Development Status and Countermeasures for Gold OA and Diamond OA Journals in China: A Case Study of DOAJ-Indexed Journals

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Date: 2024-01-31T00:00:00+00:00

Abstract

Abstract: Objective: To analyze the characteristics of gold and diamond OA journals from China and worldwide indexed in the DOAJ database, providing references for the OA development of Chinese academic journals.

Methods: The characteristics of gold and diamond OA journals from China and worldwide indexed in the DOAJ database were retrieved and analyzed, including subject classification, language, CC licenses, peer review strategies, and publication status, with statistical processing performed on the data. A questionnaire survey was conducted to understand the OA publishing status of domestic journals and editors' perceptions of OA, and the results were analyzed to summarize OA development strategies.

Results: Among the 20,015 OA journals indexed in the DOAJ database, English-language journals constitute the vast majority (16,111). Of these, 66.26% are diamond OA journals, primarily concentrated in the social sciences. The most commonly adopted CC license type is CC BY, followed by CC BY-NC-ND and CC BY-NC, with peer review types being relatively dispersed. The DOAJ database indexes only 318 Chinese journals, which differs from the global pattern: English-language journals slightly outnumber Chinese-language journals, gold OA journals account for a higher proportion (65.41%), and they are primarily science, technology, and medicine (STM) journals. The most frequently used CC license type is CC BY-NC-ND (72.32%), with single-blind and double-blind peer review being the main peer review methods. Questionnaire survey results show that currently many domestic journals are not very familiar with the DOAJ database, and Chinese OA journals indexed in the DOAJ database still account for a small proportion of China's OA journals. Bronze OA accounts for the highest proportion among domestic OA journals; journals selected for the "Excellence Action Plan for Chinese Science and Technology Journals"and newly established English-language journals mostly adopt the diamond OA model.

Conclusion: Currently, gold OA and diamond OA journals account for a relatively small proportion in China, with bronze OA being the main OA model for Chinese journals. Compared with gold OA and diamond OA models, bronze OA journals lack clear OA statements and copyright agreements; explicitly stipulating authors' copyright retention and transfer and third-party licensing, and strictly implementing CC licenses can help OA journals standardize the scope of rights and obligations of all parties, and gold OA and diamond OA models represent the development direction for Chinese OA journals. Drawing on the indexing evaluation criteria of the DOAJ database can facilitate the OA construction and development of Chinese STM journals.

Full Text

Preamble

The Development Status and Countermeasures of Chinese Gold OA and Diamond OA Journals: A Case Study of Journals Indexed in the DOAJ Database

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Abstract

[Purpose] This study analyzes the characteristics of global and Chinese Gold OA and Diamond OA journals indexed in the DOAJ database to provide reference for the development of OA in Chinese academic journals. [Methods] We retrieved and analyzed the subject classification, language, CC license, peer review strategy, and publication status of global and Chinese Gold OA and Diamond OA journals in the DOAJ database, with statistical processing of the characteristic data. A questionnaire survey was conducted to understand the OA publication status and editors' awareness of OA in domestic journals, and the results were analyzed to summarize OA development strategies. [Findings] Among the 20,015 OA journals indexed in the DOAJ database, English-language journals constitute the vast majority (16,111 journals), with 66.26% being Diamond OA journals concentrated primarily in the social sciences. The predominant CC license type is CC BY, followed by CC BY-NC-ND and CC BY-NC, while peer review types are relatively dispersed. The DOAJ database indexes only 318 Chinese journals, which differ significantly from global patterns: English-language journals slightly outnumber Chinese ones, Gold OA journals account for a higher proportion (65.41%), and most are Scientific, Technical, and Medical (STM) journals. The most commonly adopted CC license is CC BY-NC-ND (72.32%), with single-blind and double-blind peer review as the main review methods. Questionnaire results indicate that many domestic journals are not

well acquainted with the DOAJ database, and the proportion of Chinese OA journals indexed in DOAJ remains small. Bronze OA accounts for the highest proportion among domestic OA journals, while journals selected for the "Excellent Action Plan for Chinese STM Journals" and newly established English journals mostly adopt the Diamond OA model. [Conclusions] Currently, Gold OA and Diamond OA journals account for a small proportion in China, with Bronze OA being the predominant model. Compared with Gold OA and Diamond OA, Bronze OA journals lack clear OA statements and copyright agreements. Establishing explicit regulations on copyright retention and transfer by authors and third-party licensing, along with strict implementation of CC licenses, can help OA journals standardize the scope of rights and obligations for all parties. Gold OA and Diamond OA models represent the development direction for Chinese OA journals, and drawing upon DOAJ' s inclusion evaluation criteria can facilitate the OA construction and development of Chinese STM journals.

