao Yuwei: Manuscript writing; Li Chengzan: Data policy template revision and manuscript writing; Wang Pengyao: Development of online data policy customization tool; Zhou Yuanchun: Manuscript guidance and revision.

1. Introduction

As the philosophy of open scientific data sharing continues to spread and gain traction, various stakeholders in scientific data management have successively issued policies and regulations concerning data storage and sharing. Paper-related data, as a crucial component of scientific data, plays a vital role in verifying research conclusions, promoting scientific and technological innovation, and safeguarding research integrity. In June 2015, the international organization Center for Open Science (COS) introduced the TOP Guidelines in an article published in *Science*, which requires journals to maintain transparency and openness in citation, data, code, and research materials [**?**]. Major international academic publishers have since announced their adherence to these guidelines. In 2020, the STM Association designated that year as the "Research Data Year," with one of its goals being to increase the number of journals with

data policies and the number of articles containing data availability statements. This initiative attracted participation from 21 publishers and over ten thousand journals [**?**]. The *State of Open Data 2022* report, jointly published by Figshare, Springer Nature, and other institutions in October 2022, noted that 56% of respondents cited publisher requirements as their motivation for data sharing [**?**]. The inability to verify supporting data threatens the credibility of papers and public trust in science [**?**]. International publishing institutions and academic journals are gradually standardizing scientific data management by establishing data policies that require submission of related data and ensuring quality control. Currently, most international journals have relatively comprehensive data policies; for instance, all 1,721 journals on the Springer Nature website have established data policies [**?**]. Four prestigious journals—*Science*, *Nature*, *Cell*, and *PNAS*—require authors to publicly provide data and materials upon publication, with all data, materials, and code meeting the journals' standards for transparency and reproducibility [**?**]. Journals such as *Scientific Data* [**?**] and *Geoscience Data Journal* [**?**] mandate the submission of data supporting published papers.

In recent years, China has increasingly emphasized open science, with government agencies and research institutions paying greater attention to scientific data management. In March 2018, the General Office of the State Council issued the *Administrative Measures for Scientific Data*, which explicitly requires relevant departments and units to establish and improve management systems for the submission of data associated with domestic and international academic papers [**?**]. The 2019 *Administrative Measures for Scientific Data Management and Open Sharing of the Chinese Academy of Sciences* [**?**] dedicated a full chapter to requirements for paper-related data submission and management, emphasizing that CAS-affiliated journals should gradually establish pre-publication data submission mechanisms. In November 2022, the China Association for Science and Technology and the Chinese Academy of Sciences jointly issued the *Notice on Organizing and Carrying Out Paper-Related Data Submission Work*, encouraging journals to formulate paper-related data submission policies and implement data submission practices [**?**]. In both 2022 and 2023, the National Press and Publication Administration included "whether paper data has been processed, organized, and preserved" as an inspection item for the previous year's academic journal publication status [**?**][**?**]. These guiding policies are urging Chinese science and technology journals to undertake scientific data management.

However, numerous practical challenges remain in formulating data policies for Chinese science and technology journals. For example, some journals cannot guide authors in data sharing due to limited understanding of scientific data management practices; others lack legal professionals to delineate the rights and obligations of various parties during data sharing; and many have limited staffing and insufficient resources to devote to scientific data management. Overcoming these difficulties places high demands on journal editorial offices. Chinese science and technology journals are characterized by being "small, scattered, and weak,"

and during this stage where the overall sharing culture is still being established, relying on individual journals to research and formulate data policies presents significant challenges and makes it difficult to achieve scalable results [**?**].

Several scholars have already focused on the issue of data policy formulation for science and technology journals. Cheng Ming [**?**] and Song Yonghui [**?**] conducted survey analyses on the development characteristics of international publishers' data policies and research hotspots in scientific data policy, respectively. Shen Yan [**?**] examined the types and entries of international publishers' data policies to explore formulation and implementation models for Chinese journals. Kong Lihua et al. [**?**] summarized international publishers' data policies and proposed a general framework for paper-related data publishing policies. Fu Tianzhen [**?**], Peng Lin [**?**], and Kong Lihua [**?**] analyzed the formulation and implementation of data policies for Chinese science and technology journals at different periods. Lei Qiuyu [**?**] and Liu Ying [**?**] studied data policies in journals within evolutionary biology and medical fields, respectively. Current research primarily focuses on international publishers' data policies, specific policy elements, the current state of Chinese journal data policies, and domain-specific journal data policies, but no scholars have yet proposed a universal full-text template applicable to Chinese science and technology journals.

