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science editing



Aims and scope

Science Editing (Sci Ed) is the official journal of the Korean Council of Science Editors (<https://kcse.org>) and Council of Asian Science Editors (<https://asianeditor.org>). It aims to improve the culture and health of human being by promoting the quality of editing and publishing scientific, technical, and medical journals. Expected readers are editors, publishers, reviewers, and authors of the journals around the world; however, specially focused to those in Asia. Since scholarly journals in Asia are mostly published by the academic societies, universities, or non-profit organizations, Sci Ed is sought to play a role in journal development. The number of publications from Asia is increasing rapidly and overpass that of other continents; meanwhile, the number of international journals and highly appreciated journals is yet to be coming forward. It is task of Asian editors to pledge the journal quality and broaden the visibility and accessibility. Therefore, its scope includes the followings in the field of science, technology, and medicine.

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About the journal

It launched in February 20, 2014 with volume 1 and number 1. It is to be published biannually. Supplement issues may be published. Circulation number of print copies is 500 per issue. Full text is freely available from: <https://www.escienceediting.org> or <http://e-se.org>. It is the member journal of Council of Science Editors, the Association of Learned and Professional Society Publishers, and European Association of Science Editors. There is no page charge or article processing charge of author side. This journal had been supported by the Korean Federation of Science and Technology Societies, the Government of the Republic of Korea (2013-2014).

Abstracting and Indexing Services

A part of articles, metadata, or full text is available from CrossRef metadata (2014-), ScienceCentral (2014-), Goolge Scholar (2014-), Directory of Open Access Journals (2016-), Web of Science Core Collection (2017-), Emerging Sources Citation Index (2017-), Scopus (2017-), and Korean Citation Index (2018-).

Publisher: Korean Council of Science Editors

Editor-in-Chief: Kihong Kim, PhD

Korean Council of Science Editors
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It is published by the Korean Council of Science Editors. It is printed and bound by Academya, Korea (<http://www.academya.co.kr/>), and its web site and XML files are produced and maintained by M2 Community, Korea (<http://m2comm.co.kr>).

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Implementing the Principles of Transparency and Best Practice in Scholarly Publishing

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The third edition of the Principles of Transparency and Best Practice in Scholarly Publishing was published in January, 2018. This edition, which consists of 16 principles related to all aspects of scholarly publishing such as journal governance, publication ethics, copyright, archiving and profit model, has been prepared by the collaboration of four organizations, which are the Committee on Publication Ethics (COPE), the Directory of Open Access Journals (DOAJ), the Open Access Scholarly Publishers Association (OASPA), and the World Association of Medical Editors (WAME) [1]. Most of these principles are self-evident and can be considered as essential ingredients in publishing scholarly journals in an ethically, academically and entrepreneurially transparent manner. Since July, 2018, *Science Editing* has fully adopted them in the editorial policy, which can be found in our web page about Best Practice (https://www.escienceediting.org/about/best_practice.php). This has been followed by many Korean journals since then.

The Korean Council of Science Editors (KCSE) has also actively advocated these principles. A Korean translation of them was published in March, 2018 in the KCSE Newsletter. They were also included in the educational program of the KCSE. In the KCSE General Meeting and Conference held in January, 2019, Soon Kim presented the results of an extensive survey of the websites of all 793 journals published by non-profit academic societies and listed in the Science Citation Index Extended about whether the editorial policies of those journals were consistent with the 16 principles or not. She found that in surprisingly many categories including copyright, archiving and profit model information, the principles of transparency were poorly represented in the editorial policies of the majority of journals. This was especially the case for those in Asia, Africa and South America. Since it is not difficult to implement these principles, we strongly encourage many journals, especially those in Asia, to do so. This will enhance the transparency of those journals, thereby helping to develop them to better ones.

Conflict of Interest

Kihong Kim has been editor of *Science Editing* since 2014.

Received: February 11, 2019
Accepted: February 11, 2019

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Reference

1. Principles of Transparency and Best Practice in Scholarly Publishing [Internet]. The Hague: Open Access Scholarly

Publishers Association; 2018 [cited 2019 Feb 11]. Available from: <https://oaspa.org/principles-of-transparency-and-best-practice-in-scholarly-publishing-3/>

Overview of disciplinary data sharing practices and promotion of open data in science

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Abstract

The present study specifies the historical development of data sharing practices in three disciplines—oceanography, ecology, and genomics—along with the evolving progress of movements—e-Science, cyberinfrastructure, and open science—that expedite data sharing in more diverse disciplines. The review of these disciplinary data-sharing practices and the movements suggests opportunities and challenges that would serve as a basis for implementing data-sharing practices. The increasing need for large-scale and interdisciplinary research provides momentum for initiating data sharing. In addition, the development of data repositories and standards for metadata and data format facilitates data sharing. However, challenges need to be addressed, in regard to conflicting issues of patenting data, concerns about privacy and confidentiality, and informed consent that adequately enables data sharing. It is also necessary to consider the needs of the various stakeholders involved in data sharing to incentivize them to improve its impact.

Keywords

Data sharing; Disciplinary data sharing practices; Movements for open data; Open data; Open science

Introduction

Research data gain much attention these days due to their potential for being shared and reinterpreted from a new perspective. Data sharing is defined as “making data available to people other than those who have generated them” [1]. The modes of data sharing vary from the exchange of research data among colleagues to making data publicly accessible to others, mostly by depositing them into data repositories. The shared data are generally available for reuse, which refers to “the secondary use of data—not for its original purpose but for studying new problems” [2]. Data reuse allows researchers to reanalyze data with new perspectives and encourages greater scrutiny, which in turn leads to the advancement of science. Data sharing and

Received: February 11, 2019
Accepted: February 12, 2019

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reuse also enable achieving reproducible research, allowing verification of results, and utilizing big data to solve complicated research questions [3]. Researchers expect and appreciate these benefits, which motivate their data sharing.

This study examines data sharing initiatives autonomously developed in three disciplines—oceanography, ecology, and genomics—and the movements that have promoted data sharing since 2000. By presenting a historical overview of data sharing practices and movements, the study identifies opportunities and challenges of sharing research data as well as evolving frameworks that facilitate open data in science.

Data Sharing Initiatives in Three Disciplines

There are a few disciplines that demonstrate established norms and cultures of sharing research data. The present study selected three disciplines among the fields of science in which historical reviews of data sharing practices were available. The disciplines have quite an extensive history of data sharing dating back to the 1960s and provide useful insights on best practices that are key for implementing successful policy and infrastructure.

Oceanography

There has been a long history of research in oceanography conducted internationally across disciplines. Interdisciplinary collaborations are essential in this field of study to develop profound understanding of physical, chemical, biological, and geographical phenomena in the ocean [4]. A large quantity of oceanographic data of various types have thus been gathered and accumulated by extensive research projects. In particular, the Intergovernmental Oceanographic Commission (IOC) is an institution within United Nations Educational, Scientific and Cultural Organization (UNESCO) that plays a primary role in collecting and sharing research data in this field. The IOC was established in 1960, and its mission is to promote international collaboration and coordination of research, services, and capacity-building programs to investigate nature and resources in the ocean and apply the knowledge for improving management and protection of the environment. Currently, 147 countries participate in the IOC as member states.

Since the beginning of the IOC, free and unrestricted data exchange among member states has been considered important. The emphasis on data sharing results from the fact that oceanographic data have an irreplaceable value once collected. Sea-going measurements require enormous amounts of time, effort, and resources, and thus any measurements need to be well-protected along with metadata. Furthermore, the IOC cleans and refines the measurement results into workable datasets, which member states then share for the com-

mon good [5].

Glover et al. [5] elaborated the history of data sharing in oceanography, which dates back to the 1960s when the IOC was established. Even if the early phase of computer technology and the political environment related to the Cold War hampered data sharing, the IOC organized a working group named the IOC Data and Information Exchange, which became the International Oceanographic Data Exchange (IODE), a current IOC program responsible for sharing data and information across member states. The IOC also made a general plan for the Integrated Global Ocean Station System (IGOSS), which collects and exchanges oceanographic data jointly with the World Meteorological Organization.

During the 1970s, international cooperation for collecting and exchanging oceanographic data was initiated in earnest. A multidisciplinary Marine Environmental Data and Exchange system was adopted in 1973, and it was one of the earliest metadata systems accepted in practice. The IGOSS planned in the 1960s became fully operational in 1975. The IOC also provided guidance to the General Bathymetric Chart of the Ocean, the goal of which was to facilitate scientific cooperation that supported sharing and preserving bathymetric data and associated metadata. In addition, the IOC established data centers in the US and Germany that distributed large amount of surface drifter data via the global telecommunication system of the day.

In the 1980s, the remarkable progress of computer technology enabled increased data exchange capacity. The IOC recommended a general formatting system (GF3) and made software for GF3 freely available. Data sharing was then facilitated among all institutions involved in international collaboration. The IOC also improved the functionality of the IGOSS for timely collection and exchange of standard data. Moreover, the UN Conventions of the Law of the Sea was enacted to provide a legal framework that determined international maritime communication. The law significantly affected how oceanographic data could be shared within a legal boundary.

In the 1990s, the IOC embraced global programs such as the World Meteorological Organization and UN Environment Programme to ensure cooperation for organizing the Global Ocean Observing System, which later evolved into the Global Climate Observing System. In addition, the IODE Global Oceanographic Data Archaeology and Rescue project was launched in the late 1990s. All the data from the project were disseminated on DVD and uploaded to the World Ocean Database online. Improved computer technology and widespread use of the Internet in the late 1990s also allowed for developing countries to become involved in the Ocean Data and Information Network, through which the IODE expanded services for data exchange.

From 2000 to 2010, the IOC supported greater international collaboration and open data. In 2003, the IOC Oceanographic Data Exchange Policy was announced and specified timely, free, and unrestricted sharing of data collected under IOC sponsorship as well as associated metadata and all derivative products. The IOC has also sponsored projects regarding ocean carbon science and observations as well as a related project, called the Surface Ocean CO₂ Atlas, which attempted to establish a standard data format that facilitated making data publicly available. Furthermore, the Open Data Portal was developed in 2007 for seamless access to all oceanographic data on the IODE network.

Ecology

Prior to 1950, most research projects in ecology were carried out by a small number of scientists with limited funding. This small-scale research tradition was transformed by the emergence of big ecology, which represented interdisciplinary research performed with an international scope [6]. The large-scale projects that led to big ecology established policies and guidelines for data sharing and management, and this effort helped data sharing to become an accepted norm in ecology.

Michener [7] described characteristics of large ecological projects since the 1960s based on the historical analysis of ecological collaborations conducted by Coleman [6]. The International Biological Program (IBP) was an early collaborative project that examined a broad range of biomes in a multidisciplinary scope. It was successful in ecological data synthesis and the adoption of holistic approaches to ecosystems. However, data policies and protocols were not uniformly identified, and therefore IBP data were not systematically managed. As a result, it was almost impossible to discover and acquire IBP data at this time.

The US Long-Term Ecological Research (LTER) began in 1980 and has been implemented until the present with more than 24 sites in the US territories and Antarctica. In the 1980s, data managers were hired for several sites, although data were used only by data collectors and their collaborators. Making data more widely available was realized in the 1990s due to two changes in data management practices. First, a data catalog describing core data sets in all LTER sites was published. It helped identify what data were available and where they were located. Second, the first formal guideline that required each site to establish a data management policy was provided. The guideline specified roles and responsibilities of data contributors and users and recommended providing metadata, preserving data for the long-term, and making them available in a timely manner.

In 1993, the International LTER was organized and has been expanded to include 40-member networks. The LTER

networks adopted a network-wide policy in 1997, and a new data sharing policy was enacted in 2005, which strengthened the 1997 policy by defining responsibilities of data collectors and determining data embargo periods to be no more than two years after the data were collected. In addition to the adoption of the policy, the LTER established the Ecological Metadata Language, a metadata content standard that improved access to data and metadata on the LTER networks.

The National Center for Ecological Analysis and Synthesis (NCEAS) was an innovative project established in 1995; a working group consisting of 8 to 15 scientists brought existing data and collaborated on synthesizing those data and information. The NCEAS developed an informatics staff that helped the working group to manipulate and analyze data brought to the center. The NCEAS also played an important role in developing a metadata management software called Morph and establishing a data repository called the Knowledge Network for Biocomplexity, where working group members and others deposited ecological and related data.

Since 2000, several notable developments have been made for sharing biodiversity and ecological data. The Global Biodiversity Information Facility was launched in 2001, and it developed the global data portal in 2007 to promote public access to biodiversity data. Currently, the National Ecological Observatory Network and the Ocean Observatories Initiative funded by the US National Science Foundation are two major environmental observatories that provide open access to ecological data collected from territorial, freshwater, ocean, and coastal sites.

Genomics

Genomics is a field of study that examines the “whole genomes of organisms” and “uses a combination of recombinant DNA, DNA sequencing methods, and bioinformatics to sequence, assemble, and analyze the structure and function of genomes” [8]. Researchers in genomics intensively utilize instruments for mapping and sequencing nucleic acid and generate large data sets including DNA sequences, genomic locations, and functional analyses of genes and proteins. As research projects in this field become larger in scale, the need to share data is more pressing than ever before since no single laboratory can fully investigate the overwhelmingly large amounts of data.

Cook-Deegan et al. [9] discussed the historical aspects of research projects that contributed to facilitating data sharing in genomics. The Human Genome Project (HGP) was the first and foremost important project due to not only the achievements of generating a human genome reference sequence and developing new technologies and instruments, but also the establishment of principles and policies for sharing DNA se-

quences created by the project. The idea of the HGP was originally brought up in 1985, with a focus on creating a reference sequence of the human genome as a tool for research and application. By early 1996, the HGP decided to accelerate large-scale human genome sequencing with five national partners and had a meeting in Bermuda.

In this meeting, participants announced the Bermuda Principles, which replaced previous guidelines for data sharing that applied only to the National Institute of Health and the US Department of Energy. The former guidelines also required sharing data from DNA mapping and sequencing within six months of generation. The Bermuda Principles, however, strongly recommended daily releases of all HGP-generated DNA sequences. The principles provided a project-wide policy for the first time, which helped develop the Human Sequence and Mapping Index, a website that identified laboratories for DNA sequencing distributed around the world and avoided duplication of research.

The Bermuda meeting in 1996 also raised the issue of patenting DNA molecules and methods, which became common at that time. The majority of Bermuda attendees strongly disagreed with the patents and attempted to develop a data sharing policy that clearly identified the purpose: “All human genomic sequence information... should be freely available and in the public domain in order to encourage further research and development, and to maximise its benefit to society” [10]. In 1998, the Bermuda Principles became an official data sharing policy of the HGP that applied to any genome sequence data publicly funded by participating countries—the US, the UK, France, Germany, Japan, and China.

The HGP generated a human genome reference sequence between 2000 and 2003. Publicly-funded HGP sequences from laboratories in the six countries entered the public domain in 2001, and access to the data became open and free via Genbank. However, genome sequences generated from a private company named Celera Genomics, a participant in the HGP, were not completely open to the public. The data were available for free for non-commercial use in parcels of 1 kb or otherwise based on subscription fees or an access agreement with the company. The two modes of data sharing raised intense controversy over access to sequence data. A policy was later developed that recommended sharing data accompanying publications rather than the original Bermuda Principles recommending daily releases of DNA sequences when they were generated.

In 2003, when the HGP was nearly ended, the Wellcome Trust organized a meeting in Fort Lauderdale, Florida to define several important statements regarding data sharing in genomics. The meeting focused on the value of daily releases of DNA sequences, which followed the ethos of the Bermuda

Principles. At the same time, it mandated that data generators must be credited when data were reused. In addition, another genome sequence repository named dbGAP was developed in 2006. Unlike Genbank, dbGAP has two tiers, one that provides publicly available data and the other that collects private data with identifiable information. The latter requires data access committees to ensure that users have appropriate reasons to access the data. In 2007, dbGAP was designated as a primary repository for depositing data from the National Institute of Health's Genome-Wide Association Studies. The Genome-Wide Association Studies data sharing policy allows for a six-month embargo of data for validation, and dbGAP keeps the data private during the embargo period. After six months, the data are freely available to the public. The adaptations of data sharing policies and data repositories indicated that the rights and interests of both researchers and human subjects should be considered.

A recent development in the Global Alliance of Genomics was the creation of a global commons of genomics that started with 50 individuals from eight countries in 2013. It now contains around 500 institutional members from 71 countries. One of the outstanding projects that the alliance made was the Breast Cancer Gene (BRCA) Challenge, a database that curated variants of the two most studied and clinically important genes, BRCA1 and BRCA2. These are tumor suppressor genes, and some mutations of the genes are known to cause breast, ovarian, and other cancers.

The BRCA Challenge consisted of three tiers. The first tier was entirely public and provided variants with interpretations made by experts in the field. The second tier provided evidence-based research data, including conflicting interpretations of variants and reports. The third tier included case-level data linked to identifiable individuals and thus required the highest level of security. The BRCA Challenge intended to open BRCA data against patented data related to BRCA studies, which helped scientists to catch up on genomic research.

The historical development of data sharing practices in the three disciplines illustrates opportunities and challenges for data sharing. First, rapidly developed computing power and encouragement of international and cross-disciplinary collaboration were the primary impetus for active data sharing in the disciplines. Second, the development of metadata, formatting standards, and data repositories to archive and access data further facilitated data sharing. Third, a considerable conflict of interest was identified specifically in genomics between researchers who supported open data and those who agreed with patenting DNA sequences. This implies disagreements that researchers might have regarding incentives and disincentives of data sharing. Different layers in genome databases with distinct levels of access to data also indicate the

need for privacy considerations, confidentiality of human subjects, and appropriate informed consent procedures.