Keywords: DOAJ database; Open access; Gold OA; Diamond OA; Bronze OA; Predatory publishing

Open access (OA) is an initiative adopted by the international academic, publishing, and library communities to promote the free dissemination of scientific research achievements via the internet, aiming to facilitate scientific communication and enhance research efficiency. OA eliminates access barriers and holds significant importance for academic dissemination, benefiting readers while substantially increasing both article citations and journal impact. Additionally, OA has transformed journal business models from traditional subscription-based to author-pays models.

Technological development presents both opportunities and challenges for scientific journals. In November 2021, the 41st session of the UNESCO General Conference adopted the Recommendation on Open Science, marking a new stage of global consensus on open science. OA constitutes an essential component of open science, which includes open literature access, open research data, and open peer review.

The Directory of Open Access Journals (DOAJ) database was established by Lund University, Sweden, in May 2003 and indexes peer-reviewed OA journals. Without restrictions on discipline, geography, or language, the DOAJ database covers all fields of natural and social sciences, authentically reflecting the global OA journal landscape. Its selection criteria have become the unofficial gold standard for OA journal evaluation. OA types include Gold OA, Diamond OA, Green OA, Bronze OA, and hybrid publishing, among others. Different OA types vary in the degree of openness and copyright agreements, with Gold OA and Diamond OA journals providing clearer regulations on copyright retention and transfer by authors and third-party licensing. The primary distinction between Gold OA and Diamond OA lies in whether Article Processing Charges (APC) are levied. Currently, the DOAJ database only indexes fully OA journals (Gold OA and Diamond OA), excluding hybrid publishing, delayed OA, Bronze OA, and subscription journals with OA options. Furthermore, DOAJ

has explicit requirements regarding Creative Commons (CC) license adoption and peer review strategies.

Given the current state of OA development in Chinese scientific journals, this study uses the DOAJ database as a case study to analyze the quantity and characteristics (including subject classification, language, CC license, peer review, and publication status) of global and Chinese Gold OA and Diamond OA journals, with statistical data processing. By comparing Chinese journals with global OA journals in DOAJ, this study aims to identify similarities and differences between Chinese and international OA journal development, summarize OA publishing strategies and methods, and provide reference for the OA development of Chinese academic journals.

1. Methods

1.1 DOAJ Database Indexing Analysis

This study examined global and Chinese journals indexed in the DOAJ database as separate research subjects, grouping them by type to investigate the current status and differences of global and Chinese Gold OA and Diamond OA journals, with statistical analysis of inter-group differences.

1.1.1 Grouping Criteria Journals indexed in the DOAJ database were categorized into two major sources: global and Chinese. Based on APC charges, they were divided into Gold OA journals and Diamond OA journals. Subgroups were further established according to: (1) language; (2) subject classification; (3) CC license; (4) major publishers; and (5) peer review type.

1.1.2 Exclusion Criteria Since DOAJ classification options allow journals to belong to multiple categories simultaneously (e.g., Chinese journals with English abstracts may be classified as both Chinese and English), we first counted Chinese journals and then excluded duplicate data from English journals. Regarding CC licenses, since CC BY-NC, CC BY-NC-ND, CC BY-SA, and CC BY-NC-SA all include the attribution principle (CC BY), journals with duplicate CC BY markings were excluded.

1.2 Search Strategy

The DOAJ database offers categorical and keyword searching. Categorical search parameters include subject classification, language, CC license type, publisher, publication location, peer review type, indexing time, and APC charges.

Our search strategy was: (1) Global OA publication data represented total DOAJ-indexed data; Chinese journal data used "China" (including Taiwan Province of China) as the publication location; (2) Languages were English AND/OR Chinese; (3) Journals were categorized by subject type into Scientific, Technical, and Medical (STM) journals and humanities/social science journals;

(4) Other parameters included indexing year, OA type, and publisher. Boolean logic operators AND or OR were applied. (1) Medical category: Selected the "Medicine" option in DOAJ' s subject classification. (2) Science and technology category: Science OR Agriculture OR Technology OR Military Science OR Naval Science OR Technology. (3) Humanities and social sciences category: General works OR History* OR Geography anthropology, recreation OR Social science OR Fine arts OR Music OR Language and literature OR Law OR Bibliography. Library science. Information resources.