In this context, this paper proposes a universal graded template for paper-related data deposit and sharing policies specifically designed for Chinese science and technology journals. This template incorporates best practices from domestic and international journal data policies and references China's scientific data management normative system. It supports Chinese science and technology journals in formulating data policies and implementing paper-related data deposit and sharing management, thereby contributing to the development of world-class science and technology journals.

2. Current Status of Data Policy Formulation for Chinese Science and Technology Journals

The development of data policies for Chinese science and technology journals started relatively late. In 2014, Fu Tianzhen et al. [**?**] surveyed the "2013 Most Internationally Influential Chinese Academic Journals" and concluded that even among China's most internationally influential journals, the number with data publishing policies remained very limited. In recent years, as open science culture and the philosophy of scientific data sharing have further spread, an increasing number of Chinese science and technology journals have begun establishing data policies to encourage paper-related data sharing and long-term storage. This section introduces the recent developments in data policy formulation among Chinese science and technology journals and presents two exemplary case studies for detailed analysis.

In 2019, Peng Lin et al. surveyed 65 science and technology journals sponsored by the Chinese Academy of Sciences and found that 37 journals (57%) had

established data policies. These journals basically formulated their policies by referring to those of their overseas cooperative publishers, with most policies containing provisions on data submission, storage, and citation. Only a very small number of journals included provisions on data review. The policies lacked regulations and explanations regarding data copyright ownership, data use and licensing agreements, and other data-related rights and interests [**?**].

In 2021, Shen Yan [**?**] conducted research on the formulation and implementation models of data policies for Chinese science and technology journals, proposing that these journals are still in the stage of establishing whether they "have" data policies, and that the specific content of data policies should be graded to different degrees so that journals can freely choose according to their own conditions. Between July and August 2022, Kong Lihua et al. selected 302 journals from the first batch of the "China Science and Technology Journal Excellence Action Plan" in 2019 (including "Leading Journals," "Key Journals," "Echelon Journals") and those selected in 2020 and 2021 as "High Starting Point New Journals" as research subjects. Among them, 18 out of 22 leading journals (81.82%) had established relevant data policies; 18 out of 29 key journals (62.07%) had relevant policy statements; 69 out of 199 echelon journals (34.67%) had relevant policy statements; most high starting point new journals had already considered relevant policies during their founding period, with 36 out of 52 surveyed journals (69.23%) having relevant statements [**?**].

2.2 Case Studies of Domestic Journal Data Policies

2.2.1 ***China Scientific Data*** *China Scientific Data* is an academic journal specifically dedicated to scientific data publishing across multiple disciplines, committed to the open sharing and citation of scientific data, promoting long-term preservation and data asset management, exploring effective evaluation mechanisms for scientific data work, advancing the development of data science, and facilitating scientific data that is findable, accessible, interoperable, and reusable (FAIR) [**?**]. The journal's data policy is primarily specified in its "Submission Guidelines" [**?**], reflected in sections on submission instructions, publication ethics and academic misconduct, dataset submission procedures, and publication agreements. The policy addresses data content, data rights, data repository selection, and data availability statements.

As a specialized data paper publishing journal, *China Scientific Data* imposes high requirements on data quality: datasets described in data papers should follow rigorous data production and processing methods and adopt effective quality control measures. Additionally, the data paper review process includes a data initial review. The journal also provides illustrated instructions for the specific operational procedures for dataset submission.

2.2.2 ***Data Analysis and Knowledge Discovery*** *Data Analysis and Knowledge Discovery* is an academic professional journal supervised by the Chinese Academy of Sciences and sponsored by the National Science Library,

Chinese Academy of Sciences. The journal focuses on research and applications in various industries that are based on big data, rely on complex mining and analysis, enable knowledge discovery and prediction, and support decision analysis and policy formulation, dedicated to providing theoretical guidance, technical support, and best practices [**?**]. The journal has formulated a specialized *Interim Measures for Public Preservation and Sharing of Paper Supporting Data* (hereinafter referred to as the *Interim Measures*) [**?**], supplemented by the *Paper Supporting Data Submission Process* [**?**] to provide additional explanations on data types, submission methods, and data availability statements.