Movements that Support Open Data in Science

The disciplines that already have a long history of data sharing practices indicate that norms for data sharing have been established. Yet, the culture of sharing data is prevalent only in certain disciplines. Data sharing has been facilitated in a wider range of disciplines by movements that promote the emergence of data-centric science and the importance of data sharing. The following sections describe influential movements since 2000, including e-Science, cyberinfrastructure, and open science.

e-Science and cyberinfrastructure

The term e-Science was originally proposed in 1999 by John Taylor, Director General of Research Councils in the UK Office of Science and Technology. Predicated on his experience as the head of Hewlett-Packard Lab, he recognized the transformation of scientific research as a new way of collaborative, interdisciplinary, and data-intensive work. In this sense, he defined e-Science as “global collaboration in key areas of science and the next generation of infrastructure that will enable it” [11]. Hey and Trefethen [12] further elaborated that e-Science represents large-scale and highly complex scientific problems for which efforts by distributed, collaborative, and multi-disciplinary teams are needed as well as the collaborative tools and technologies required to solve these problems. In this e-Science environment, it is evident that enormous amounts of research data and metadata were being generated and accumulated, and thus how to manage the data deluge became an important issue. Data repositories thus played a significant role in e-Science infrastructure by not only preserving the wealth of scientific data but also providing programs to manipulate and visualize them [13].

Sharing data generated from government-funded research was also necessary in order to fulfill the premise of e-Science. The roles and responsibilities of governments were emphasized to address data sharing issues beyond national boundaries and to build international cooperation for issues of global significance. As a result of these discussions, 13 Organization for Economic Cooperation and Development (OECD) principles and guidelines for access to data from public funding were proposed in 2007: openness, flexibility, transparency, legal conformity, protection of intellectual property, formal responsibility, professionalism, interoperability, quality, security, efficiency, accountability, and sustainability. The principles implied that data from public research should be available as widely as possible, with consideration for legal and ethical

conditions and based on efficient and accountable data management.

Cyberinfrastructure was a term first introduced in 2003 by the US National Science Foundation’s Blue Ribbon Advisory Panel on Cyberinfrastructure, which defined it as “infrastructure based upon distributed computer, information and communication technology” [14]. The underlying layer of cyberinfrastructure consisted of technological components related to computation, storage, and communication. The upper layer was composed of software programs, services, instruments, data, information, knowledge, social practices, and communities of practices. Cyberinfrastructure between the two layers “should provide an effective and efficient platform for the empowerment of specific communities of researchers to innovate and eventually revolutionize what they do, how they do it and who participates” [14].

Both e-Science and cyberinfrastructure signified computational infrastructure that enabled researchers to assemble heterogeneous data and information sources as well as to make scientific analyses and visualizations based on a substantial quantity of data. Large research grants were offered for research and technical development of cyberinfrastructure, which led to a new form of investigation and cross-disciplinary collaboration [15].

The scope of openness in e-Science was also discussed since the commitment to disclosing research outputs varies by disciplines, although it was framed in science as a whole. It was suggested that the degree of openness towards research materials perceived by scientists ranged from private management through peer exchange to public sharing. The various perceptions of openness imply that it was necessary to understand the benefits that researchers expected or actually gained and how it affected their patterns of providing open access to research materials, methods, tools, and resources [16].

Open science

Open science is a movement that evolved through previous efforts to provide open access to research results, increasing motivations to share resources between disciplines, and the need for greater efficiency, accountability, and reproducibility of research [17]. The 2015 OECD report suggests that open science indicated efforts by various stakeholders in scientific communities, including researchers, governments, and funding agencies, to make publications and research data publicly accessible in digital format with no or minimal restrictions [18]. This notion of open science, however, is regarded as narrow, and a recent definition of open science encompasses a wide range of activities in science: “Open science is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research

processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods” [19]. The European Commission has an even broader definition of open science, which it describes as “a new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools” [20]. This definition represents a shift from the traditional way of creating publications to sharing and using all available knowledge as early as possible during the research process.

Open science is an overarching term that concerns various movements for sharing publications, data, methods, resources, and tools at any stage of the research process. Fecher and Friesike [21] determined the movements involved in open science as five schools of thoughts: democratic, infrastructure, measurement, pragmatic, and public. The democratic school focuses on making research products available and has two main streams, open access to publications and open data. The infrastructure school involves building technological infrastructure, mostly software applications that enable research via the internet. The measurement school concerns developing alternative standards and measures to assure scientific impact, known as altmetrics, which deal with other forms of publication and social media as a source of scientific contribution. The pragmatic school considers open science as a method for making research and knowledge dissemination more efficient and believes that science can be advanced by opening and reinventing knowledge production processes. Lastly, the public school involves making science accessible to the public and suggests that scientists increase accessibility of research processes and research results for citizens.

In particular, open data is one of the core topics in open science and evolved from the OECD principles and guidelines of 2007. An increasing number of government funding agencies are adopting these principles and developing policies that strongly recommend data sharing. For instance, the National Science Foundation has specified the requirement of a data management plan for all grant proposals since 2011. A data management plan must include types of data and other materials from a proposed research, standards for data and metadata, policies for data sharing and reuse, and plans for archiving data [22]. In addition, scholarly journals have gradually enacted data sharing policies. Kim and Stanton [23] found that journals’ enforcement of their data policies positively affected researchers’ data sharing.

Conclusion

The present study describes the historical development of data sharing initiatives in oceanography, ecology, and genom-

ics as well as movements facilitating data sharing, which have evolved since 2000 from e-Science and cyberinfrastructure to open science. The review shows various social and technological activities that have promoted data sharing as well as conflicting issues that indicate restrictions for open data. Specifically, open science encourages researchers to disclose not only publications and data, but also methods, tools, and resources for the advancement of science. It is important to consider the different needs of stakeholders—researchers, study participants, governments, funding agencies, journals, and publishers—when developing policies and procedures, which will improve the impact of data sharing.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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The 30-year publication history of *Asian-Australasian Journal of Animal Sciences*

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Abstract

Asian-Australasian Journal of Animal Sciences (AJAS) is the official journal of the Asian-Australasian Association of Animal Production Societies and was founded in 1988 in Korea. The journal was created to serve the animal industry and academia in the Asian-Australasian region through the efficient publication and distribution of scientific information on animal sciences. At the beginning, there was neither a real need expressed by member countries nor a firm belief in the success of such publication activity in Asia. However, a few dedicated individuals, led by Prof. In K. Han, the first editor-in-chief, were able to turn AJAS into one of the most respected global journals in animal sciences. Over the last three decades, AJAS has achieved notable development in the quantity and quality of the articles and their publication process. AJAS initially published four issues per year; this number grew to six issues in 1995-1998, eight issues in 1999, and 12 issues from 2000 onward. Overall, the journal has published more than 5,700 articles. Total citation frequency in 1997, when AJAS was first indexed by SCIE, was lower than 100, but by 2017, it was more than 4,000. Similar improvement was seen in the two-year impact factor, which was 0.094 in 1997 and rose to 1.243 by 2017. This article aims to introduce the development of the AJAS editorial system, manuscript submission, publication activities, and citation frequency. Additionally, a special development, called the AJAS 2020 program, is introduced as a reference for other journals.

Keywords

Asian-Australasian Journal of Animal Sciences; Editorial system; History

Received: December 26, 2018

Accepted: January 4, 2019

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Introduction

The Asian-Australasian Association of Animal Production Societies (AAAP), also known as ‘Triple AP’, now has 38 years of history behind it and has become one of the largest global academic organizations in the area of animal sciences. The AAAP was founded in Kuala Lumpur in 1980, and to honor its formation, the First AAAP Animal Science Congress was held at the campus of

Universiti Putra Malaysia, Malaysia, September 2–5, 1980 [1].

Originally, the plan to create an Association of Animal Production Societies to represent the countries in Asia and the Pacific Rim was started in 1977 during Dr. Syed Jalaludin's tenure as the president of the Malaysian Society of Animal Production. After a few years' discussion, it was agreed that animal scientists in Asia should meet regularly to exchange ideas and discuss common problems. The Malaysian Society of Animal Production organized the First AAAP Animal Science Congress, which was a major step toward the founding of the AAAP. Dr. Jalaludin was elected the first president of the society, which had eight charter members (Australia, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, and Thailand). The council members elected for the newly created international association, AAAP, were Dr. I. M. Nitis (Indonesia), Dr. V. G. Arganosa (Philippines), Dr. N. Tulloh (Australia), Dr. C. Chantalakhana (Thailand), Dr. Y. Yamada (Japan), Dr. In K. Han (Korea), Dr. M. Mahyuddin Dahan (Malaysia), Dr. C. Devendra (Malaysia), and Prof. A. R. Sykes (New Zealand) [2,3].

The AAAP's main activities are holding the biannual AAAP Animal Science Congress and managing the publication of *Asian-Australasian Journal of Animal Sciences* (AJAS), its official journal. Thus far, 18 AAAP Animal Science Congresses have been held in 11 different member countries, serving as the regional platform for animal scientists in Asia to exchange their ideas and opinions, and to present current advances in animal sciences and technology.

AJAS: Official Journal of the AAAP

Although the statutes of the AAAP called for the publication of an official journal, it did not materialize until eight years after the foundation of the association. Following the Third AAAP Animal Science Congress held in Seoul, Korea, May 6–10, 1985, a proposal to publish an official journal of the AAAP was submitted to the fourth Council Meeting of the AAAP by Professors Dong A. Kim (Korea), In K. Han (Korea), Syed Jalaludin (Malaysia), and Charan Chantalakhana (Thailand). In 1987, the proposal was reconfirmed by the fifth Council Meeting of the AAAP in Hamilton, New Zealand. There Prof. In K. Han was appointed as the founding editor-in-chief, and Professors D. Minson (Australia) and R. Kawashima (Japan) were appointed as associate editors of the AJAS. After about one year of preparation, the first issue (vol. 1, no. 1) of the AJAS was published in March 1988 at the Suwon campus of Seoul National University [3].

AJAS was established with the mission to serve the animal industry and academia in AAAP regions through the efficient publication and distribution of scientific information on ani-

mal sciences and technology. It was, to the best of our knowledge, the first English-language journal of an international scope in Asia to cover this field. Thus, it made a tremendous contribution to the development of animal sciences in the AAAP region. During the first phase (1988–1994), AJAS published four issues per year; the number grew to six issues in 1995–1998, eight issues in 1999, and 12 issues from 2000 onward. This growth was possible thanks in part to increasing research activities in many Asian countries over the years.

Editorial System Development

Editorial members

In its 30-year history, the AJAS has had three editors-in-chief. Prof. In K. Han (Fig. 1A), the founding editor-in-chief, must be recognized for his tremendous contributions to the development of the AJAS. During his tenures as editor-in-chief (1988–1994, 1998–2001), Prof. Han nurtured AJAS, both in quantity and in quality, from its outset until 2001, when he stepped down to take a still more important position: president of the Korean Academy of Science and Technology. Prof. Dong A. Kim (Fig. 1B), a professor at Seoul National University, ran AJAS successfully for four years during the absence of Prof. In K. Han, who devoted himself to the organization of the Eighth World Conference on Animal Production. The third editor-in-chief, Prof. Jong K. Ha (Fig. 1C), took over operation of AJAS starting in 2001 after serving the journal as editorial board member, business manager, and assistant editor. In addition to the three editors-in-chief, numerous editors, editorial board members, reviewers, and editorial staff have also made outstanding contributions over the last three decades to the development of AJAS.

In 1988, when the journal was created, the editorial structure was relatively simple. The initial editorial board consisted of an editor-in-chief, two associate editors, and 20 editorial members, most of whom were invited from AAAP member countries [3]. The 2017 list shows that the board has grown into a much larger and more international team from a wider range of disciplines. As of 2018, we have one editor-in-chief, one deputy editor-in-chief, 24 associate editors, and 101 editorial members from 26 countries (34 from Korea, 14 from China, nine from Japan, six from the United States, four from Australia, four from Taiwan, four from Thailand, three from India, two from Canada, two from Pakistan, two from Indonesia, two from New Zealand, and one each from 13 other countries). Members are invited for an initial three-year term with the possibility of extension. Due to the complexity of editorial work in recent years, editors with special functions are also invited, such as English editor, statistical editor, managing editor, and manuscript editor.



Fig. 1. Professors (A) In K. Han (the founding editor-in-chief; 1988–1994, 1998–2001), (B) Dong A. Kim (second editor-in-chief, 1994–1998), and (C) Jong K. Ha (third editor-in-chief, 2001 to present).

Guide for authors and review and editorial policy

The original guide for authors and the review and editorial policy was prepared by a few scientists led by Prof. In K. Han during the preparation for journal launching, and its final form was completed in January 1988 [3]. It was very simple, briefly describing a few essential items. The guide for authors mainly described a few key guidelines: formatting specifications, number of carbon copies to be submitted, manuscript components, and reference style (the Council of Biology Editors manual). The review policy described the method of review (single blind), the number of reviewers per manuscript, and the time frame for the review process. Initial editorial policy defined the procedures of manuscript handling, including review, revision, and publication and the responsibility of the editor-in-chief and editorial committee.

The original review and editorial policies were extensively improved in February 1999. Many editorial members gave input during the preparation of new policies. Of the many editorial members, Prof. Phil Thacker in Canada made great efforts in shaping the editorial policy of the AJAS during its early stages of development. A revised guide for authors provided much more detailed guidelines with easy-to-understand specifications. The guide for authors included submission of the manuscript (key elements of the manuscript and general guidelines), the structure of the manuscript (how to prepare each section, including reference citations), guideline for the preparation of tables and figures, the use of numbers and units, and an abbreviation list for frequently cited journals and terminologies.

One interesting aspect of the new policy was to set up a

section-editor system for more efficient and fair manuscript handling, but the system was never fully implemented. Having the extra step of manuscript evaluation by the section editor might have provided a more reliable peer-review system. However, this was time-consuming, adding weeks and sometimes months to the process, because in those days, all manuscripts were circulated through regular post in a hard-copy form. The “Responsibilities of section editors” were presented as the following [3]:

- 1) Section editors are responsible to invite (collect) at least one or two quality review paper(s) in their own field from animal scientist(s) in any area of the world.
- 2) Section editors are also responsible for critical review of seven to eight original manuscripts per year submitted for publication in AJAS.
- 3) Section editors will check manuscripts returned by authors to ensure that they have been revised as suggested by editorial members, and then send the manuscript back to editor-in-chief within four weeks.
- 4) Section editors then will have to decide acceptance or rejection on specific manuscripts that have split decisions by two editorial members or any overdue manuscript, review process of which has not been completed by editorial members within 2 months. In this case, section editors may request a critical review from another editorial member within four weeks. Final decision should be sent to editor-in-chief in two months from the time of receiving the specific article from editor-in-chief.
- 5) Section editors may nominate a paper for the Purina Outstanding Research Award of the AJAS that will be pre-



Fig. 2. The cover of *Asian-Australasian Journal of Animal Sciences*. (A) Before 2017 and (B) since January 2017.

sented at the opening ceremony of AAAP Animal Science Congress. The award is a cash prize of 2,000 US dollars plus a memento or plaque.

After the second revision, a few minor changes and improvements on publication policies were made. The latest and perhaps most extensive revision was made in September 2016. For the latest version, many editorial members gave considerable input, but the most important contributions were made by Prof. Sun Huh (Hallym University, Korea), Hye Min Cho (Infolumi, Korea) and Prof. Beob Gyun Kim (Konkuk University, Korea), to whom AJAS is deeply indebted. The journal-improvement project included a cover redesign, which was introduced in January 2017 (Fig. 2). The new version was prepared with attention to many aspects related to the recent international publication environment and in a way that accommodated many modern publication technologies. Major modifications include the following:

1) Aims and scope: To reflect modern developments in animal sciences, sections were rearranged, and a few new ones were introduced (animal health, animal biotech-

nology, animal behavior, and welfare).

- 2) Open access policy: AJAS became an open access journal starting January 2014, and its declaration was included in the new version. The open access policy of AJAS was changed from /by-nc/ to /by/ in 2018.
- 3) Research and publication ethics: AJAS adheres to the ethical guidelines for research and publication described in the ICMJE (Guidelines on Good Publication and the International Committee of Medical Journal Editors) guidelines. Extensive ethics guidelines are announced in the latest guideline. The major parameters include authorship; originality, plagiarism, and duplicate publication; secondary publication; conflict of interest statement; care and use of animals; and the process for managing research and publication misconduct; and editorial responsibilities.
- 4) Submission and peer review process: More elaborated step-by-step explanations on the manuscript-handling process were provided for authors, reviewers, and the editorial staff, including the editor-in-chief.

5) Manuscript preparation: The basic structure and manuscript preparation guidelines of the second revised version were maintained in the 2016 version, with minor changes. Items were rearranged, expressions were improved, and a style guide was provided so authors could follow a step-by-step submission procedure. Some notable changes are: (1) The abstract style was changed from non-structured to structured. (2) The reference citation method of the Council of Biology Editors system, used since 1988, was changed to the National Library of Medicine system. All authors submitting manuscripts were asked to adhere to the new style and format starting January 2017.

Manuscript Submission and Publication

System development

Initially, like any other journal, AJAS received printed manuscripts (three copies) from authors. Two copies were sent out to two external reviewers, and one copy was kept for internal purposes. Reviewers also, of course, sent back the copy along with their comments. It took months for one round of the peer review process. The main task of the editorial staff in those days was to handle hard copies and to respond to authors and reviewers, spending hours to read and write letters. Two staff members were able to handle this process until the total number of annual submissions reached about 500. By 2004, the staff was overloaded and did not have enough time to take care of other business. AJAS, with the help of the company Aninet (Korea), developed its own manuscript-submission and handling system, which was inaugurated on January 1, 2006. This was one of the most important steps in AJAS's transition toward an online operation system. Although the system was not perfect by any means, authors, reviewers, editorial members, and staff valued the system, which saved time and money for all stakeholders in AJAS for almost nine years. Then, as the number of submissions dramatically increased, it became necessary to use a more powerful and more efficient online system. After a year's preparation, AJAS contracted with a new web hosting company, M2 Community, in September 2014.