1.3 Statistical Analysis

SPSS 22.0 statistical software was used for comparative analysis of data across categories of Gold OA and Diamond OA journals. Pearson' s chi-square test or Fisher' s exact probability test was employed for count data comparison, with $P<0.05$ considered statistically significant.

1.4 Survey on OA Implementation Status of Chinese Journals

An online questionnaire was designed to investigate editorial offices' understanding and implementation of OA and the DOAJ database. Joining DOAJ represents one pathway for journals to achieve OA, but the most critical indicator of an OA journal is whether full texts are publicly available and downloadable. Currently, many Chinese OA journals are not yet indexed in DOAJ, while many non-OA journals lack understanding of OA, CC licenses, and DOAJ. This questionnaire aimed to analyze Chinese journal editors' awareness and implementation status of OA.

1.4.1 Questionnaire Design and Survey Subjects The questionnaire covered: (1) respondent' s discipline; (2) language; (3) level of OA understanding; (4) whether the surveyed journal has implemented OA; (5) OA timing (immediate or delayed); (6) level of DOAJ database understanding; (7) peer review type; (8) awareness and implementation of CC licenses (and which type); (9) whether an English mirror site exists; and (10) APC status.

Survey subjects were Chinese academic journal editorial offices, primarily STM journals.

1.4.2 Data Analysis Questionnaire results underwent statistical analysis. Additionally, indexed and non-indexed OA journals in DOAJ were compared to analyze OA implementation status and DOAJ indexing patterns, with comparative analysis between Chinese and global DOAJ-indexed journals.

2. Results

2.1.1 Growth Trends

As of September 30, 2023, the DOAJ database indexed 20,015 OA journals, including 13,261 non-APC-charging journals (Diamond OA, 66.26%) and 6,754 APC-charging journals (Gold OA, 33.74%). Since 2007, global OA journal indexing in DOAJ has shown an upward trend, entering a rapid development phase after 2014, particularly between 2015-2022 when DOAJ indexed over 1,000 Diamond OA journals annually. The annual distribution of OA journals indexed in DOAJ is shown in Figure 1 [Figure 1: see original paper].

2.1.2 Global Geographic Distribution of DOAJ-Indexed Journals

As of September 30, 2023, the countries with the most DOAJ-indexed OA journals were Indonesia (2,326), followed by the United Kingdom (2,108) and Brazil (1,649). Brazil had the most Diamond OA journals (1,510), followed by Indonesia (1,326) and Spain (933). The United Kingdom had the most Gold OA journals (1,637), followed by Indonesia (1,000) and Switzerland (775). OA journals are primarily concentrated in Asia, Europe, and the Americas. However, this data also reflects that DOAJ indexing remains limited, with many OA journals, particularly other OA types (hybrid journals, Bronze OA journals), not yet indexed. Moreover, the geographic distribution of global OA journals, Gold OA journals, and Diamond OA journals in DOAJ is inconsistent, as shown in Table 1 .

2.1.3 Characteristic Analysis of DOAJ-Indexed Gold OA and Diamond OA Journals

Among all OA journals indexed in DOAJ, English-language journals constitute the vast majority (80.49%, 16,111/20,015), with statistically significant differences between language categories ($P<0.05$). Non-English Diamond OA journals have a higher proportion (82.94%, 3,238/3,904). For Diamond OA journals specifically, the proportion of English-language journals decreases to 75.58% (10,023/13,261), primarily because Diamond OA journals are more numerous in South American countries where Spanish-language journals have increased in recent years.

Regarding subject classification, STM journals significantly outnumber humanities and social science journals among Gold OA journals ($P<0.05$), while Diamond OA journals account for 85.08% of humanities and social science journals, indicating that DOAJ-indexed Diamond journals are concentrated in these fields.

For CC licenses, the attribution principle (CC BY) dominates, followed by CC BY-NC, CC BY-NC-ND, and CC BY-SA, with statistically significant differences ($P<0.05$).