The *Interim Measures* address 14 issues closely related to paper-related data deposit and sharing, covering data definitions (scope of data sharing and exceptions), data formats, data rights, data licensing agreements, selection of public preservation platforms, and data review requirements. Combining the actual characteristics of the journal's published content, the measures further specify the concrete content for implementing public data preservation. They not only categorize sharing intensity based on the relevance to direct paper results but also provide specific guidance on what data to share according to disciplinary characteristics. Simultaneously, the *Interim Measures* clearly define the various responsibilities and obligations of the journal and public preservation platforms during the paper data deposit and sharing process. The journal formulated these measures based on principles of respecting and reasonably balancing the interests of stakeholders, classified management, precise policy implementation, multiple measures, and combining push and pull strategies [**?**].

3. Analysis of Journal Data Policy Elements

Currently, major international publishers have formulated relevant data policies based on their actual circumstances, while international organizations have proposed various construction guidelines or recommended templates for journal data policies. Chinese relevant units and institutions have also initiated scientific data management practices. This chapter summarizes and analyzes the aforementioned content.

3.1 Elements of Data Policies from Mainstream International Publishers

Through investigation of four major publishers' data policies, the following characteristics were identified: First, data sharing is encouraged: all four major publishers encourage paper-related data sharing, with Springer Nature [**?**] and Wiley [**?**] explicitly proposing graded data policies, including policy types that mandate data sharing and mandatory peer review. Second, data policies are presented in diverse formats: content related to research data appears not only on dedicated data policy pages but also in frequently asked questions, submission instructions, author guidelines, and other modules or pages. Additionally, all four

major publishers have established "Research Data" homepages. Third, basic elements of data policies share commonalities: by investigating content related to research data policies on the four major publishers' websites and extracting their content elements, it was found that all four publishers provide provisions on the scope and exceptions of data policies, data sharing forms/approaches and timing, data licensing agreements, data citation, data availability statements, and help and support (see Table 1).

3.2 Elements and Frameworks Recommended by International Organizations for Journal Data Policies

To make data policies more standardized and reduce confusion among researchers due to conflicting policies, the Research Data Alliance (RDA) established a Data Policy Standardization Implementation Group and published research results providing implementation guidelines for establishing standardized data policies for journals and publishers [**?**]. The *Framework for Journal and Publisher Data Policies* [**?**] proposes 14 essential elements or characteristics for data policies: data definition, exceptions to data policies, embargo periods, supplementary materials, data repositories, data citation, data agreements, help and support, data availability statements, data formats and standards, data sharing intensity requirements, data peer review, and data management plans. Based on different levels of data policies, these 14 elements are divided into two types: those that only need to be mentioned in the policy, and those that need to be both mentioned and implemented.

STM released the guidance document *Selecting and Implementing a Journal Data Policy* [**?**] to assist journals in developing and implementing data policies. Regarding how to formulate journal data policies, the document recommends that journals consider six questions (see Table 2). Data policies should consider both general cases and exceptions, with corresponding provisions or rules formulated for exceptional circumstances.

3.3 China's Scientific Data Management Normative System

In 2018, the General Office of the State Council issued the *Administrative Measures for Scientific Data*. Subsequently, local governments at all levels released corresponding implementation rules or interim regulations for scientific data management, with some documents explicitly stipulating requirements for paper data submission. Various scientific research fields in China have also formulated scientific data management measures for different disciplines and research projects. By summarizing relevant normative documents issued by various ministries and commissions, two points can be identified: first, ministries and commissions formulate exclusive data management policies for specific research projects/programs; second, normative documents in different fields share common basic elements, with all documents stipulating data definitions and data use, and some mentioning data production and collection, data submission and preservation, data quality control, and data rights ownership. Regarding

"data definition," in addition to defining the "data" referred to in the document, data is also classified into different levels and categories. Regarding "data use," it is typically closely connected with data sharing.

It can be observed that China's scientific data management normative system focuses on data classification and the use and sharing of data, with some regulations also addressing data quality, data citation, and data rights ownership. Data classification is closely related to the scope of data sharing; for example, sharing scope is defined based on data types, and the principle of "openness as the norm, non-openness as the exception" is proposed for scientific data formed with government budget funding.

4. Graded Template for Data Policies of Chinese Science and Technology Journals

Based on the above investigation and analysis, and fully considering the entire data submission process, this paper proposes a universal template for paper-related data deposit and sharing policies for Chinese science and technology journals [**?**]. The main features of this policy are: first, the template adopts a graded format, dividing journal data policies into five levels based on different data sharing intensities and data review strengths; second, the template can be freely combined and customized according to actual journal needs, reducing the cost and burden of policy formulation; third, it forms a unified and standardized bilingual (Chinese-English) data policy template suitable for domestic journals, assisting and accelerating the establishment of their own data policies.