Manuscript submission

A dramatic increase was seen in the number of submissions. They grew from 50 in 1988 to almost 1,000 annually in 2016 (Fig. 3), indicating that animal scientists consider AJAS a good journal in which to publish their work [4]. At the same time, this trend may reflect the increased research activity in the AAAP region, especially in East Asia and some developing countries, in recent years. Chinese scientists submitted 291 manuscripts (30.8%) in 2017, while Korean scientists sub-

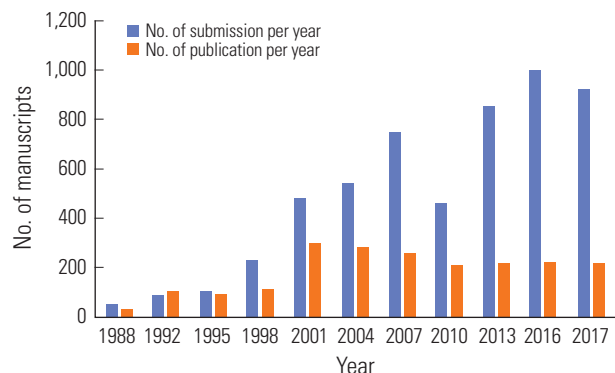


Fig. 3. Manuscript submission and publication by *Asian-Australasian Journal of Animal Sciences* (1988-2017).

mitted 130 manuscripts (13.8%). Other major contributors in terms of manuscript submission to AJAS in 2017 were from Brazil (7.9%), India (6.3%), Iran (4.5%), Thailand (3.7%), Turkey (2.9%), Indonesia (2.9%), Pakistan (2.1%), and South Africa (2.0%). Japan was a major contributor until the year 2000; however, its share dropped to less than 1% of total submissions in 2017. This is likely due to Japan's success in launching many SCIE journals in recent years. Although China has also recently made remarkable advances in journal publication, not all manuscripts generated from their research activities would be accommodated.

Publication activities

As mentioned previously, AJAS initially published four issues per year (1988-1994), but 12 issues a year have been published since 2000. A total of 301 articles were published in 2001, and annual publication numbers have been maintained at around 220 articles (Fig. 3) in the last 10 years [4].

Table 1 shows the number of publications by AAAP member countries over the past 30 years. As can be seen, the majority of articles (78.4%) came from AAAP member countries. Initially, fewer than 10 AAAP member countries published papers in AJAS, but in 2017, scientists from more than 30 different countries chose AJAS to publish their work, indicating that AJAS is now recognized as an international journal. Korean scientists published the most papers over the three decades, followed by scientists from Japan, China, India, Taiwan, and Thailand.

As AJAS has gained popularity, thanks in part to recent considerable improvements in its impact factor, publication by authors from non-AAAP regions also increased. The recent three-year statistics presented in Table 2 clearly show such a trend. Korea and China, as AAAP member countries, are the two major countries that contributed the most, but the contribution by other non-AAAP members such as the Unit-

Table 1. Manuscripts published by Asian-Australasian Association of Animal Production Societies member countries (1988-2017)

Country	1988-2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Australia	110	-	5	5	2	4	5	5	2	5	5	2	3	153
Bangladesh	138	-	1	1	1	-	-	2	-	-	-	-	1	144
China	-	7	63	66	53	51	43	56	65	55	61	58	74	652
India	355	41	23	10	11	15	24	13	12	6	4	8	6	528
Indonesia	42	-	2	-	1	-	1	-	-	2	5	1	-	54
Iran	11	6	4	13	14	10	6	9	4	-	-	2	4	83
Japan	541	25	25	15	24	15	14	13	4	7	6	5	9	703
Korea	566	81	76	69	59	65	60	83	74	85	73	92	63	1,446
Malaysia	71	-	1	3	2	-	4	1	6	6	-	-	-	94
Mongolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nepal	3	-	-	-	-	-	-	-	-	-	-	-	-	3
New Zealand	12	3	1	1	-	3	1	-	-	-	1	1	1	24
Pakistan	103	7	12	7	2	2	5	1	2	-	1	3	3	148
Papua New Guinea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philippines	17	1	-	-	-	-	-	-	-	-	-	-	1	19
Sri Lanka	-	-	-	-	-	-	-	1	-	-	-	1	1	3
Taiwan	141	22	10	10	8	5	2	2	3	4	4	3	7	221
Thailand	83	11	9	11	5	5	6	8	13	6	6	15	9	187
Vietnam	22	3	-	4	-	7	4	3	3	2	4	-	2	54
Total	2,215	207	232	215	182	182	175	197	188	178	170	191	184	4,516

Nineteen Asian-Australasian Association of Animal Production Societies member countries: 4,516 papers (78.4%); Non-Asian-Australasian Association of Animal Production Societies member countries: 1,244 papers (21.6%). Published articles from 33 countries in 2017.

Table 2. Publication contributions in the most recent 3 years (2015-2017)

Country	No. of articles
Korea	240
China	201
USA	55
Thailand	35
Japan	31
Brazil	28
India	19
Turkey	18
Australia	15
Taiwan	15
Mexico	15
Canada	5

ed States, Brazil, Turkey, Mexico, and Canada is growing.

Original research articles and reviews were the main form of AJAS publication thus far, and it is time to consider some

changes. In 2018, two editorial papers covering AJAS's 30-year history [4] and a guide for experimental design and statistical analysis [5] were published. In the same year, AJAS published its first special issue: vol. 31, no. 7 was dedicated solely to global beef production. We certainly hope these types of publications will provide more interesting and informative content to our readers. We believe that AJAS should consider a wider range of content types, so that other technical notes, short reports, or letters to the editor can be accepted by AJAS in the near future. One good approach would be to carry abstracts presented at the AAAP Animal Science Congress, which would properly facilitate the citation of presenters' work. As the official journal of the Association, AJAS needs to provide as much service as possible to member countries. Given the rapid changes in the global publication environment as well as the technology involved, it is certainly the right time to consider other types of information presentation beyond text, such as infographics, video, audio, and summary graphics, so that we can accommodate a variety of needs from the community.

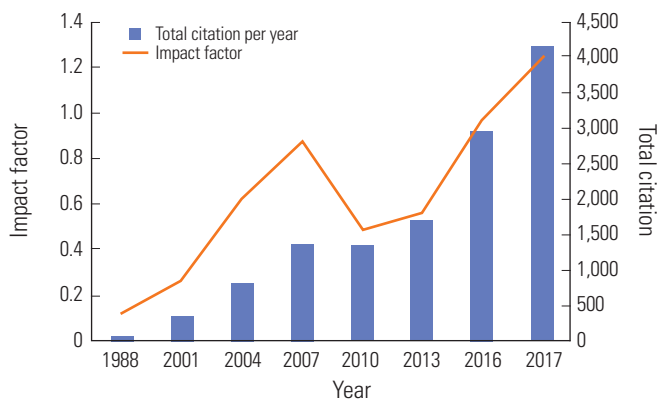


Fig. 4. Trend in total citation frequency and two-year impact factor of *Asian-Australasian Journal of Animal Sciences* (1998-2017).

Citation Frequency

AJAS was indexed by SCIE for the first time in 1997 and had an impact factor of 0.094; the impact factor rose to 1.243 in 2017, as shown in Fig. 4. The total number of citations in the first year was low (fewer than 100), but by 2007 it was over 4,000—a 40-fold increase in 20 years. Significant improvements were made during the past three years, and the trend is expected to continue in the future. Recently, added coverage by major international databases such as PMC (PubMed Central), DOAJ (Directory of Open Access Journals), and the adoption of the open-access policy are considered major contributors to the growth in citations.

Although AJAS did an excellent job in improving citation frequency in recent years, its relative ranking in the animal science area is not high enough. It stands in the upper 66% in terms of the two-year impact factor (Table 3). It is worth noting that the ranking calculated on the basis of total citations in AJAS is much better than that calculated based on impact factor—perhaps an indication that the journal’s impact factor will improve in the long term.

AJAS 2020 Program

AJAS launched a seven-year improvement plan (AJAS 2020 program for 2013–2020) in 2013. As the editor-in-chief and all editorial members tried to turn AJAS into one of the top journals globally, a well-organized and systemic action plan was necessary to carry out the improvement plan. After a long discussion among the editorial members, the following AJAS 2020 program was born. It defined the mission and vision of AJAS’s publication, and the goals to be achieved within seven years were established. Four key areas for journal improvement were identified: (1) journal exposure and citation frequency, (2) journal management, (3) editorial, and (4) budget.

Table 3. *Asian-Australasian Journal of Animal Sciences* ranking in agriculture, dairy, and animal sciences (% position from top journal)^{a)}

	2012	2013	2014	2015	2016	2017
IF ranking	39	36	32	47	60	66
Total cites ranking	65	63	74	74	76	82

^{a)}Percentage position compared to the top journal as 100%.

Outline of AJAS 2020 program

Mission of the program was to serve the animal industry and academia in the AAAP region by the efficient publication and distribution of scientific information on animal sciences. The vision was to become a globally important and respectable journal in the area of animal sciences with sustainable structure. To achieve the vision of the program the program’s goals were set for AJAS to become a top 30% journal in animal sciences or a top 10% journal with multi-disciplinary nature covering major areas of animal sciences with >2.0 impact factor.

The first strategy was to increase journal exposure and citation frequency. Some of measures to be considered were: adoption of open access policy with full-text XML service, coverage by Medline/PubMed Central, creation of new sections such as laboratory animals and animal health (veterinary science) covering hot topics citable by non-livestock sectors (medical, veterinary, and/or basic sciences), invited review papers, social networking services (Facebook, Twitter, Youtube, mobile web).

Next strategy was to improve journal management. Examples of measures to taken were: to develop the system for better service to authors, subscribers, reviewers, supporters, and the general public, to upgrade journal quality and credibility by updating publishing policies and technologies, to improve journal style (cover, PDF), to upgrade homepage to international standard, and to register AJAS and/or AAAP as a foundation for more official status and fundraising.

The third area was editorial aspect. The followings were proposed: Separate editorial board and reviewer pool, Reduce editorial board to about 50 members representing AAAP and non-AAAP countries, strengthen reviewer pool and secure more reviewers for efficient and professional evaluation, upgrade reviewer qualification, adopt best reviewer of the year program, improve manuscript handling process and review system, create section-editor system to improve manuscript handling and to provide more professional and independent decisions.

Budget is also vital area for achieving goals of AJAS 2020 program. The following aspects were considered. Current sources of budget are subscriptions, reprints, page charges, ad-

vertisements, and institutional support. Subscriptions and reprints budgets are expected to diminish, while advertisements and institutional support are uncertain. Under these conditions page charges will be the main source of funding, and a substantial increase will be inevitable in the next few years (from 30% to 50% of publication cost). It is also important to secure sustainable funding sources from the government and private sectors.

Progress of the AJAS 2020 program

Setting the goal was initially most important, but checking and evaluating the progress regularly, adjusting the program, and setting the action plan appears to be necessary. We checked the progress of each category at least once every year and discussed the results at the associate editors' meeting. Moreover, the progress was reported to both the AJAS general editorial meeting and the AAAP council meeting, which were held during the biannual AAAP Animal Science Congress.

Table 4 summarizes the progress made in major categories by the end of 2017. Most of the goals set in 2013 were already achieved by the end of 2017, with one exception: the official registration of AJAS (or AAAP). Achieving this is essential for the future development of AJAS, but it will take additional time to consider the factors involved in the method and form of legal registration. The overall assessment on the effectiveness of the AJAS 2020 program is that we have made good progress in the first five years, and one of the results is the improvement in the impact factor score and journal citation frequency in the last three years.

Conclusion

Publishing a science journal is a challenge in itself. This is especially true these days, when the world seems to be moving and changing so rapidly. Even though AJAS has done well in

Table 4. Progress of AJAS 2020 program

Category	Target (2020)	Progress as of the end of 2017
Journal exposure & citation	IF (2.0), rank (70%)	IF 1.243 and ranking 66% in 2017
	Open access	joined on January 1, 2014
	XML service	Converted all articles from 2012 onward
	PubMed Central	Indexed from July 2014
	New section	Three sections (Animal Health, Animal Behavior and Welfare, Environment and Management) were added from 2014
	Invited review	19 articles since 2009
	SNS	Facebook open in September 2014 Mobile journal(http://ajas.info/m/)
	DOI	Completed submission of DOI of all articles (from the 1st issue) in 2015
Journal management	MS handling system	A new system from October 2014
	Journal style	New style from January 2017
	Homepage	A new hosting service from June 2014
	Legal status	To be solved
Editorial process	Ethics	Join Similarity Check, adopt COI, IRB from 2014
	Editorial structure	New system from January 2015
	Reviewer pool	Total 322 as of December 2017
	Editorial board	Total 101 as of December 2017
	Staff	Maintain 2 as of December 2017
	Training & education	Attend several International & domestic meetings per year
Budget sustain-ability	Advertisement	Maintain 5 as of December 2017
	Page charge	Increased rate (July 2014)
	Subscription	Maintained
	Public & private support	Maintained

AJAS, *Asian-Australasian Journal of Animal Sciences*; IF, impact factor; SNS, social network service; MS, manuscript; COI, conflict of interest; IRB, institutional review board.

carrying out its mission over the last 30 years, many challenges lie ahead.

Competition with journals belonging to or managed by large international publishers will be one such challenge. Special tactics that may suit a rather small and non-bundle journal such as AJAS should be developed. Currently, AJAS covers almost all areas of animal sciences. Providing specialized information (in discipline, animal species, climate, region, etc.) can be one tactic for surviving. Furthermore, today we are constantly pushed to adopt new technologies, and publishing journals is no exception. The rapid developments in information technology and the new programs created have to be adopted, and sometimes almost enforced, to keep up with other journals. Constant training and education, along with a supply of new blood to the journal-managing system, is essential.

How to increase multidirectional communication among authors, reviewers, editors, readers, and the general public is another challenge. AJAS exists to help animal scientists publish their original work, through which field practitioners in the AAAP region can obtain the information they need. Perhaps in the past, we spent too much energy considering how to increase the impact factor and forgot about the meaning of the real impact of scientific development and how it should be used. AJAS may set up some communication channels in online and/or offline gatherings during the AAAP Animal Science Congress.

Since AAAP does not have individual membership, no revenue comes from member subscriptions. Industry support is diminishing, as is public support. The identification of new funding sources will be a big challenge for the sustainable publication of AJAS.

Conflict of Interest

Cheol Heui Yun serves as an editor of *Science Editing*, but have no role in the decision to publish this article. Except for that, no potential conflict of interest relevant to this article was reported.

Acknowledgments

Special thanks are expressed to Hae J. Ahn (business manager) and Kyung S. Pyun (manuscript editor) for data compiling and analysis for this article.

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Current and planned adoption of data sharing policies by editors of Korean scholarly journals

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Abstract

Purpose: This study analyzed the present status of data sharing policies and attitudes towards such policies through a web-based survey of editors of scholarly journals published in Korea.

Methods: From December 26, 2018 to January 3, 2019, a survey was distributed to 1,055 persons listed in the member directories of both the Korean Council of Science Editors and the Korean Federation of Science & Technology Societies. The survey contained four items on subjects' information, three items that gathered information about the journals, and two further items on reasons for adopting or not adopting a data sharing policy and further opinions about such policies.

Results: Of the 100 respondents (from 100 journals), 13 stated that their journals had already adopted a data sharing policy. The strength of the policy was recommendation-only in 10 of those 13 journals. The most frequent reason for adopting a data sharing policy was to follow international trends. The repository sites were the Harvard Dataverse for two journals and Mendeley Data for one. The most common reasons for not adopting a data sharing policy were a lack of knowledge on data sharing, the possibility that submitters would not want to share their data, and the questionable effect of data sharing on scientific development.

Conclusion: Data sharing policies were uncommon among Korean scholarly journals. The advantages and disadvantages of adopting such policies should be discussed more actively among editors and researchers. Furthermore, data sharing infrastructure and training courses are required for data sharing policies to be established in scholarly journals in Korea.

Keywords

Data availability; Journal editor; Knowledge; Republic of Korea

Received: February 4, 2019

Accepted: February 10, 2019

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Introduction

Data sharing is the practice of making data used for scholarly research available to other investigators. Funding agencies in Korea still do not consider data sharing policies as part of their decision-making process, whereas the United States National Institutes of Health (NIH) recommends data sharing, as follows [1]:

In NIH's view, all data should be considered for data sharing. Data should be made as widely and freely available as possible while safeguarding the privacy of participants, and protecting confidential and proprietary data. To facilitate data sharing, investigators submitting a research application requesting \$500,000 or more of direct costs in any single year to NIH on or after October 1, 2003 are expected to include a plan for sharing final research data for research purposes, or state why data sharing is not possible.

The United States National Science Foundation (NSF) also recommends data sharing policies, as follows [2]:

Investigators are expected to share with other researchers, at no more than incremental cost and within a reasonable time, the primary data, samples, physical collections and other supporting materials created or gathered in the course of work under NSF grants.

Furthermore, the International Committee of Medical Journal Editors (ICMJE) recommends a data sharing statements follows [3]:

ICMJE will require the following as conditions of consideration for publication of a clinical trial report in our member journals: As of July 1, 2018 manuscripts submitted to ICMJE journals that report the results of clinical trials must contain a data sharing statement as described below. Clinical trials that begin enrolling participants on or after January 1, 2019 must include a data sharing plan in the trial's registration. The ICMJE's policy regarding trial registration is explained at www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html. If the data sharing plan changes after registration this should be reflected in the statement submitted and published with the manuscript, and updated in the registry record.