In terms of publishers, Elsevier (Netherlands), MDPI AG (Switzerland), and BMC (Germany, under Springer Nature) rank among the top OA journal publishers, primarily publishing Gold OA journals due to their profit-driven nature and expensive APCs, making Gold OA the main model while ensuring journal impact. However, these publishers also publish Diamond OA journals; for example, Elsevier operates 55 Diamond OA journals. DOAJ-indexed Diamond OA journals are mostly operated by universities and academic societies, while those launched by publishing groups are typically newly established. The non-APC model of Diamond OA journals helps attract author submissions.

Statistically significant differences exist between Gold OA and Diamond OA journals in subject classification, CC license, major publishers, and peer review ($P<0.05$). The main characteristics of global OA and Diamond OA journals indexed in DOAJ are shown in Table 2 .

2.2.1 Trends of Chinese OA Journals Indexed in DOAJ

As of September 30, 2023, the DOAJ database indexed 318 Chinese OA journals, including 110 non-APC-charging journals (Diamond OA) and 208 APC-charging journals (Gold OA). Figure 2 [Figure 2: see original paper] shows the specific numbers of Chinese OA journals and Diamond OA journals indexed in DOAJ since 2007. Between 2007-2014, the growth of indexed Chinese OA journals was not significant; growth accelerated between 2014-2018, similar to global DOAJ indexing trends. After 2018, the growth rate of indexed Chinese journals significantly exceeded global levels, while the growth of indexed Diamond OA journals remained slow despite increases after 2014.

2.2.2 Characteristic Analysis of Chinese Gold OA and Diamond OA Journals Indexed in DOAJ

Unlike global distribution patterns, Chinese journals indexed in DOAJ show English-language journals accounting for 58.18% (185/318), with statistically significant differences between English and Chinese journal numbers ($P<0.05$), but no significant difference between English and Chinese Gold OA journals ($P>0.05$).

Regarding OA classification, Chinese journals in DOAJ differ significantly from global patterns, with a higher proportion of Gold OA journals (65.41%, 208/318) primarily focused on STM fields. The proportion of Diamond OA journals (34.59%, 110/318) is significantly lower than the global level (66.26%, 13,261/20,015). However, English-language journals dominate Diamond OA journals (76.36%, 84/110), primarily due to China' s recent encouragement of new English journal launches that adopt Diamond OA models to address manuscript sourcing challenges, particularly among journals selected for the "Excellent Action Plan for Chinese STM Journals."

In subject classification, STM journals significantly outnumber humanities and social science journals for both Gold OA and Diamond OA ($P<0.05$), with

humanities and social science journals accounting for a smaller proportion than the global average [15.09% (48/318) vs. 47.78% (9,564/20,015)]. Among STM journals, Gold OA journals significantly outnumber Diamond OA journals.

Regarding CC licenses, Chinese journals show significant differences from global OA patterns. Both Gold OA and Diamond OA journals most frequently adopt the most restrictive CC BY-NC-ND license (72.32%, 230/318), whereas globally, attribution-based (CC BY) journals constitute the vast majority, with CC BY-NC-ND accounting for only 22.23% (1,502/6,754), indicating that Chinese OA journals tend to adopt stricter CC licenses.

In publishing, KeAi Publishing Group is the largest OA journal publisher, operating 74 Gold OA and 34 Diamond OA journals. Consistent with international patterns, Diamond OA journals launched by publishing groups are mostly newly established, though publisher rankings differ significantly. Additionally, journal editorial offices represent an important publishing model for domestic OA journals, operating 54 Gold OA and 33 Diamond OA journals. All inter-group differences are statistically significant ($P<0.05$).

Regarding peer review, significant differences exist between domestic and international patterns. Chinese journals primarily use single-blind and double-blind peer review with relatively uniform distribution, showing no statistically significant differences between groups ($P>0.05$). The characteristic analysis of Chinese Gold OA and Diamond OA journals indexed in DOAJ is shown in Table 3 .

2.3 Questionnaire Survey Results on Journal OA

Since DOAJ indexes relatively few Chinese journals, this study designed a questionnaire to understand domestic journal editors' knowledge and awareness of OA and DOAJ. We collected 122 responses, revealing that 81 journals (66.39%) have implemented OA strategies, with 6 planning implementation. Among these 81 OA journals, 24 are indexed in DOAJ and 2 are under application. While 95 respondents indicated some understanding of DOAJ, 27 (22.13%) were completely unfamiliar, representing a substantial proportion. Most journals not indexed in DOAJ have already implemented OA strategies (66.39%). Detailed questionnaire results are shown in Table 4 .