4.1 Instructions for Using the Data Policy Template and Explanation of Clause Content

Based on different intensities of paper-related data sharing and data review strength, this template divides journal paper-related data policies into five levels (see Table 3): Level 1 represents the highest sharing intensity and highest data quality requirements, with intensity decreasing sequentially from Level 1 to Level 5. Numbers 1 through 9 in Table 1 correspond to Articles 1 through 9 in the main policy text, with "√" indicating that the clause should be included at that policy level and "×" indicating it should not. Journals can select appropriate policy clause content based on their actual needs to compose their own data policy (see Table 4).

4.2 Practice of the Data Policy Template

This data policy template was initially released in August 2022, with an updated version released in September 2022. To facilitate policy formulation for journals and reduce the editorial burden of compiling data policies, our team developed an online customization tool for journal data policies [**?**] in the second half of 2022. This service supports personalized policy customization, automatic

content filling, automatic Word document export, and other functions, providing bilingual services free of charge to the public.

As of early May 2023, this data policy template has assisted over 40 journals (see Table 5) in formulating and publishing their own data policies, achieving a fundamental transformation from "non-existence" to "existence" of journal policies and providing authors with clear guidelines for submitting paper-related data. This helps science and technology journals establish their own scientific data management systems.

Statistics show that 44 journals have adopted this graded data policy template, with two additional journals referencing it. According to the grading method in Table 3, we categorized the data policies of these 44 journals. Levels 1 through 4 were strictly classified according to the table. However, since some journals did not include all clauses when formulating their policies, all policies not belonging to Levels 1 through 4 were classified as Level 5. The statistics reveal that among the 44 journals, 27 (61.4%) adopted Level 3 data policies, which encourage data sharing, employ formal data review, and include all nine clauses; 6 journals (13.6%) adopted Level 2 policies; 8 journals (18.2%) adopted Level 5 policies; and 3 journals (6.8%) selected Level 4 policies. It is evident that 75% of journals chose more comprehensive data policies covering all nine clauses, with the vast majority selecting encouragement-based data submission policies. Meanwhile, 25% of journals opted for more concise data policies that did not include all nine clauses, with the most frequently omitted clauses being data review (not adopted by 8 journals) and data availability statements (not adopted by 7 journals).

Open, transparent, and well-equipped journal data policies also facilitate the publication and sharing of paper-related data. In February 2023, the editorial office of *Nuclear Science and Techniques* formulated its *Journal Data Policy for Depositing & Sharing Paper-Related Data* [**?**] based on this template and published it on the journal's official website. In the same month, the journal joined Science Data Bank (ScienceDB) and established a data community. According to ScienceDB statistics, from February to early May 2023, the *Nuclear Science and Techniques* data community received 117 paper-related data submissions, with 95 datasets formally reviewed and published in its data community [**?**].

This data policy template actively supports the cluster development of journals, providing references for the *Data Sharing Policy for Paper-Related Data of the Journal Consortium Editorial Office of the Institute of Microbiology, Chinese Academy of Sciences* [**?**] and the *Notice on Organizing and Carrying Out Paper-Related Data Submission Work* issued by the China Association for Science and Technology and Chinese Academy of Sciences [**?**]. This research will continue to monitor the application and practical effectiveness of this graded data policy template, gather feedback from journal editorial offices and data authors, and continuously optimize and improve the policy template.

5. Conclusion and Existing Limitations

As the philosophy of open scientific data sharing becomes increasingly popular and deeply rooted, various policies for scientific data management will gradually be implemented. The paper-related data deposit and sharing policy template proposed in this study provides a universally applicable, freely customizable graded template for data policy construction for Chinese science and technology journals, reducing the burden and cost of policy formulation for journals, assisting them in conveniently and efficiently managing paper-related data, and simultaneously protecting the legitimate rights and interests of data authors to the greatest extent possible.

However, this template requires continuous improvement and optimization: First, the data policy grading table needs refinement, as current distinctions between policy levels in terms of included clauses are not sufficiently clear. Second, the data policy lacks intellectual property-related clauses; beyond the currently included data licensing agreements, subsequent versions should further clarify issues such as data rights ownership. Third, the criteria for distinguishing strong versus weak data policies require further consideration. Finally, due to the particularities of various disciplines, different fields have varying requirements and norms for scientific data. This template only provides references for policy elements, structural frameworks, and suggested content text. Journals should modify and further refine their data policies according to their disciplinary contexts and actual publication requirements.

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