ICMJE's data sharing statement and data sharing plan is different with general data sharing policy of NIH or NSF, which is not a recommendation of but a statement or plan of data sharing. It is believed that data sharing policies can be beneficial for researchers, as data sharing enables the replication of data analysis and the use of other analytical methodologies for the same data. Biomedical researchers who work on DNA or

protein sequences are already expected to submit their data to National Center for Biotechnology Information (NCBI) databases, including GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>). Therefore, this NCBI database has become invaluable for the study of genes and proteins. Ecological data sharing appeared in the 1950s and became a prerequisite for acquiring funding from a number of funding agencies. As a result, the big data provided by Global Biodiversity Information Facilities or the National Ecologic Observatory Network have become essential to ecological researchers [4].

Besides the data sharing policies of specific research groups or funding agencies, a 2011 report described the adoption of data sharing policies by high-impact factor journals [5]. Of the analyzed journals, 88% had a statement regarding a data sharing policy; however, there was wide variation in the level of the requirements. Since 2016, medical editors of Korean journals that follow ICMJE recommendations have begun to adopt data sharing policies [6]. However, it is unknown how many journals in Korea have adopted a data sharing policy. Furthermore, it is still uncertain whether such policies are a trend in scientific journal publishing beyond the medical field, and no consensus exists among scholarly journal editors throughout the world on the adoption of data sharing policies beyond the clinical data sharing policies found in the medical field. Although data sharing policies remain an unfamiliar concept to some editors of journals in non-medical fields in Korea, it is time for journal editors to consider and discuss such policies.

This study aimed to analyze the present status of adoption of data sharing policies and attitudes towards such policies among editors of scholarly journals published in Korea through a web-based survey. The findings may provide a reasonable and effective basis for introducing data sharing policies to scholarly journals. As a null hypothesis, we hypothesized that there would be no difference in the adoption of data sharing policies across research fields.

Methods

Ethics approval: An anonymous web-based survey was used in this study. It was not possible to identify personal information; furthermore, the survey focused on journal policies. During the survey, no identifiable or sensitive information was collected. Therefore, informed consent was not required according to Korean law [7].

Study design: This study had a cross-sectional and observational design based on a questionnaire survey.

Setting/participants: From December 26, 2018 to January 3, 2019, a survey was distributed to 1,055 persons who were listed in the member directories of both the Korean Council of

Science Editors and the Korean Federation of Science & Technology Societies. The recipients invited to take the survey via email were either journal editors or societies' official email recipients. A Google survey was used. The survey site was <http://bit.ly/2GwuisA>. Survey items included follows: (1) field, (2) role, (3) gender, (4) year of work experience, (5) language of journal, (6) year of launch of journal, (7) status of data sharing policy, (8) reasons for (not) adopting a data sharing policy, (9) plans to adopt a data sharing policy, and (10) further opinions.

Validity and reliability of the acceptability questionnaire: The 4 items that gathered information on subjects' characteristics and the 3 items that collected journal information were basic items that were not subject to bias. We were not able to identify studies in the literature describing the results of surveys of editors about data sharing policies. However, a previous study presented survey results on sharing of clinical trial data from clinical trialists, although the 32 items used in the survey were focused on clinical trialists, not editors [8].

The questionnaire items on editors' reasons for adopting or not adopting a data sharing policy, their plans to adopt such a policy, and further opinions were agreed upon as suitable for the aims of the survey through a discussion among the 3 co-authors of this study. Since the responses to items were not on Likert scales, a reliability test was not done.

Variables: The variables related to the characteristics of respondents and their journals are listed in Table 1. The questionnaire items were considered to be the outcome.

Data sources/measurement: The source of all variables was response data from the survey questionnaire. The measurement method was a comparative analysis.

Bias: There was no noteworthy source of bias during the collection of the survey results or the analysis.

Study size: The sample size ($n = 100$) was 9.5% of all invited subjects. If the effect size was set to 0.7; alpha error probability, 0.05; power, 0.95; and estimated allocation ratio, 1, an adequate sample size for a comparative analysis was estimated as 90 based on GPower ver. 3.1.9.2 [3].

Quantitative variables: All variables were nominal and quantitative. There was no qualitative analysis.

Statistical methods: A descriptive analysis was carried out. The respondents were compared by research field using DB-STAT ver. 5.0 (DBSTAT Co., Chuncheon, Korea), available from <http://dbstat.com>.

Results

All responses from the subjects and the coded content are available in Dataset 1. The characteristics of the 100 respondents and information about their journals are summarized

Table 1. Characteristics of respondents and their journals (from 100 Korean editors)

Item	Option	Number
Fields	Medical/health	54
	Engineering	22
	Natural science	13
	Agricultural science & fisheries	6
	Social science & humanities	3
	Multi-disciplinary	2
Role	Editor	93
	Associate editor	4
	Managing editor	1
	Editorial assistant	2
Sex	Male	71
	Female	29
Experience in current role	Less than 1 yr	8
	1–2 yr	12
	3–6 yr	36
	Over 6 yr	44
Language of journal	English	52
	English or Korean	33
	Korean	15
	Other	0
Year of launch	1945–1949	1
	1950–1959	5
	1960–1969	10
	1970–1979	15
	1980–1989	24
	1990–1999	13
	2000–2009	24
2010–present	8	
Present data sharing policy	Yes	13
	No	87

in Table 1. Medical/health editors comprised 54% of the respondents. The vast majority of the respondents were editors (93%). There were more men (71%) than women. Most respondents (80%) had served in their role for over 2 years, and as many of 44% of editors reported having over 6 years of editorial experience for their journal. Fifty-two percent of the journals had an English-only language policy, and 69% were launched in 1980 or later. Thirteen journals had already adopted a data sharing policy at the time of the survey. As shown in Fig. 1, 76.9% of those journals were in the medical/

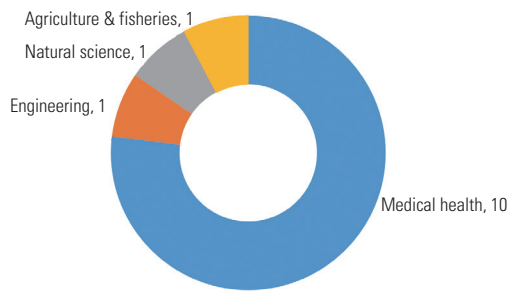


Fig. 1. Fields of the 13 journals in Korea that have adopted a data sharing policy.

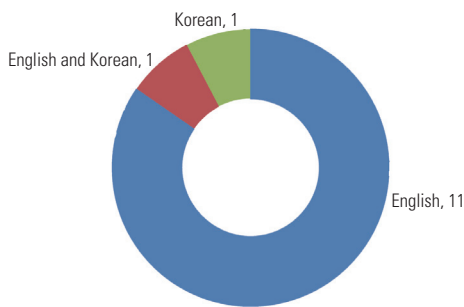


Fig. 2. Language of the 13 journals in Korea that have adopted a data sharing policy.

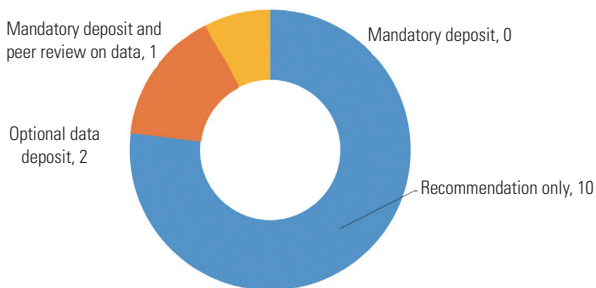


Fig. 3. Strength of the data-sharing policies of the 13 journals in Korea with such a policy.

health field. Of the 13 journals with a data sharing policy, 11 were published only in English (Fig. 2). Although a comparative analysis of the proportion of journals that had adopted a data sharing policy according to field was done, it was difficult to reach any conclusions about whether differences were statistically significant due to the lack of a normal distribution of the data from each field. However, our findings indicate that journals in the medical/health field had adopted data sharing policies more broadly than those in other fields. The strength of the data sharing policies is presented in Fig. 3. The data sharing policies were recommendation-only in the majority of cases (76.9%) in Korea. The reasons for adopting data

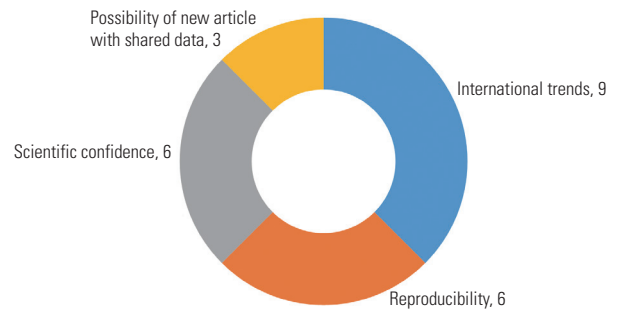


Fig. 4. Reasons for adopting a data sharing policy, among the 13 journals in Korea with such a policy.

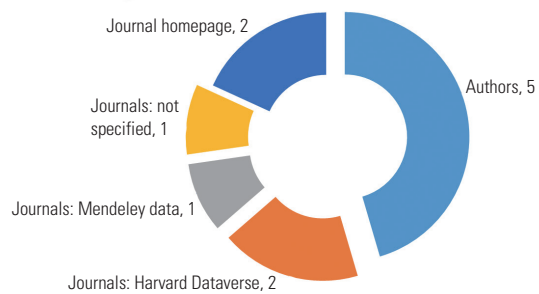


Fig. 5. Who has the responsibility for data deposit and which repository sites are used by the journals in Korea that have adopted a data sharing policy.

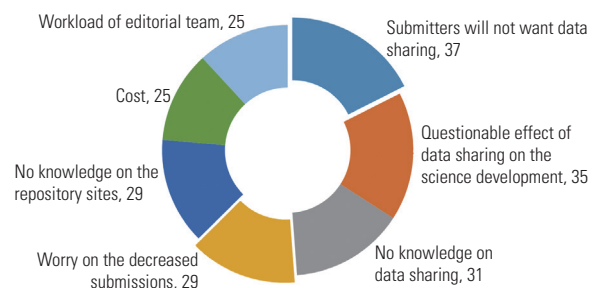


Fig. 6. Reasons for not adopting a data sharing policy, among the 87 journals in Korea with no such policy.

sharing policies are shown in Fig. 4; multiple choices were possible, but the main reasons were reproducibility (6) and scientific confidence (6). Other reasons included increased brand value and protection against falsification or fabrication. The repository sites were selected by the authors (5) or journals (4), and in 2 cases, the data were deposited on the journal's homepage (2). The repository sites chosen by the journals were the Harvard Dataverse (2) and Mendeley Data (1); in the remaining case, the repository site was not clear (Fig. 5).

The reasons for not adopting a data sharing policy are listed in Fig. 6. The following reasons were the most frequent responses: submitters will not want to share their data (37); the

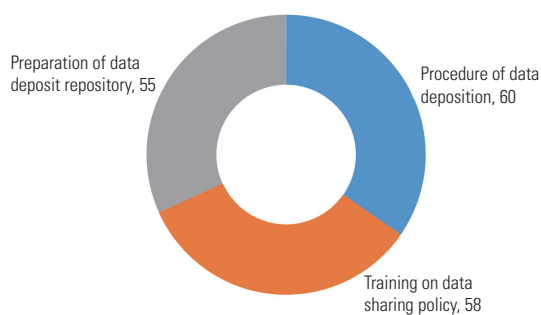


Fig. 7. Factors identified as necessary for editors to establish data sharing policies in Korea.

questionable effect of data sharing on scientific development (35); and a lack of knowledge on data sharing (31). Some of other reasons not listed in Fig. 6 included copyright problems and the lack of critical consideration by the society. Of the 87 editors of journals that had not adopted a data sharing policy, 36 had a plan to adopt such a policy, while 49 said that they had no plan to do so. Two editors did not respond to this item. Fig. 7 shows the editors' responses regarding factors that would be necessary for data sharing policies to be established (multiple choices were possible). Preparation of a data deposit repository (55), data deposit procedures (60), and training on data sharing policies (58) were selected by 87 editors. Other desires included budget preparation and a process of agreement within the society.

Discussion

Key results: Thirteen of the 100 respondents reported that their journal had adopted a data sharing policy (Figs. 1, 2). The data sharing policies were recommendation-only in most cases (76.9%) (Fig. 3). Three journals mentioned a data repository: two Harvard Dataverse and one Mendeley Data (Fig. 5). Data sharing policies are still unfamiliar to some Korean editors (31%) (Fig. 6). Of the 87 editors whose journals had not adopted a data sharing policy, 41.2% had a plan to adopt such a policy.

Interpretation and suggestions: We found daunting circumstances regarding data sharing policies in scholarly journals in Korea. In contrast, numerous well-known foreign journals have adopted data sharing policies. For example, a previous study assessed the presence of data sharing and code sharing policies in 170 journals in the categories of mathematical and computational biology, statistics and probability, and multidisciplinary sciences in Web of Science, with the following results: "of 170 journals, 38% had a data policy, 22% had a code policy, and 66% had a supplemental materials policy as of June 2012" [9]. Editors also should decide the strength of the

policy. If it is only a recommendation, it is difficult to recruit enough submissions with shared data. Among the respondents, only one journal editor stated that the shared data were reviewed for studies at the present time. Furthermore, data files must be reviewed in light of the following considerations: who submits the data; for how long the data will be shared; where the data will be deposited; what portion of the data will be deposited; and what format of data will be deposited. No consensus exists regarding data format in a variety of fields, except for gene and protein data, which should be deposited at the NCBI. Journal editors should jointly discuss a standardized format. Some editors mentioned the possibility of new articles based on shared data (Fig. 4). Work to clarify the merits of this possibility should be encouraged. For example, if analyses of shared data are included more often in meta-analyses or systematic reviews, that would potentially provide evidence for the merits of data sharing policies. Only three editors deposited data to repository sites such as the Harvard Dataverse or Mendeley Data (Fig. 5). According to Korean law, limitations exist on transferring sensitive information of human subjects to data repositories in foreign countries; such information includes "ideologies, beliefs, admission to or withdrawal from a trade union or political party, political opinions, health, sexual life, and other personal information that is likely to threaten the privacy of any data subject noticeably" based on the Enforcement Decree of the Personal Information Protection Act [10]. Although legal debates continue regarding the definition of sensitive information, it would be preferable to provide a public data repository site in Korea to avoid these legal issues.

Lack of knowledge about data sharing policies and data repository were frequently reported reasons for not adopting such policies; the frequency of these responses suggests that some editors were not aware of data sharing policies (Fig. 6). It is time to inform them about such policies through training courses or workshops organized by editors' organizations, such as the Korean Council of Science Editors. Before deciding whether or not to adopt a data sharing policy, the advantages and disadvantages of doing so should be discussed actively among editors and researchers at editors' workshops. Some funding agencies, including the US NIH, recommend a data sharing policy, although it is not currently mandatory. Furthermore, the ICMJE recommendation regarding clinical data sharing is not mandatory. It requires a statement by authors indicating whether the data may be shared. Therefore, if authors do not want to share their data, it is acceptable to state that decision in the data sharing statement. However, if authors want to share their data, editors and publishers should consider an appropriate data repository and ensure data review. It may be challenging to introduce such policies if tech-

nical difficulties emerge during adoption. To remove technical barriers, editors and publishers should also receive appropriate training.

Limitations: The data were not collected from randomly selected samples. There may be non-response bias. Therefore, it is difficult to state that the results of this study represent the current situation in all science journals in Korea. Second, only 13 respondents stated that their journal had a data sharing policy. Therefore, it was challenging to conduct a comparative analysis according to characteristics of the respondents or their journals due to the non-normal distribution of the data. The null hypothesis that there would be no difference in the adoption of data sharing policies across research fields could not be rejected due to the non-normal distribution of the sample.

Generalizability: Since the sample was not randomized, care should be taken when extrapolating our findings to represent all scholarly journals in Korea. There are 643 scientific journals in Korea according to the Korea Citation Index, available from: https://www.kci.go.kr/kciportal/po/statistics/poStatisticsMain.kci?tab_code=Tab1 (cited 2019 Feb 4). More intensive data collection is necessary to characterize the present situation. The data described the present situation and trends in the adoption of data sharing policies by journals in the near future. According to our results, the possibility of such policies being adopted is promising.

Conclusion: Publishing societies and organizations in Korea should decide whether to adopt a data sharing policy. According to our results, only 13% of journals had adopted such a policy and 49% of editors did not have a plan to do so. Before making such decisions, training courses on data sharing are required in order to help editors understand such policies more lucidly. Furthermore, infrastructure (such as establishment of a domestic data repository) is also required to support editors who would like to adopt such a policy.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Data Availability

Dataset 1. Response data of the questionnaire survey and the content of coding is available from the Harvard Dataverse at: <https://doi.org/10.7910/DVN/F41EQP>.

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Network analysis of scientific collaboration in North Korea

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Abstract

Purpose: Although North Korea invests in scientific research, few selected research results are published to international journals. However, the latest peaceful political developments around North Korea have increased concerns about how they will support international scientific cooperation. This study aims to analyze the scientific collaboration and intellectual structure of North Korean researchers.

Methods: We conducted a co-word analysis with author keywords and author names using the Web of Science records for 1976–2018 to observe the changes in research trends in North Korea. The structure of the median centrality of words and the parallel nearest neighbor clustering methods were used to visualize the results.

Results: The analysis of 55 final keywords confirms that the corresponding network is composed of 17 sub-clusters under four areas. As a result of the investigation of 56 final author names, the corresponding network is composed of 15 sub-clusters under four areas.

Conclusion: As more accurate information is needed about collaboration partners to ensure successful cooperation, this analysis result can support getting an overview of North Korea's research community and their research network.

Keywords

Co-word analysis; Network analysis; North Korea; Scientific collaboration; Scholarly communication analysis

Received: January 22, 2019

Accepted: February 8, 2019

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Introduction

North Korea has maintained a very secretive status and remains isolated globally. Although North Korea has invested in scientific research, few selected research results have been published in international journals. However, North Korean leader Kim Jong-un announced that he intends to boost North Korea's economy through science and education by having 'a scientific and technical power and a talent power' at a China visit in April 2018 [1]. With this movement, some scientists expect North Korea to open the door for more international research collaboration.