The survey revealed that among 81 OA journals implementing OA, 24 execute CC licenses (all DOAJ-indexed), including 15 using CC BY-NC-ND, 4 using CC BY, and 5 using CC BY-NC. Twenty-three journals understood CC licenses but had not implemented any. These results indicate that Bronze OA journals without CC licenses constitute the vast majority of OA journals.

Among 81 OA journals, 51 charge APCs while 20 do not. Of the 24 DOAJ-indexed journals, 16 are Gold OA (charging APCs) and 8 are Diamond OA (non-APC).

By subject classification, 64 medical (including biological) journals participated (52.46%), with 44 being OA, 14 indexed in DOAJ (3 using CC BY-NC and 11

using CC BY-NC-ND), 41 charging APCs, and 3 not charging. All biomedical journals employ peer review (51 single-blind, 13 double-blind). Fifty-six science and technology journals participated (45.90%), with 34 being OA but only 9 indexed in DOAJ. Among these, 15 do not charge APCs while 19 do. Regarding CC licenses, 4 use CC BY, 2 use CC BY-NC, and 4 use CC BY-NC-ND, indicating one CC-implementing journal is not DOAJ-indexed. For peer review, 6 journals have no peer review (5 editorial board review, 1 without any review), while among 50 with peer review, 19 use single-blind and 31 use double-blind methods. Two social science journals are both OA and non-APC, with one indexed in DOAJ (using CC BY) and both employing double-blind peer review.

The questionnaire results demonstrate that Gold OA and Diamond OA journals represent a low proportion, with Bronze OA journals constituting the majority. Most Bronze OA journals charge APCs, similar to Gold OA journals, with the primary distinction being the presence of CC licenses and OA declarations. Regardless of OA model, all journals employ peer review strategies.

3. Discussion

3.1 Characteristics and Outlook of OA in Chinese Scientific Journals

China currently has over 8,400 academic journals, but many adopting OA publishing models remain unindexed in DOAJ. The China Open Access Publishing Development Report (2022) surveyed 4,963 scientific journals from the Blue Book of Chinese Science and Technology Journals (2021), finding that as of May 17, 2022, China had 1,810 OA scientific journals (36.47%). Bronze OA journals were most numerous at 1,459 (29.40%), while Gold OA and Diamond OA journals accounted for only 227 (4.57%) and 23 (0.46%) respectively. Research indicates that Chinese OA scientific journals currently focus on Bronze OA, lacking clear copyright agreements. The Blue Book of Chinese Science and Technology Journals (2022) notes that Chinese scientific journal open publishing has distinctive characteristics: editorial offices aim to benefit domestic scholars through open publishing while facing challenges in digital publishing technology updates and insufficient internet dissemination capacity. Consequently, Chinese scientific journals, particularly Chinese-language ones, have developed their own solutions, creating models featuring self-operated journal websites, free full-text access, and paid full-text provision through external platforms, establishing a parallel OA and subscription publishing model. For Chinese Bronze OA journals, the scope of copyright rights and obligations is not clearly defined, with insufficient descriptions of readers' permissible actions. Using CC BY-NC-ND as an example, Bronze OA journals lack agreements on whether others can commercially use or create derivative works (adaptations, translations, annotations, compilations) from published works. Thus, Chinese journal OA development has unique characteristics, but some journals inadequately disclose copyright agreements, making DOAJ' s copyright regulations and information transparency construction worthy of reference.

3.2 CC License Types, Applicability, and Recommendations

CC licenses comprise four basic rights requirements: Attribution (BY), Non-Commercial (NC), No Derivatives (ND), and Share Alike (SA). The current CC 4.0 version includes seven license types: CC BY, CC BY-NC, CC BY-NC-ND, CC BY-NC-SA, CC BY-ND, CC BY-SA, and CC0. The most used CC license among Chinese journals indexed in DOAJ is CC BY-NC-ND (72.32%, 230/318), the strictest type besides CC0, restricting commercial use and prohibiting authors or third parties from publishing derivative works (adaptations, translations, annotations, compilations). The next most common are CC BY (17.61%) and CC BY-NC (8.49%).