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There have been mentions of North Korea's position and research areas in specific academic fields. However, very few studies have examined research articles published by North Korean researchers with bibliometric analysis [2-4]. Bibliometric analysis is a research method that helps to clarify research trends and specific research areas within a particular academic field. However, bibliometric research about North Korea has some challenges due to the small number of published articles and the misclassification of various names for South Korea and North Korea [2]. As North Korea may be known as the Democratic People's Republic of Korea, North Korea, DPRK, or DPR Korea, the author searched for "North Korea," "DPR Korea," and "North Korea" in the address field on the Web of Science [3]. Jeong and Huh [4]'s study result showed that Kim Il Sung University researchers had published the most articles and their main areas of research were physics, mathematics, materials science, chemistry, and engineering. China, Germany, and Australia were the main cooperating countries and the funding agencies were mainly Chinese. However, these studies primarily used quantitative and suggested statistical results.

In this paper, network analyses with author keywords and the co-authors of articles that were published by North Korean researchers are conducted. The limited number of published articles from North Korea means that co-word analysis and co-author analysis, which identify patterns in sub-areas with titles, abstracts, and keywords, would be a better methodology than citation analysis. From this result, visualized networks of core subject areas and primary authors of North Korea could be presented. This could bring a more in-depth view from learning more about science research in North Korea by analyzing the North Koreans' scientific literature. Furthermore, this study result could provide the possibility of cooperation for those looking for opportunities to enter into research collaborations with North Korean researchers.

Methods

In this study, co-word analysis is carried out to identify the intellectual structure of studies from North Korea. All available data from Core Collection of Science Citation Index Expanded, Social Science Citation Index, and Arts & Humanities Citation Index in the Web of Science were collected and analyzed. Detailed information of published articles for 1976–2018 was collected through a country code search using the keyword "North Korea" (Dataset 1). After that, author keywords and the authors of each data were extracted to perform co-word analysis. To visualize the results, the structure of the median centrality of words and the parallel nearest neighbor clustering (PNNC) analysis of words were observed. The

same process was conducted with author names.

Basic preprocessing and information extraction of data were performed with Bibexcel ver. 2014-03-25 (Persson O, available at: <https://homepage.univie.ac.at/juan.gorraiz/bibexcel/index.html>). In addition, COOC, which is a co-occurrence matrix generation program, and WNET (Lee JY, Seoul, Korea), which performs weighted network analysis, were used to obtain matrices for co-occurrence matrices, determine weighted network centrality through co-occurrence analysis using author keywords, and extract authors from the data. In addition, the network was visualized through NodeXL (Microsoft, Seattle, WA, USA) to understand its structure and scholarly communication.

First, to understand the detailed subjects and scholarly relations among authors in a field, a country code search was conducted with the keyword "North Korea." As a result, 638 data was collected in total as of December 6, 2018. There is some misclassification of papers among South Korea and North Korea, so the authors' affiliation addresses were checked manually.

Second, author keywords (DE: Author Keywords) and authors' full names (AF: Author's Full Name) were extracted using Bibexcel for co-word and co-author analysis. The collected keywords and names were capitalized with the first letter of each word. The number of keywords and names were defined with frequency of 3 and 5 respectively. Fifty-five keywords and 57 authors were selected as the final data for co-occurrence analysis as shown in Table 1.

Third, in the case of authors with a family name, data were collected with the full registered names to prevent other names being misidentified as the same author when initialized. As a result, 2,156 author names in total were identified. Afterward, for the convenience of analysis, only the authors of frequency ≥ 5 were considered as the final analysis targets. Only those 59 authors were manually rechecked and one author whose full name and initials were confirmed was revised, finally confirming the final author list with 56 authors (Table 2).

In a co-occurrence matrix that applies the frequency, relationships do not appear between the key node and the non-key node [5]. Therefore, it is not suitable for network analysis when it needs to express the weight of the strength's connection [6]. For network analysis in this paper, second-order Pearson's correlation coefficient matrix (Pearson's matrix) was used.

Pearson's matrix can measure the similarity of co-occurrence patterns between two keywords and a third keyword [7]. The result of the Pearson's correlation coefficient has a value between 1 and -1, where 1 indicates entirely related, 0 means that there is no association, and -1 means that they are completely inversely related. The higher the value, the higher the topic relevance between the two words and lower the value, the lower their connection.

Network analysis was performed to visualize the relationship between the keywords and authors to classify them into clusters according to similarity. For this, the Pathfinder network (PFNet) technique was applied to Pearson's matrix and a network was constructed that left only essential links for each node. Afterward, PNNC was applied to subdivide the networks and the NodeXL program was used for visualization.

Results

Keyword network analysis

Analyzing the PNNC cluster of the co-occurrence word network using the Pearson's matrix obtained from the 55 final

keywords confirmed that the corresponding network was composed of 17 sub-clusters under four areas as shown in Table 3.

To identify the relationship between keywords, the PFNet was applied to Pearson's matrix. Afterward, two types of centrality were measured to clarify which node is the main or core node within the network. First, the relative Triangle Betweenness Centrality (rTBC) is the centrality that measures a broad relationship by connecting other keywords and influential positions within the network. Second, relative Nearest Neighbor Centrality is the centrality of how much of an intermediary role it plays among other nodes within the network. The top 10 keywords for each centrality were compared to corroborate the core keywords (Table 4). Due to having the

Table 1. Fifty-five final keywords with frequency >3

No.	Name	Frequency	No.	Name	Frequency
1	Incline matrix	7	29	Surface roughness	3
2	Sers	6	30	Sphalerite	3
3	Incline	6	31	Pressure boundary condition	3
4	North Korea	6	32	Ent-kaurane	3
5	Korean peninsula	5	33	Iterated function system (Ifs)	3
6	Quantum dot	5	34	Ti ₂ AlN _b -based alloy	3
7	Mixed boundary condition	5	35	Democratic People's Republic of Korea	3
8	Pahs	5	36	Surface plasmon resonance	3
9	Existence	5	37	Metal nanocomposites	3
10	Navier-Stokes equations	5	38	Korea	3
11	Ionic liquid	5	39	Variable exponent	3
12	Mechanical properties	5	40	Lattice matrix	3
13	Keratin	4	41	Compressible Navier-Stokes equations	3
14	Stability	4	42	Xlpe cable insulation	3
15	Microstructure	4	43	Surface plasmons	3
16	Electronic structure	4	44	Labiatae	3
17	Serds	4	45	Cloud computing	3
18	Cosmology of theories beyond the standard model	4	46	Uniqueness	3
19	Switching	4	47	Water treeing	3
20	Water	4	48	Density functional theory	3
21	Integrated pest management	4	49	China	3
22	Surface plasmon	4	50	Conjugate symmetry	3
23	Plutella xylostella	3	51	DPRK	3
24	Pieris rapae	3	52	Spark plasma sintering	3
25	Waveguide	3	53	Fe ₂ TiSi	3
26	MCM-41	3	54	Fe ₂ TiSn	3
27	Hydroxyethyl starch	3	55	Fractal interpolation function	3
28	Water hammer	3			

Table 2. Fifty-six final author names with frequency ≥ 5

No	Name ^{a)}	Frequency	University	Department	Country
1	Choe Chunsik	7	Kim Chaek University of Technology		North Korea
2	Han Song Chol	14	Kim Chaek University of Technology	Math	North Korea
3	Jang Yong Man	6	Kim Chaek University of Technology	Nat Sci Ctr	North Korea
4	Jin Hak Son	6	Kim Chaek University of Technology		North Korea
5	Ju Hyonhui	5	Kim Chaek University of Technology	Dept Math	North Korea
6	Ju Kyong Sik	5	Kim Chaek University of Technology	Inst Adv Sci	North Korea
7	Kim Chol Jin	6	Kim Chaek University of Technology	Dept Chem	North Korea
8	Kim Nam Chol	13	Kim Chaek University of Technology	Dept Phys	North Korea
9	Choe Song Il	5	Kim Chaek University of Technology	Dept Phys	North Korea
10	Ho Kum Song	6	Kim Chaek University of Technology	Dept Phys	North Korea
11	Ko Myong Chol	7	Kim Chaek University of Technology	Dept Phys	North Korea
12	Ri Chol Song	6	Kim Chaek University of Technology	Dept Phys	North Korea
13	Sin Chung Sik	6	Kim Chaek University of Technology	Dept Phys	North Korea
14	Sin Jun Sik	7	Kim Chaek University of Technology	Dept Phys	North Korea
15	Im Song Jin	17	Kim Chaek University of Technology	Dept Phys	North Korea
16	Ryo Hyok Su	7	Kim Chaek University of Technology	Dept Phys	North Korea
17	Yu Chol Jun	19	Kim Chaek University of Technology	Mat Sci Dept Computat Mat Design	North Korea
18	Jong Un Gi	9	Kim Chaek University of Technology	Mat Sci Dept Computat Mat Design	North Korea
19	Ri Gum Chol	10	Kim Chaek University of Technology	Mat Sci Dept Computat Mat Design	North Korea
20	Sim Kyong Ho	6	Kim Chaek University of Technology	Dept Mat Engr	North Korea
21	Choe Song Hyok	7	State Academy of Sciences	Inst Lasers	North Korea
22	Hong Hakho	6	State Academy of Sciences	Inst Math	North Korea
23	Kim Ds	6	State Academy of Sciences	DPRK INST BOT	North Korea
24	Kwon Yong Hyok	7	State Academy of Sciences	Inst Lasers	North Korea
25	Kim Jongnam	10	State Academy of Sciences	Inst Geol	North Korea
26	Kim Kwang Hyon	19	State Academy of Sciences	Inst Lasers	North Korea
27	Kim Myongchol	10	State Academy of Sciences	Inst Geol	North Korea
28	Yang Jonghyok	10	State Academy of Sciences	Inst Geol	North Korea
29	Kim Tujin	8	State Academy of Sciences	Inst Math	North Korea
30	Choe Chol Ung	8	University of Science	Dept Phys	North Korea
31	Li Hx	8	Beijing Normal University	Dept Math	Peoples R China
32	Wang Guofeng	7	Jilin University	Coll Elect Sci & Engr	Peoples R China
33	Li Lin	6	Northeastern University	Coll Sci	Peoples R China
34	Jiang Pingkai	10	Shanghai Jiao Tong University	Dept Polymer Sci & Engr	Peoples R China
35	Li Jian Bo	9	Cent South University	Forestry & Technol	Peoples R China
36	Zhang Yanbin	6	Chinese Academy of Sciences	Inst Geol & Geophys	Peoples R China
37	Ri Songil	5	Jilin University	Sch Math Sci	Peoples R China
38	Kang Jin U	12	Nanjing University	Dept Phys	Peoples R China
39	Duan Jingkuan	5	Shanghai Jiao Tong University	Shanghai Key Lab	Peoples R China
40	Huang Xingyi	5	Shanghai Jiao Tong University	Shanghai Key Lab	Peoples R China
41	Kim Chonung	11	Shanghai Jiao Tong University	Shanghai Key Lab	Peoples R China
42	Chang Xulu	8	Wuhan University	Coll Life Sci	Peoples R China
43	Fang Chengxiang	8	Wuhan University	Coll Life Sci	Peoples R China
44	Hao Zhong Hua	6	Wuhan University	Sch Phys & Technol	Peoples R China
45	Jiang Fan	7	Wuhan University	Coll Life Sci	Peoples R China
46	Peng Fang	10	Wuhan University	Coll Life Sci	Peoples R China
47	Ren Lvzhi	6	Wuhan University	Coll Life Sci	Peoples R China
48	Wang Qu Quan	8	Wuhan University	Sch Phys & Technol	Peoples R China
49	Zhang Yumin	9	Wuhan University	Coll Life Sci	Peoples R China
50	Zheng Congyi	5	Wuhan University	Coll Life Sci	Peoples R China
51	Darvin Maxim E	8	Charité - Medical University Berlin	Dept Dermatol Venerol & Allergol	Germany
52	Lademann Juergen	7	Charité - Medical University Berlin	Dept Dermatol Venerol & Allergol	Germany
53	Herrmann Joachim	13	Max Born Institute	Nonlinear Opt & Short Pulse Spectro	Germany
54	Husakou Anton	7	Max Born Institute	Nonlinear Opt & Short Pulse Spectro	Germany
55	Kronfeldt Heinz Detlef	6	Technical University of Berlin	Inst Opt & Atom Phys	Germany
56	Jong Kwanghyok	5	Abdus Salam International Centre for Theoretical Physics		Italy

^{a)}Family name first.

Table 3. Parallel nearest neighbor clustering cluster grouping of keywords within the network

Area	Sub-cluster	Keyword	Area	Sub-cluster	Keyword	
A	1	Incline	D	12	Keratin	
		Incline matrix			Pahs	
		Lattice matrix			Serds	
B	2	Compressible Navier-Stokes equations			Sers	
		Stability			Water	
B	3	Quantum dot			13	DPRK
		Surface plasmon				North Korea
C	4	Switching			14	China
		Waveguide				Cloud computing
		Existence				Conjugate symmetry
C	5	Mixed boundary condition			15	Cosmology of theories beyond the standard model
		Variable exponent				Density functional theory
		Navier-Stokes equations	Electronic structure			
D	6	Pressure boundary condition	16	Hydroxyethyl starch		
		Uniqueness		Ionic liquid		
		Mechanical properties		Korea		
D	7	Microstructure	17	Korean peninsula		
		Democratic People's Republic of Korea		MCM-41		
		Integrated pest management		Sphalerite		
D	8	Pieris rapae	15	Surface plasmons		
		Plutella xylostella		Water hammer		
		Spark plasma sintering		Fractal interpolation function		
D	9	Surface roughness	16	Iterated function system (Ifs)		
		Ti ₂ AlN _b -based alloy		Metal nanocomposites		
		Ent-kaurane		Surface plasmon resonance		
D	10	Labiatae	17	Water treeing		
		Fe ₂ TiSi		Xlpe cable insulation		
		Fe ₂ TiSn				

Table 4. Centrality comparisons among top keywords within the network

Rank	Keyword	rTBC (0–1)	Rank	Keyword	rNNC (0–1)
1–14	China	0.53389	1–2	Pieris Rapae	0.05556
	Cloud Computing		3–9	Plutella Xylostella	0.05556
	Conjugate Symmetry			Existence	0.03704
	Cosmology Of Theories Beyond The Sm		Incline Matrix	0.03704	
	Density Functional Theory		Pressure Boundary Condition	0.03704	
	Electronic Structure		Serds	0.03704	
	Hydroxyethyl Starch		Sers	0.03704	
	Ionic Liquid		Ti ₂ AlN _b -Based Alloy	0.03704	
	Korea		Uniqueness	0.03704	
	Korean Peninsula				
	MCM-41				
	Sphalerite				
	Surface Plasmons				
	Water Hammer				

rTBC, relative Triangle Betweenness Centrality; rNNC, relative Nearest Neighbor Centrality.

Table 5. Parallel nearest neighbor clustering cluster grouping of authors within the network

Area	Sub-cluster	Author ^{a)}	Area	Sub-cluster	Author ^{a)}	
A	1	Jang Yong Man	C	9	Choe Chol Ung	
		Jong Un Gi			Han Song Chol	
		Ri Gum Chol			Hong Hakho	
		Yu Chol Jun			Jong Kwanghyok	
		Choe Song Hyok			Ju Hyonhui	
	2	Herrmann Joachim		Kang Jin U		
		Husakou Anton		Kim Ds		
		Kim Kwang Hyon		Kim Tujin		
		3		Ho Kum Song	Li Hx	
				Im Song Jin	Li Lin	
	Ri Chol Song			Ri Songil		
	4	Choe Song Il		10	Duan Jingkuan	
		Hao Zhong Hua			Huang Xingyi	
		Kim Nam Chol			Jiang Pingkai	
		Ko Myong Chol			Kim Chonung	
Li Jian Bo		Choe Chunsik				
5	Wang Qu Quan	11	Darvin Maxim E			
	Sin Chung Sik		Lademann Juergen			
	Sin Jun Sik		Kronfeldt Heinz Detlef			
B	6	Kim Jongnam	13	Kwon Yong Hyok		
		Yang Jonghyok		Jin Hak Son		
		Zhang Yanbin		Kim Chol Jin		
	7	Chang Xulu	D	14	Ju Kyong Sik	
		Fang Chengxiang			Ryo Hyok Su	
		Jiang Fan			15	Sim Kyong Ho
		Kim Myongchol				Wang Guofeng
		Ren Lvzhi				
	8	Zheng Congyi				
		Peng Fang				
		Zhang Yumin				

^{a)}Family name first.

Table 6. Centrality comparisons among the top authors within the network

Rank	Author	rTBC (0–1)	Rank	Author	rNNC (0–1)
1–11	Han Song Chol	0.56431	1–5	Yu Chol Jun	0.05455
	Kang Jin U			Kim Nam Chol	
	Choe Chol Ung			Jiang Pingkai	
	Li Hx			Chang Xulu	
	Kim Tujin			Fang Chengxiang	
	6–10		Kim Ds	Yang Jonghyok	0.03636
			Li Lin	Kim Jongnam	
			Hong Hakho	Darvin Maxim E	
			Ri Songil	Husakou Anton	
			Jong Kwanghyok	Ho Kum Song	
	Ju Hyonhui	0.56431			

rTBC, relative Triangle Betweenness Centrality; rNNC, relative Nearest Neighbor Centrality.

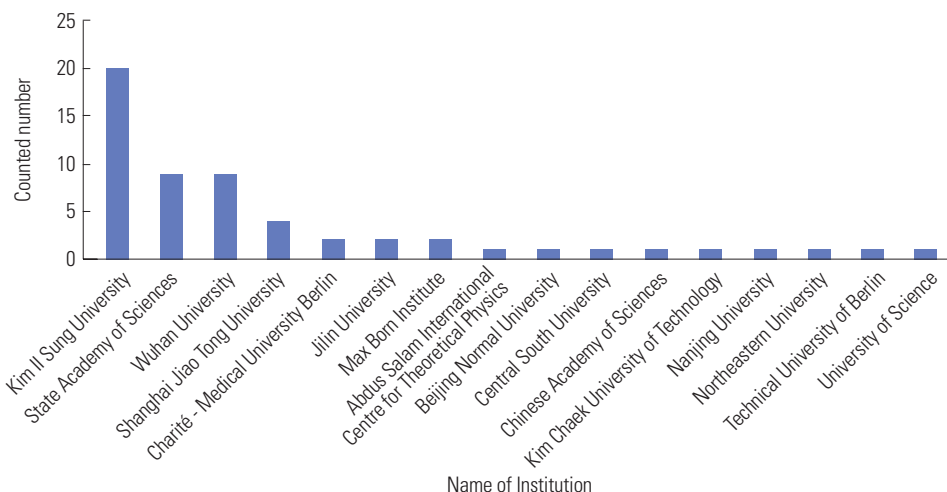


Fig. 2. The institution distribution of authors within the network.

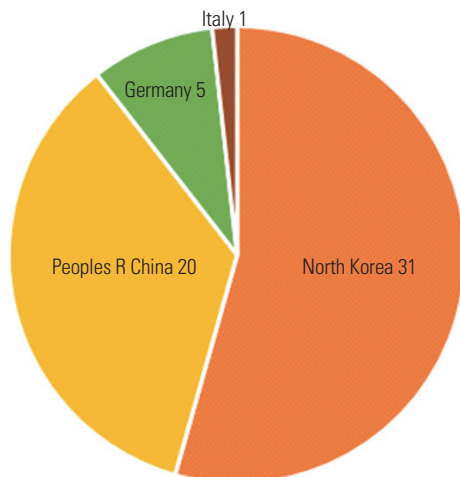


Fig. 3. The country distribution of authors within the network.

same ranks, 14 and nine keywords were analyzed for each centrality.

For visualization, the rTBC of keywords was set to the size of the nodes. In addition, to express the PNNC cluster, the areas were set with the shape of the node and the clusters were to the color of the node (Fig. 1).

Author network analysis

The results of analyzing the PNNC cluster of the co-occurrence word network using the Pearson's matrix obtained from 56 final authors confirm that the corresponding network is composed of 15 sub-clusters under four areas as shown in Table 5.

The same analysis that was used for keyword network analysis was conducted to identify the relationship between keywords. After applying PFNet to Pearson's matrix, rTBC and relative Nearest Neighbor Centrality were measured and the

top 10 authors for each centrality were compared (Table 6).

In addition, to clarify the distribution and relationships among the authors based on country and institution, author affiliation addresses were extracted (Figs. 2, 3).

For visualization, the rTBC of the author was set to the size of the nodes. In addition, to express the PNNC cluster, areas were set with the shape of the node and the clusters were the color of the node (Fig. 4). Number of publication in Fig. 5.

Discussion

North Korea is one of the most closed-off countries in the 21st century, even with its recent interactions with other nations. Although limited research articles by North Korean researchers have been published and are available to the public, bibliometric analysis can be useful for getting an overview of the academic intellectual structure in North Korea.

Based on the tendency of increasing publications from North Korea as shown in Fig. 5, it is expected that the North Korean government will encourage researchers to publish research results in international journals [3]. North Korean researchers have expanded their publications to more than 50 articles since 2015.

Although the country's research has focused on enhancing military strength, North Korean researchers have been publishing in other fields such as materials science, physics, and mathematics [8].

Based on keyword analysis results, the most researched academic topics were incline, compressible Navier-Stokes equations, quantum dot, switching, existence, Navier-Stokes equations, mechanical properties, Democratic People's Republic of Korea, spark plasma sintering, Ent-Kaurane, keratin, DPRK, China, fractal interpolation function, metal nanocomposites,

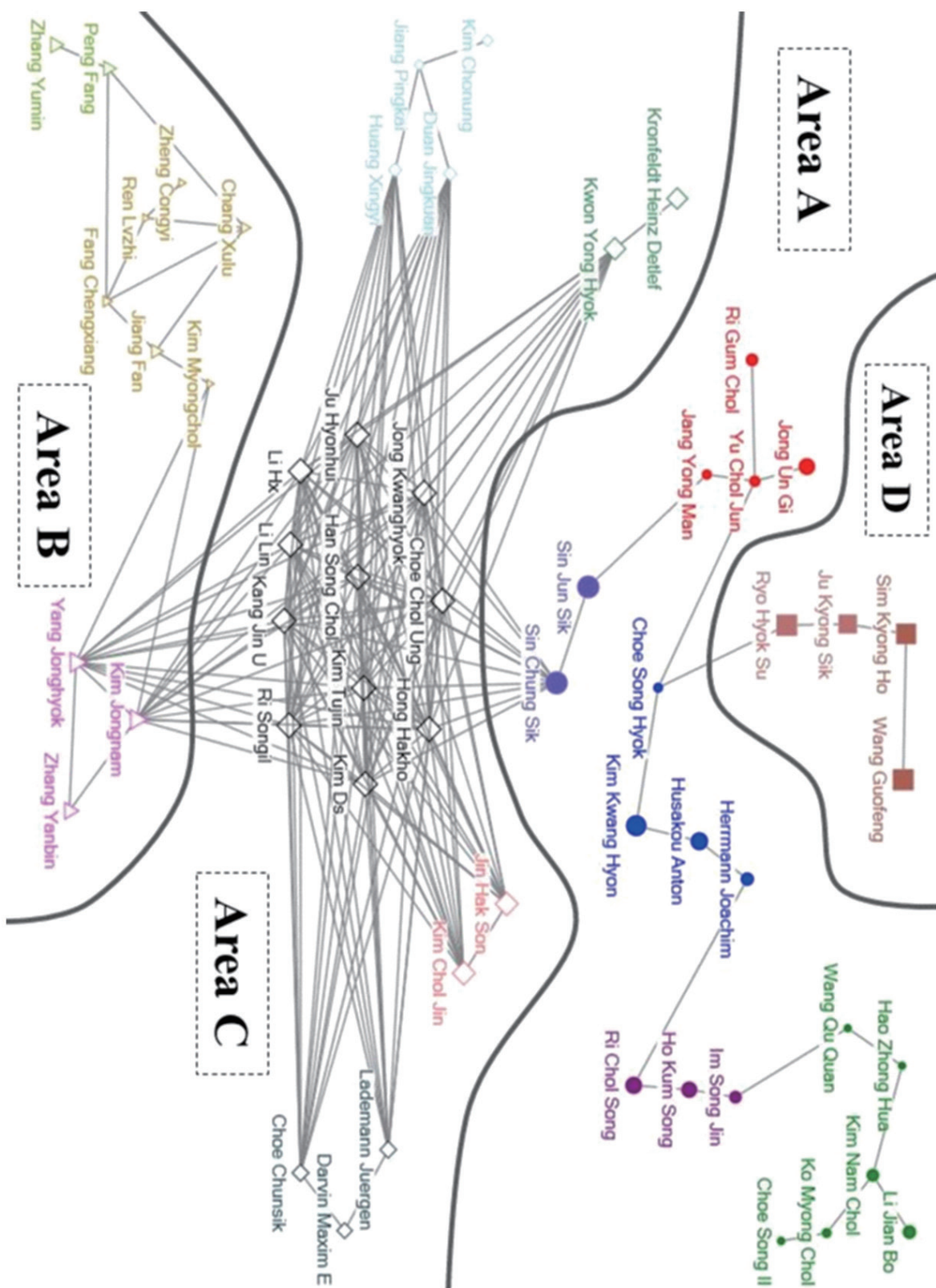


Fig. 4. Network visualization based on the parallel nearest neighbor clustering clusters with 57 authors.

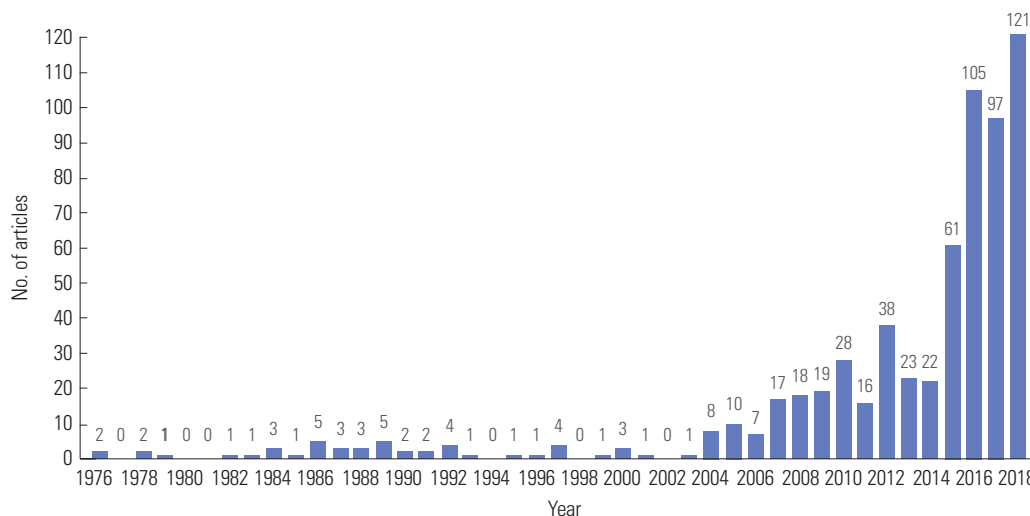


Fig. 5. Number of publication from North Korea searchable in Web of Science Core Collection by year.

Fe₂TiSi, and water treeing. The top three subject areas were mostly related to physics, chemistry, and mathematics.

The representative authors of sub-cluster were Jang Yong Man, Choe Song Hyok, Ho Kum Song, Choe Song Il, Sin Chung Sik, Kim Jongnam, Chang Xulu, Peng Fang, Choe Chol Ung, Duan Jingkuan, Choe Chunsik, Kronfeldt Heinz Detlef, Jin Hak Son, Ju Kyong Sik, and Sim Kyong Ho. Among these 15, eleven were from North Korea, three were from China, and one was from Germany. This shows that China most frequently conducts collaborative research with North Korea. All the eleven authors who have high betweenness centrality were included in C-9 sub clusters.

This study has some limitations: it lacks content analysis to clarify the specific relationships among subject areas and this study does not represent the research intellectual structure and author analysis within North Korea since this includes articles that were collaboratively created with foreign nations.

However, since very few studies have focused on North Korea's research areas and authors, the results can lead to further research focusing on domain-oriented study to explore North Korea's future research trends and changes.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Data Availability

Dataset 1. Original dataset for bibliometric scholarly network of North Korea is available from the Harvard Dataverse at: <https://doi.org/10.7910/DVN/273J7G>.

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Bibliographic and content analysis of physics papers from North Korea indexed in the Scopus from 2005 to 2018

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Abstract

Purpose: It aimed at assessing the current status of physics research in North Korea through a bibliographic and content analysis of the physics papers from North Korea indexed in the Scopus from 2005 to 2018.

Methods: The Scopus was searched on January 18, 2019 by using the search option 'Affiliation city' with "Pyongyang OR Chongjin OR Hamhung OR Sariwon OR Wonsan OR Kimchaek" as the city name and 171 physics papers from North Korea written in English were identified. By performing supplementary searches based on the author names and the references, 46 papers belonging to physics were added and the total of 217 papers were identified. They were classified by publication year, co-authors' country, institution, subfield, journal and author. Representative North Korean physicists and the active subfields of physics were identified.

Results: The number of physics papers from North Korea has been growing rapidly in the recent years. Physics research activities in North Korea were extremely centralized in its capital, Pyongyang, where all major research institutions were located. Major research areas included condensed matter physics, optics and high energy physics and the large majority of papers were theoretical ones. From a bibliographic and content analysis, sixteen representative or notable physicists in North Korea were identified.

Conclusion: It appears that the North Korean government is actively encouraging researchers to publish more papers in international journals. There is a strong growth potential in physics research in North Korea. In order to achieve balanced development in physics, it is an important task to build competitive experimental groups.

Keywords

Bibliography; North Korea; Physics research

Received: February 11, 2019

Accepted: February 12, 2019

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Introduction

North Korea is perhaps the most closed society in the current world. It has had little interaction with a large part of the outside world in many areas of human activities. This is also the case with academic activities, as we can see from the very small number of papers from North Korea published in international journals. Recently, Jeong and Huh performed the first extensive bibliometric analysis of North Korean publications in all academic disciplines indexed in the Web of Science Core Collection during the last forty years [1,2]. They also performed a bibliometric and content analysis of medical articles in the PubMed database published by North Korean authors during the last twenty years [3]. One of the findings from this study is that even though the total number of publications from North Korea is extremely small compared to more developed countries, it has been increasing fairly rapidly in recent years. In this article, we extend this line of study and perform a detailed bibliographic and content analysis of North Korean publications in the discipline of physics published during the last fourteen years, based on the search results of the Scopus database. We find the yearly variation of the number of papers and examine which foreign countries North Korean physicists have collaborated with. We identify major research institutions and the journals where multiple papers were published. We also classify the number of papers by various subfields of physics. Finally, we identify some representative North Korean physicists who have produced a substantial number of high-quality papers. In the Discussion, we comment on the current status and future prospect of physics research in North Korea.

Methods

We performed the search of the Scopus database on January 18, 2019. Initially, we used the Scopus search option 'Affiliation country' with "North Korea" as the country name. We found that this search yielded rather inaccurate results because many papers with South Korean affiliations were wrongly included. We also found that there were many reverse cases where North Korean institutions were searched as South Korean. By manually going through the affiliations of North Korean authors, we found that in almost all cases, the city where the institutions were located was Pyongyang, the capital city of North Korea. Through an extensive survey of the affiliations and additional searches, we found that except for Pyongyang, only five other North Korean cities, which were Chongjin, Hamhung, Sariwon, Wonsan and Kimchaek, appeared in the addresses of North Korean papers. Therefore, we used the Scopus search option 'Affiliation city' with

"Pyongyang OR Chongjin OR Hamhung OR Sariwon OR Wonsan OR Kimchaek" as the city name. We have found that this way of searching for North Korean papers is the most accurate method. Using this method, we found that before 2005, there were only a very small number of papers from North Korea. From 2005 to 2018, we found 791 North Korean papers in all academic disciplines, 190 of which were classified as belonging to the subject area of physics and astronomy according to the Scopus. Among these, 171 papers were in English and 19 were in Chinese.

We restricted our study only to the papers written in English. Through a careful survey of the references of the 171 English-language papers found above, we realized that there were a substantial number of missing papers and the classification by the subject area in the Scopus database was not sufficiently accurate. To correct this deficiency, we performed supplementary searches based on the author names in addition to finding missing physics papers manually from the references. With this procedure, we found 46 additional papers from North Korea, which clearly belonged to physics but were not included in our original search results. By adding these, we obtained our basic set of 217 papers.

Next, we conducted a detailed survey of the bibliographic data, such as authors, institutions, countries and journals and examined the content of each paper to determine which subfield of physics it belonged to and whether it was primarily theoretical or experimental. We classified the papers by publication year, co-authors' country, institution, subfield, journal and author. From this study, we identified some representative North Korean physicists and the subfields of physics in which active research was performed in North Korea.

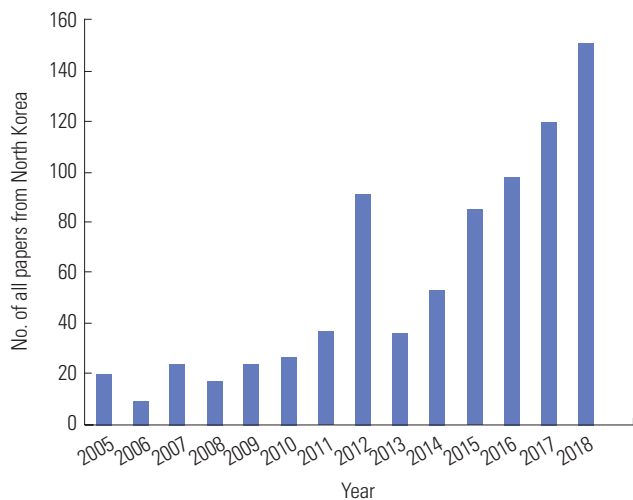
Results

In order to make a quantitative comparison between the number of publications from North Korea and that from South Korea, we first consider the search results obtained without the supplementary searches described in the Methods section. The number of North Korean papers in all fields published from 2005 to 2018 was 791. We compare this with the number of South Korean papers during the same period, which was 922,677. This number was obtained using the search option 'Affiliation country' with "Korea" as the country name and then subtracting 791 from the obtained result. We find that the number of papers from North Korea is merely 0.086% of that from South Korea as shown in Table 1. The ratio of the physics and astronomy papers from North Korea and those from South Korea during the same period is slightly higher and is equal to 0.121%. In order to find a more recent trend, we also calculated similar ratios for the papers

Table 1. Comparison between the numbers of all papers from South Korea and those from North Korea published during the period of 2005 to 2018 and during the period of 2016 to 2018

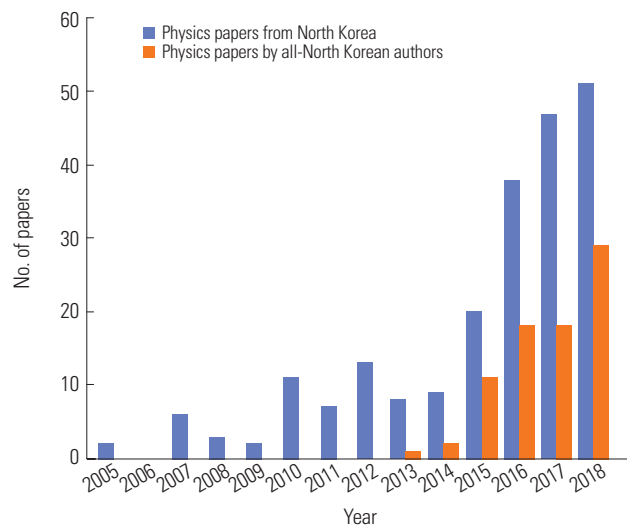
Period	No. of all papers from South Korea (A)	No. of all papers from North Korea (B)	100 B/A (%)	No. of physics and astronomy papers from South Korea (C)	No. of physics and astronomy papers from North Korea (D)	100 D/C (%)
2005-2018	922,677	791	0.086	157,617	190	0.121
2016-2018	251,262	368	0.146	36,475	98	0.269

Similar comparisons are made also for physics and astronomy papers.