Academic journals strictly prohibit multiple submissions, and many do not accept rewritten or translated manuscripts. As increasing numbers of Chinese STM journals are indexed in international databases (either in full text or abstract form), journals publishing derivative works (especially translations) and those publishing original works may both be indexed in the same database, potentially causing duplicate publication. Therefore, we recommend Chinese OA journals adopt the CC BY-NC-ND license to limit derivative works by authors or users. For journals with preprint releases that typically publish papers online before formal publication to expand dissemination and impact, we recommend CC BY-SA or CC BY-NC-SA licenses. Table 5 shows CC license types and applicability for Chinese journals indexed in DOAJ.

3.3 Positive Impact of DOAJ Indexing on Journal Visibility

The OA model facilitates academic achievement dissemination and enhances journal visibility and international influence. Referencing DOAJ inclusion requirements can help journals formulate OA strategies. For fully OA journals, applying for DOAJ indexing offers several benefits: (1) It aligns with open science development requirements, promotes disciplinary development and rapid knowledge dissemination, and enhances journal impact. (2) As the world' s largest OA database with numerous indexed journals and users, DOAJ can further increase citation frequency domestically and internationally, improving the visibility of indexed journals and papers and raising the profile of authors, journals, and institutions. (3) The application process helps journals improve various systems (including OA statements, OA policies, peer review systems, editorial systems, ethics policies, plagiarism declarations, etc.) and build international journal websites with transparent information. (4) Adopting and implementing a CC license clarifies copyright regulations and clearly displays users' rights and obligations.

DOAJ indexing helps OA journals standardize their systems and clarify OA scope. Even without joining DOAJ, journals can develop OA strategies tailored to their characteristics by drawing upon DOAJ standards.

3.4 Developing OA Strategies Tailored to Journal Characteristics

Most Chinese journals operate as editorial offices under supervisory and sponsoring organizations, with many being profit-oriented. Therefore, whether to adopt OA and which OA model to choose should be based on journal characteristics, selecting between Gold OA, Diamond OA, and other models. The DOAJ database only indexes fully OA journals (Gold OA and Diamond OA), excluding partially OA or delayed OA journals. Currently, Bronze OA accounts for the highest proportion among Chinese OA journals, while Gold OA, Diamond OA, and hybrid publishing represent smaller proportions. Although Bronze OA journals offer free article downloads, they lack clear copyright agreements. As copyright agreements gradually become more explicit, Bronze OA journal numbers will likely decline. We recommend domestic journals clarify copyright details (especially usage boundaries for licensees), clearly display implemented CC licenses, and standardize the scope of rights and obligations for journals, authors, and readers. Gold OA and Diamond OA are the two major publishing types indexed in DOAJ, differing primarily in APC charges. APCs generally cover manuscript processing system fees or bundled costs (peer review, language editing, figure production, editing, typesetting, proofreading, preprint release), post-publication article promotion services, and long-term archiving. Domestic journals typically refer to APCs as page charges or publication fees, which may include the above cost components. Currently, some Chinese journals have adopted Diamond OA models, primarily among journals selected for the "Excellent Action Plan for Chinese STM Journals," other newly established English journals, and journals receiving sufficient sponsor support to forego APCs. Most are co-published by domestic sponsors and international publishing institutions. The Diamond OA model helps attract manuscripts and enhance journal influence. Gold OA journals should charge reasonable APCs, as excessive fees may deter authors and risk developing into predatory journals. Research indicates that Chinese Chinese-language and Chinese-English OA journals still follow traditional page charge models with generally low fees. Some English OA journals have initially established APC charging rules but lack complete, transparent charging systems. We recommend developing a charging framework suitable for Chinese OA journal development, strengthening journal website information construction, and improving transparency in journal fees and other information.

For both Gold OA and Diamond OA journals, article compilation copyrights and information network dissemination rights transfer to the editorial office (or publisher) upon publication, while authors retain partial copyrights (moral rights including attribution and integrity protection). The main advantage of Gold OA and Diamond OA models is immediate free access for readers, which helps increase article readership and academic content dissemination, potentially further increasing citation counts.

In summary, Chinese scientific journal open publishing has distinctive characteristics, and editorial offices should develop OA strategies tailored to their specific circumstances.