**Fig. 1.** Yearly variation of all papers from North Korea.

published during the recent three years from 2016 to 2018. We find that the ratio for all papers and that for physics and astronomy papers have increased to 0.146 % and 0.269 % respectively. In Fig. 1 (Suppl. 1), we show the yearly variation of all papers from North Korea published from 2005 to 2018. We observe that the number has been increasing rapidly in recent years.

As we have explained in the Methods section, the classification of papers by subject area in the Scopus database is not very accurate. For example, we found 10 papers from North Korea published in the journal *Plasmonics*, which should clearly be classified as physics papers but were not included in the original search result. By performing the supplementary searches described in the Methods section, we corrected this deficiency and obtained the main set of 217 papers in the discipline of physics and astronomy, which we plotted in Fig. 2 by year (Suppl. 2). Only one of them was in the field of astronomy. We also identified the papers written by only North Korean authors and plotted them by year in Fig. 2. The total number of these all-North Korean papers with no international collaboration, which appeared only after 2012, was 79, which was about 36.4% of the total. We observe that both numbers have been increasing quite rapidly in the recent few

**Fig. 2.** Yearly variations of the number of all physics papers from North Korea and that of physics papers written by all-North Korean authors. The total number of all physics papers shown here, 217, is larger than the corresponding number in Table 1, 190, because we added the number of physics papers found by the supplementary searches described in the Methods section.

years. We found that nine physics papers from North Korea appeared already during the first half-month of 2019, though we did not include the data in this article. Using this number, we project that in 2019, over 100 physics papers from North Korea can appear in the Scopus. From such a rapid increase in the number of publications, we suspect that the North Korean government has an active policy to encourage researchers to publish more papers in international journals.

The majority of the 217 papers from North Korea were written in collaboration with other countries. In Table 2, we list the top five foreign countries to which the largest number of physics papers from North Korea are affiliated. Seventy-nine papers constituting 36.4% of the total were written by only North Korean authors and the rest 138 papers (63.6%) were written in collaboration with other countries. We find that China and Germany are the main partner countries of North Korea. China accounts for 37.8% and Germany accounts for 23% of the total papers respectively.

Table 2. Top five foreign countries to which the largest number of physics papers with North Korean authors are affiliated

Co-authors' country	No. of papers	Percentage in the total
China	82	37.8
Germany	50	23.0
Italy	4	1.8
USA	4	1.8
Russia	3	1.4
None (all-North Korean authors)	79	36.4

The numbers are compared with that of physics papers written by all-North Korean authors.

Table 3. Top seven institutions to which the largest number of physics papers are affiliated

Institution	No. of papers	Percentage in the total
Kim Il Sung University	131	60.4
University of Science	25	11.5
Institute of Lasers	25	11.5
Kimchaek University of Technology	22	10.1
Institute of Physics	8	3.7
Kim Hyong Jik Normal University	7	3.2
Institute of Mathematics	6	2.8

In addition, we counted the number of papers where a North Korean author is either the first author or the corresponding author. We found that in 172 papers, which were 79.3% of the total, a North Korean was the first author. In the cases where we can identify the corresponding author from the bibliographic data, we found that a North Korean was the corresponding author in 111 papers, which was about 51.2% of the total. We conclude that North Korean researchers have played a major role in the large majority of papers.

Physics research activities in North Korea seem to be extremely centralized in Pyongyang, the North Korean capital. In fact, 215 papers out of the total 217 are affiliated to Pyongyang. Chongjin and Hamhung appear respectively in two papers and Kimchaek appears in one paper. The sum of these numbers is greater than 217 due to some papers affiliated to multiple cities. Four institutions, which include Kim Il Sung University, University of Science, Kimchaek University of Technology and the Institute of Lasers, are responsible for about 90% of the total publications. Among these, Kim Il Sung University, which takes 60.4%, is the single most dominant institution. All of the top seven institutions with the largest number of papers listed in Table 3 are located in Pyongyang.

Table 4. Classification of the number of papers by various subfields of physics

Field	No. of theoretical papers	No. of experimental papers	Total no.
Optics, photonics	51	6	57
Condensed matter physics, materials physics	45	10	55
Applied physics, engineering physics	14	6	20
High energy physics, string theory, cosmology	18	0	18
Nonlinear physics	12	2	14
Chemical physics	10	3	13
Soft matter physics	12	0	12
Biological physics	0	8	8
Mathematical physics	7	0	7
Nuclear physics	1	3	4
Plasma physics	3	0	3
Fluid physics	2	0	2
Quantum information	2	0	2
Statistical physics	1	0	1
Astronomy	1	0	1
Total	179	38	217

Table 5. List of all journals where more than two North Korean physics papers were published

Journal	No. of papers
<i>Optics Express</i>	12
<i>Journal of High Energy Physics</i>	11
<i>Plasmonics</i>	10
<i>Physica B</i>	8
<i>Physical Review E</i>	7
<i>Physical Chemistry Chemical Physics</i>	5
<i>Journal of Materials Science</i>	5
<i>Physical Review B</i>	4
<i>Laser Physics</i>	4
<i>Chemical Physics Letters</i>	4
<i>Journal of Electronic Materials</i>	4
<i>Radiation Effects and Defects in Solids</i>	4
<i>Proceedings of SPIE</i>	4
<i>Physical Review A</i>	3
<i>Applied Physics A</i>	3
<i>Applied Physics B</i>	3
<i>Scientific Research</i>	3
<i>Journal of Power Sources</i>	3
<i>Electrochimica Acta</i>	3

We next examined the contents of the 217 papers and classified them by various subfields of physics. Nowadays, it is difficult to make such a classification unambiguously and accurately because many research topics are interdisciplinary and therefore many papers belong to several research areas simultaneously. Nevertheless, we attempted the classification and listed the result in Table 4. The top two fields where the largest numbers of papers were published were optics/photonics and condensed matter physics/materials physics. Other areas of research where many papers were published included applied physics/engineering physics, high energy physics/string theory/cosmology, nonlinear physics, chemical physics, soft matter physics and biological physics. Curiously, we notice that there were only four papers in the field of nuclear physics, though we expect the level of nuclear physics research in North Korea will be quite high.

In modern physics, physicists usually choose to specialize in theoretical research or in experimental research. Since

physics is based on the study of natural phenomena, the experimental research has always been considered as highly important and the number of experimental papers is substantially larger than that of purely theoretical papers in the usual case. An interesting and unusual aspect regarding the data in Table 4 is that in North Korea, the number of theoretical papers is much greater than that of experimental ones. The percentage of theoretical papers is 82.5% of the total. We suspect that in North Korea, there is a severe lack of modern high-technology experimental equipment, which are essential in experimental research these days.

Next, we classify the papers by the journals where they are published. In Table 5, we list all journals where more than two North Korean physics papers were published. The top five journals are *Optics Express*, *Journal of High Energy Physics*, *Plasmonics*, *Physica B* and *Physical Review E*. In addition, there were 11 publications in American Physical Society (APS) journals other than *Physical Review E*, including *Physi-*

Table 6. Top six North Korean physicists with the largest number of papers

Researcher	Institution	Major field	Theory/ experiment	No. of papers	Journals where multiple papers were published
Chol-Jun Yu	Kim Il Sung University	Materials physics	Theory	24	<i>Journal of Materials Science</i> (5), <i>Journal of Power Sources</i> (3), <i>Physical Review B</i> (2), <i>Physical Review Applied</i> (2), <i>Physical Chemistry Chemical Physics</i> (2), <i>Journal of Materials Chemistry A</i> (2)
Kwang-Hyon Kim	Institute of Lasers	Optics, photonics	Theory	20	<i>Optics Express</i> (7), <i>Plasmonics</i> (3), <i>Annalen der Physik</i> (2)
Song-Jin Im	Kim Il Sung University	Optics, photonics	Theory	18	<i>Physical Review B</i> (2), <i>Optics Express</i> (2), <i>Scientific Research</i> (2), <i>Laser Physics</i> (2)
Jin U Kang	Kim Il Sung University	High energy physics, string theory, cosmology	Theory	15	<i>Journal of High Energy Physics</i> (9), <i>Journal of Cosmology and Astroparticle Physics</i> (2)
Nam-Chol Kim	Kim Il Sung University	Optics, photonics	Theory	15	<i>Plasmonics</i> (6), <i>Optics Express</i> (3), <i>Nanotechnology</i> (2)
Chol-Ung Choe	University of Science	Nonlinear physics	Theory	13	<i>Physical Review E</i> (7), <i>International Journal of Dynamics and Control</i> (2)

Table 7. List of some notable North Korean physicists other than those in Table 6

Researcher	Institution	Major field	Theory/experiment
Jun-Sik Sin	Kim Il Sung University	Soft matter physics	Theory
Chun-Sik Choe	Kim Il Sung University	Biological physics	Experiment
Yong-Hyok Kwon	Institute of Lasers	Optics, photonics	Experiment
Hyok-Su Ryo	Kim Il Sung University	Condensed matter physics	Theory
Ha Kim	University of Science	Condensed matter physics, many body theory	Theory
Gum-Chol Ri	Kim Il Sung University	Materials physics	Theory
Un-Gi Jong	Kim Il Sung University	Materials physics	Theory
Myong-Chol Ko	Kim Il Sung University	Optics, photonics	Theory
Ok Song An	Kim Il Sung University	High energy physics, string theory, cosmology	Theory
Kwang-Il Kim	Kim Il Sung University	Quantum information	Theory

cal Review A, Physical Review B, Physical Review D and Physical Review Applied. The majority of journals including the APS journals, *Optics Express* and *Journal of High Energy Physics* are considered high-quality journals in the physics community. Overall, we find that the large majority of North Korean physics papers appeared in relatively high-quality journals. One interesting comment we want to add is that among the 12 papers published in *Optics Express*, which is an open access journal with expensive publication charges, only one paper has a North Korean as the corresponding author.

Finally, we attempted to identify representative North Korean physicists who produced many high-quality research papers. In fact, we found that all of the top six researchers who published the largest number of papers in all academic disciplines were physicists. In Table 6, we list those six researchers, all of whom are theoretical physicists. It is interesting that the three of them are in the field of optics and photonics. Four researchers are from Kim Il Sung University. The other two are from the Institute of Lasers and University of Science respectively.

In Table 7, we list some notable North Korean physicists other than those in Table 6. We selected researchers with a large number of publications or those majoring in timely research fields such as quantum information. We have to caution that our way of identifying productive researchers based only on the bibliographic information is rather limited and can be incomplete. We suspect that the majority of those in Table 7 are rather young. It appears that senior researchers who studied previously in Germany or in China returned to North Korea and have been building research groups actively.

Our final comment is concerned about the fraction of female physicists in North Korea. It is possible to guess the gender of a Korean based on the first name, though it is far from being an accurate method of determining gender. Among the names of all North Korean authors of the 217 papers, we found only one name which we could guess as a woman's name. From this, we guess that there are an extremely small percentage of women in the North Korean physics community.

Discussion

In this article, we have performed a detailed bibliographic and content analysis of the physics papers from North Korea indexed in the Scopus from 2005 to 2018. Even though the total number of publications from North Korea is extremely small compared to more developed countries, we have found that

the number of papers has been growing quite rapidly in the recent few years. We think North Korea has a strong growth potential in the future in physics research, especially in theoretical physics research. Physics research activities in North Korea are extremely centralized in its capital city, Pyongyang, where all major research institutions are located. Major research areas include condensed matter physics, optics and high energy physics and the large majority of the papers are theoretical ones. In order to achieve balanced development in physics, it is essential to build strong experimental groups which are bigger than theoretical groups. This will be an important future task in North Korea. From a bibliographic and content analysis, we have identified sixteen representative or notable physicists in North Korea.

Conflict of Interest

Kihong Kim is the editor-in-chief of *Science Editing*; however, he was not involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

Supplementary Material

The supplementary file is available from the Harvard DataVerse at: <https://doi.org/10.7910/DVN/PQSDMG>

Suppl. 1. Yearly variation of all papers from North Korea

Suppl. 2. Yearly variations of the number of all physics papers from North Korea and that of physics papers written by all-North Korean authors

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Status of digital standards, licensing types, and archiving policies in Asian open access journals registered in Directory of Open Access Journals

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Abstract

Purpose: This study aims to analyze the digital standards of Asian journals registered in the Directory of Open Access Journals (DOAJ) which has been recognized as an index of quality for open access journals.

Methods: Data including 54 fields of each journal listed in DOAJ were provided by the DOAJ team in June 5, 2018. We focused on 11 fields including digital standards, content licensing types and digital archiving policy.

Results: Based on raw data from DOAJ from June 5, 2018, there are 11,534 journals registered in the directory. Among all journals in the directory, Asian journals comprise 1,972 journals from 18 countries. Indonesian journals rank at the top for Asian journals, with 1,322 journals originating from that country. Other major Asian countries' registration status includes India (238), South Korea (82), China (80), Malaysia (45), Pakistan (39), Taiwan (30), Thailand (27), Japan (20), and Hong Kong (20). Eighty percent of journals (1,584) are using PDF-only as their full-text format, and DOI is adopted in 852 journals (43%). Almost 98% of journals (1,936) are having a Creative Commons license; however, 85% of journals (1,689) do not have a digital archiving policy.

Conclusion: Generally, digital standards are well implemented in South Korea, and digital archiving/deposit policy is well accepted in Indian journals. Many Asian open access journal editors can refer to this study result when they digitalize their journals in order to meet global standards.

Keywords

Digital standards; Directory of Open Access Journals; Open access journal; Open access publishing; Publication technology

Received: January 14, 2019
Accepted: January 24, 2019

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Introduction

As the number of open access (OA) journals increases, Directory of Open Access Journals (DOAJ) has firmly taken root at the core of this new field [1]. DOAJ is a community-created online directory that provides access to high-quality OA peer-reviewed journals. DOAJ is independent, and all funds are made through donations, with 40% coming from sponsors and 60% coming from members. All DOAJ services are free, and all data is available free of charge worldwide. It is not a blacklist which provides predatory journals not to publish. Rather, it is a white list that makes it easy to find, read, use and cite academic scholarly content [2].

Although DOAJ was only launched in 2003, it has already made significant progress in data quality and standardization of OA journal indexing. In April 2015, 50 members of Science Europe announced a guideline requiring that a journal must be listed in either DOAJ, Web of Science, Scopus or PubMed to be provided payment/subsidies to OA venues. As the number of DOAJ journals has increased from the 300 originally listed in 2003 to 12,437 listed in January 2019, there has been a demand for more detailed information about journals' OA policies. This situation required a more rigorous set of selection standards which would meet the expectations of stakeholders to encourage best practices and transparency of OA publishing [1].

In January of 2018, the Committee on Publication Ethics, the DOAJ, the Open Access Scholarly Publishers Association, and the World Association of Medical Editors revised their joint 'Principles of transparency and best practice in scholarly publishing' which was first published in 2013 and revised thirdly in 2018 [3]. This guideline is used as the criteria for evaluation of new journals into DOAJ. DOAJ requires a total of 54 fields of journal information to be input on the DOAJ application site

divided into five groups: basic journal information, quality and transparency of the editorial process, openness of the journal, content licensing, and copyright and permissions [1].

This study aimed to characterize digital standards of journals such as the use of Crossref DOIs, full-text formats, crawling, download statistics and plagiarism screening tools. As a licensing type, we investigated Creative Commons (CC) license types and whether journals allow the author to hold copyright without restrictions. Lastly, we studied journals' digital archiving policies. This result could help journal editors or publishers understand how to efficiently implement these digital standards in order to meet global publishing standards.

Methods

We obtained data for this study from the DOAJ team via an Excel spreadsheet dated June 5th of 2018 (Dataset 1). Journals must be peer-reviewed or of editorial quality control and be OA in order to be included in the DOAJ. To be registered in the DOAJ, a total of 54 questions must be answered on their application site (<https://doaj.org/application/new>). Based on answers input by a journal editor, DOAJ checks the journal homepage manually to evaluate the quality of each OA journal. Among all criteria, we focused on 11 fields for this study including digital standards, content licensing types and digital archiving policy as shown in Table 1.

Results

Overview of registered journals in DOAJ

Based on raw data from the DOAJ from June 5, 2018, there are a total of 11,534 journals registered in the database. Among them, Asian journals comprise 1,972 journals from 18 countries. Indonesian journals currently rank at the top for

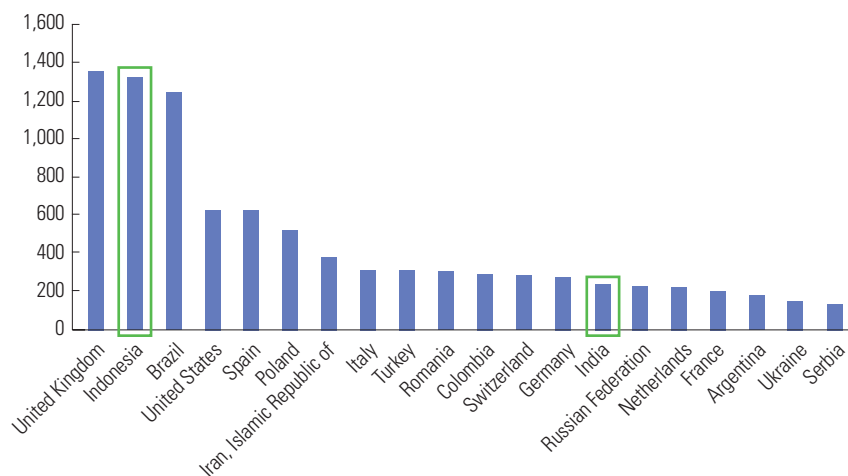


Fig. 1. Top 20 countries in Directory of Open Access Journals.