3.5 Improving Systems and Transparency Based on Journal Characteristics

(1) Journals should implement appropriate CC licenses to clarify the scope of rights and obligations for publishers, authors, and users. They should explicitly state authors' retained copyrights (attribution rights, integrity protection rights, etc.), with compilation copyrights and information network dissemination rights clearly stipulated in copyright transfer agreements. China' s predominant Bronze OA journals are characterized by unclear copyright licensing agreements and lack of CC licenses. While articles may be freely accessible, users face unclear copyright agreements. Therefore, implementing appropriate CC licenses or clear copyright statements would benefit Chinese OA journals.

(2) Strict implementation of peer review systems is crucial for achieving open science. OA is an essential component of open science, which includes open data, open peer review, and open academic achievements. Strict peer review implementation helps improve academic quality and promote open science development. Moreover, rigorous and transparent peer review is a hallmark of OA journals. In December 2013, DOAJ first launched Principles of Transparency and Best Practice in Scholarly Publishing to help distinguish high-quality journals. Journal websites should display basic information including journal introduction, aims & scope, sponsor, publisher, editorial board, CC license, copyright information, peer review strategy, and APC fee information (including waiver policies).

(3) Strict OA implementation prevents predatory publishing. While no clear definition of predatory journals exists, predatory publishing typically features: (1) excessively short review cycles, absence of peer review, or questionable review quality; (2) extremely high APCs; and (3) mega journals with massive publication volumes. Editorial offices should address these issues. DOAJ' s indexing evaluation emphasizes information transparency, attaches great importance to peer review systems to ensure all indexed journals conduct peer review, and requires indexed journals to disclose and publicize APC standards. Therefore, DOAJ' s rigorous review process enables researchers to identify safe OA journals. Information transparency is crucial for eliminating predatory publishing, and predatory journal warning systems provide safeguards for OA development. Applying for DOAJ indexing or referencing its inclusion standards can help improve journal OA construction.

According to UNESCO' s definition, open science aims to make scientific knowledge in multiple languages accessible to everyone in open, reusable ways, enhancing scientific collaboration and information sharing to benefit all of society while opening scientific knowledge creation, evaluation, and dissemination to social actors beyond traditional scientific communities. Open science encompasses public display of published scientific content, encouraging open data and

sources, and open peer review content, helping eliminate predatory publishing. Currently, DOAJ requires journals to display peer review strategy information and implement it strictly, and may gradually open specific peer review content in the future.

3.6 Transition Between Different OA Models and Traditional Subscription Models

Many Chinese academic journals have transitioned from traditional subscription models to OA, significantly impacting journal operations. While OA models enhance journal influence, journals must achieve sustainable operations. Subscription model changes affect revenue, but the short citation half-life of scientific literature makes rapid achievement display a critical task. The development of full-text paid databases leads some users to search literature directly in databases, causing potential subscriber loss.

Subscription revenue typically represents a small proportion of total academic journal income. For most Gold OA journals, APCs are the primary revenue source, while journals with major sponsor support and newly established English journals not yet indexed in SCI can adopt Diamond OA to attract manuscripts. After SCI indexing and securing stable, high-quality manuscript sources, these journals can transition to Gold OA for profitability. Additionally, Bronze OA journals can transform into Gold OA and Diamond OA journals by clarifying copyright agreements. DOAJ' s inclusion requirements for Gold OA and Diamond OA journals provide valuable references. Chinese scientific journal development faces both opportunities and challenges, and developing Chinese-characteristic OA models that follow international OA publishing standards while accommodating Chinese journal circumstances will be our development direction.

Currently, increasing numbers of journals are adopting OA models to replace traditional subscription models. Chinese OA journals are currently characterized by Bronze OA dominance, with Gold OA and Diamond OA representing smaller proportions. Compared with Gold OA and Diamond OA, Bronze OA journals lack clear OA statements and copyright agreements, making Gold OA and Diamond OA models the development direction for Chinese OA journals. Drawing upon DOAJ' s inclusion evaluation system can facilitate OA construction and development, while adopting and implementing CC licenses helps OA journals standardize the scope of rights and obligations for all parties. OA models benefit academic achievement dissemination and enhance journal visibility, representing an essential component of open science. OA journals should adopt specific OA models based on their characteristics to adapt to open science development.

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