Asian journals with 1,322 journals from that country as shown in Fig. 1. Other major Asian countries' registration status include India (238), South Korea (82), China (80), Malaysia (45), Pakistan (39), Taiwan (30), Thailand (27), Japan (20), and Hong Kong (20).

Digital standards

The available full-text format is shown in Fig. 2. Eighty per cent of journals (1,584) are using PDF-only as their full-text format, and 330 journals (17%) are using HTML format. XML is available just for 81 journals (4%).

Regarding permanent article identifiers, Crossref DOI is

Table 1. Directory of Open Access Journals questions regarding digital standards, content licensing, and digital archiving policy for a new applicant

Category	Question	Answer
Basic journal information	What digital archiving policy does the journal use? (Select all that apply. Institutional archives and publishers' own online archives are not valid.)	No policy in place CINES CLOCKSS LOCKSS PKP PN PMC/Europe PMC/PMC Canada Portico A national library Other
	Does the journal allow software/spiders to automatically crawl the journal content (also known as text mining)?	Yes No
	Which article identifiers does the journal use?	None DOI Handles ARK Other
	Does the journal provide article download statistics?	Yes No
	Please indicate which formats of full text are available (Tick all that apply).	PDF HTML ePUB XML Other
	Does the journal have a policy of screening for plagiarism?	Yes No
	Does the journal embed or display licensing information in its articles?	Yes No
	Does the journal allow reuse and remixing of content in accordance with a CC license or other type of license with similar conditions (Select 'Other')?	CC BY CC BY-NC CC BY-NC-ND CC BY-NC-SA CC BY-ND CC BY-SA Other
	With which deposit policy directory does the journal have a registered deposit policy? (Select all that apply)	None Sherpa/Romeo Dulcinea Héloïse Diadorim Other
	Does the journal allow the author(s) to hold the copyright without restrictions?	Yes No
Copyright and permissions	Will the journal allow the author(s) to retain publishing rights without restrictions?	Yes No

CINES, National Computing Center for Higher Education; CLOCKSS, Controlled Lots of Copies Keep Stuff Safe; LOCKSS, Lots of Copies Keep Stuff Safe; PKP PN, Public Knowledge Project Preservation Network; PMC, PubMed Central; CC, Creative Commons; NC, non-commercial; ND, no derivative works; SA, share-alike.

well adopted in 852 journals (43%). Crossref is a non-profit organization which allows journal article to be found, cited, linked and assessed. Crossref is one of the most successful examples of cooperation across the publishing community.

Countries where DOI is well-implemented include Indonesia (400 journals, 30%), India (180 journals, 76%), South Korea (75 journals, 91%), and China (73 journals, 91%). Indonesia is one country where allowing software/spiders to automatically crawl the journal content has been well-imple-

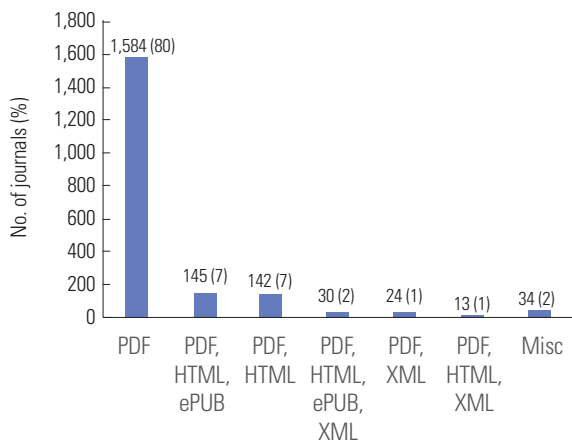


Fig. 2. The accessible full-text format of Asian journals (Misc includes other forms such as MS Word file or combined various formats such as HTML, ePUB, and XML).

mented (1,186 journals, 90%). Regarding article download statistics, India shows the highest penetration rate (174 journals, 73%) as indicated in Table 2.

Generally, digital standards are well implemented in South Korea, especially XML with an implementation rate of 55% and screening for plagiarism with an implementation rate of 70%. Currently, some journals have started using Journal Article Tag Suite (JATS), an XML format for describing online scientific literature, in order to be promoted globally. Implementation of JATS XML is an efficient way to adopt most digital standards. If journals are produced with JATS XML, it is easier to get included in free full-text databases such as PubMed Central [4].

Content licensing and copyright issue

DOAJ accepts journals into their database where copyright must be transferred to the publisher if articles are published OA in compliance with the Budapest Open Access Initiative (BOAI). A total of 1,952 journals (98.9%) allow unrestricted reuse by BOAI.

However, this situation is not advantageous for authors since the publisher could have the commercial rights of the contents if an author has transferred copyright to a publisher [1]. Hence, DOAJ encourages journals to allow authors to retain copyright. However, only 358 journals (18%) allow authors to hold publishing rights without restrictions, and 378 journals (19%) allow authors to hold copyright without restrictions. In an exam-

Table 2. Digital standards adoption rate of top five Directory of Open Access Journals registered countries in Asia

Country	Total	Permanent article identifiers: DOI	%	Full-text crawl permission	%	Provide download statistics	%	Plagiarism screening policy	%	XML implementation	%
Indonesia	1,322	400	30	1,186	90	91	7	534	40	8	1
India	238	180	76	209	88	174	73	49	21	12	5
South Korea	82	75	92	55	67	25	30	57	70	45	55
China	80	73	91	46	58	27	34	59	74	5	6
Malaysia	45	13	29	36	80	3	7	27	60	2	4

Table 3. Content licensing status of top five countries registered in Directory of Open Access Journals

Country	Total	Allowing unrestricted reuse in compliance with BOAI?	%	Author holds publishing rights without restrictions	%	Author holds copyright without restrictions	%	Embed licensing information in its article	%
Indonesia	1,322	1,307	99	225	17	236	18	824	62
India	238	238	100	26	11	26	11	176	74
South Korea	82	81	99	10	12	10	12	64	78
China	80	79	99	13	16	16	20	49	61
Malaysia	45	45	100	8	18	7	16	5	11

BOAI, Budapest Open Access Initiative.

ple from the Asian region, 17% of Indonesian journals (225) allow authors to hold publishing rights as shown in Table 3.

DOAJ encourages copyright and licensing information to be displayed with all individual articles because published articles are sometimes separate from the journal [1]. A total of 61% of journals (1,205) have embedded CC licensing information in their articles. The four countries excluding Malaysia are having well-integrated licensing information as shown in Table 3.

The application of a CC license is encouraged but not required to be accepted in the DOAJ. If a journal does not have a CC license policy, the terms of license should be indicated on the journal homepage. The free journal is a different concept within the OA journal concept; a journal's OA policy is crucial in determining whether it allows secondary use for various purposes.

Free access journals can only be converted into OA journals after adopting a CC license [1]. One benefit of indexing in DOAJ is that Web of Science shows a journal as OA if it is registered in the DOAJ [4].

Fig. 3 shows the type of CC license for Asian journals registered in the DOAJ. Seven hundred eleven journals (36%) have a CC-BY license, and 441 journals (22%) have a CC-BY-SA license. A CC-BY license means that users should give creators credit by whatever method is requested by the creators.

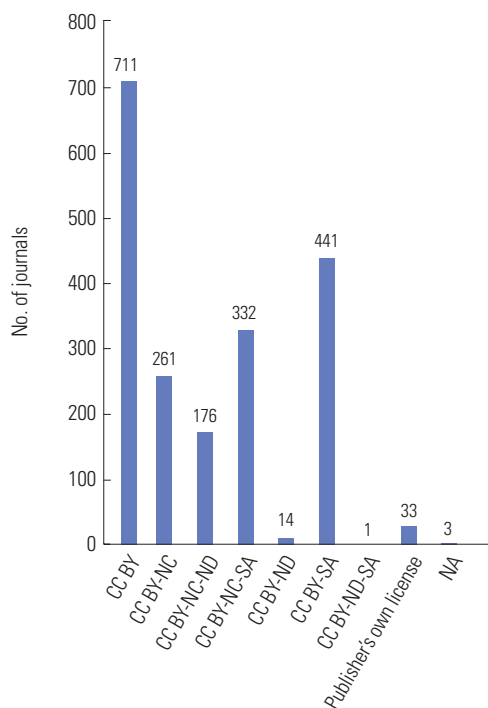


Fig. 3. Type of Creative Commons (CC) license of Asian journals which are registered in Directory of Open Access Journals. NC, non-commercial; ND, no derivative works; SA, share-alike; NA, not available.

A CC-BY-SA license means that users can copy, distribute, display, perform and modify the creator's work as long as the user distributes any modified work on the same terms as the original work.

Digital archiving and deposit policy

According to DOAJ guidelines, a journal's plan for digital backup and preservation of access to journal content such as CLOCKSS, Portico and PubMed Central should be documented in the event a journal is no longer published. CLOCKSS is a collaborative project between academic publishers and research libraries [5], and Portico has a diversified flow of funds from over 1,000 libraries and 100 publishers [6]. They both provide a sustainable dark archive to ensure the long-term viability of web-based academic content. PubMed Central is a repository for journal content deposited by participating journals and for authors following the research funding agency's public access policy [7].

However, as shown in Fig. 4., 86% of Asian journals (1,689) do not have any digital archiving policy. Three hundred fourteen journals are using LOCKSS and CLOCKSS, 152 journals are using Portico, and 106 journals are using PubMed Central as their deposit repository.

Deposit policies vary among publishers and journals, resulting in confusion among authors as to how to deposit their articles. To combat this confusion, the DOAJ has a policy of checking whether journals are using directories like Sherpa/

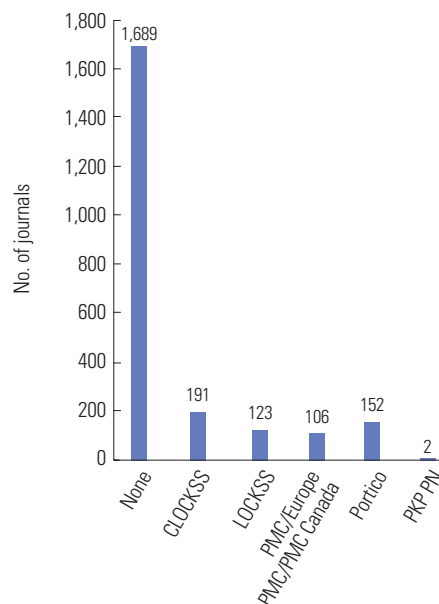


Fig. 4. Status of digital archiving policy in Directory of Open Access Journals registered Asian journals (Total number is over 1,972 as selected as many as possible). CLOCKSS, Controlled Lots of Copies Keep Stuff Safe; LOCKSS, Lots of Copies Keep Stuff Safe; PMC, PubMed Central; PKP/PN, Public Knowledge Project Preservation Network.

Table 4. Digital archiving status of top five countries registered in Directory of Open Access Journals

Country	Total	Deposit policy directory: Sherpa/Romeo	%	Digital archiving policy	%
Indonesia	1,322	40	3	15	1
India	238	140	59	152	64
South Korea	82	16	20	38	46
China	80	16	20	39	49
Malaysia	45	0	0	1	2

Romeo which provide information on journals' archiving policy [1]. India is the top Asian country regarding Sherpa/Romeo registration (140 journals, 59%).

Stating a deposit policy on the journal's homepage shows that a journal recognizes the author's right to archive a copy of his/her work. India is the top Asian country regarding digital archiving and deposit policy as shown in Table 4.

Discussion

The DOAJ aims to increase the visibility of peer-reviewed, OA content. Adoption of digital technology is an essential element for the promotion and internationalization of journals to raise awareness of their content. In particular, to quickly adopt DOI, Crossmark, Funder Registry and ORCID, many publishing experts are recommending using full-text JATS XML [4]. PubMed Central is also requesting full-text JATS XML as a primary standard in order to be indexed. Journal citation rates generally raise after being posted in international databases such as PubMed Central, therefore full use of JATS XML is beneficial for journal editors who want to increase their journal's global visibility [8].

For the active promotion of journals to an international level, more journals should utilize these digital standards. However, journals need extra budget items and digital publication technology experience in order to implement digital standards. Journal editors and scientific societies can refer to this study when they prepare their journal enhancement plan. This study only analyzed Asian DOAJ journals. The number of all registered DOAJ journal was 12,436 as of January 3, 2019. Further investigation is recommended for expanding this study to all registered DOAJ journals.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Data Availability

Dataset 1. Raw data received from DOAJ team and analysis data are available from the Harvard Dataverse at: <https://doi.org/10.7910/DVN/PGC7GJ>.

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Comparison between Korean and foreign authors concerning the citation impact of Korean journals indexed in Scopus

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Abstract

Purpose: An aim of this study is to analyze the citation impact of articles and reviews that were published in engineering, materials science, and medical journals in Korea over the 5-year period from 2012 to 2016 based on authors' countries. These three subject areas were selected to provide insights regarding citation impact because they are better represented than other subjects among the 248 Korean journals indexed by Scopus.

Methods: We classified authors' as Korean and foreign to assess and compare the citation impact of articles and reviews according to the authors' countries and evaluated whether bibliometric indicators, such as the number of authors and the view count, were associated with a higher citation impact.

Results: We found that the citations count and publications in the top 10 citation percentile in these three subject areas were higher for reviews than for articles; further, the citation impact of articles and reviews by foreign authors was higher than that of articles and reviews by Korean authors. The number of authors had a weak relationship with citation impact based on the subject area, and the number of authors per review by foreign authors in materials science and medicine was negatively associated with citation impact. Moreover, the views count was found to be positively associated with the citation impact of publications in these three subject areas.

Conclusion: Considering these findings, future research should explore more bibliometric indicators, subject areas, and countries in order to develop practical applications. The results of this study provide insights and statistical evidence indicating that journal publishers and editors in Korea should attempt to attract more publications by foreign authors and promote their publications to increase their visibility and likelihood of being cited.

Keywords

Bibliometrics; Citation; Publications; Republic of Korea; Research

Received: May 15, 2018

Accepted: June 4, 2018

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Introduction

According to the Korea Citation Index, 5,445 scholarly journals have been published in Korea [1]. Of these journals, 248 journals were indexed in Scopus as of May 2018. The number of articles and reviews published in Korean journals indexed in Scopus increased over the 5-year period from 2012 to 2016, with an annual growth rate of 4.6%. Among the articles and reviews published in 248 Korean journals, 62.8% had Korean authors, followed by Chinese authors (12.2%), authors from the United States (5.5%), Indian authors (4.1%), and authors from Iran (3.7%). More foreign authors have published articles and reviews in Korean journals, according to a prior analysis indicating that 77.4% of articles in Korean journals were published by Korean authors [2]. It is likely that improved accessibility through various online databases such as the Web of Science, Scopus, PubMed, Google Scholar, and DOAJ (Directory of Open Access Journals) has increased the visibility of Korean journals, which may have led to more publications by foreign authors.

Along with the quantitative increase in the number of publications, previous research has addressed which bibliometric indicators lead to an increase in citations from a qualitative perspective. Because publishing high-quality research is fundamental to science, regularly evaluating the impact of publications is essential for scholarly journals and individual researchers [3]. As a qualitative evaluation indicator, the citation of publications determines the journal impact, which in turn shapes the number of publications. Furthermore, citations can be crucial for researchers' hiring and promotion decisions and for attracting high-quality papers to journals, although citation impact often depends on the subject area, journal index, and number of authors in co-authored publications. Citation impact also has been used as an assessment tool for parameters such as collaborative activity, engagement in various types of collaboration (e.g., international collaboration), open access, reference impact, abstract readability, and more [4,5].

In this study, the relationship between research collabora-

tion (i.e., the number of authors per publication) and view counts a form of usage data generated when requests are made for a publication on the Scopus site were investigated. Data on views were chosen because this parameter has implications for interest in research output and citation impact. We also sought to analyze and compare the citation impact of publications according to authors' countries. To investigate the latter, we examined information on authors' affiliations presented in articles and reviews. Groups of authors were classified as Korean or foreign based on the affiliation information presented in publications. If a Korean author was included in a publication for which foreign authors were predominant, the publication was classified as an article by foreign authors. The purpose of this paper is to provide comparative evidence on the citation impact of publications in engineering, materials science, and medical journals by Korean and foreign authors and identify the bibliometric indicators associated with the citation impact of the publications.

Methods

Among the 248 Korean journals indexed by Scopus, the three subject areas of engineering (46 titles), materials science (22 titles) and medicine (81 titles) were selected for analysis. The citation trends and patterns from these subject areas were expected to yield meaningful results since more journals are indexed by Scopus in these areas than in others. We chose a study period of 5-year from 2012 to 2016 and only examined articles and reviews. Our entire data set included 22,577 publications from the engineering field, 4,959 from materials science, and 25,957 from medicine. We evaluated the publications in each subject area using quantitative and qualitative indicators (Tables 1, 2).

Our analytical strategy was to identify authors' affiliations and the number of authors and then assess the relationships of those parameters with citation impact. First, we extracted engineering, materials science, and medical journals published by Korean publishers and societies. Second, the dataset was limited to the parameters of publication type (article and re-

Table 1. Dataset description

	Subject	2012	2013	2014	2015	2016	Overall
Article	Engineering	3,490	3,952	4,844	4,999	4,940	22,225
	Materials science	887	937	941	1,032	1,085	4,882
	Medicine	4,152	4,490	4,743	4,932	5,038	23,355
Review	Engineering	108	65	59	51	69	352
	Materials science	12	10	24	14	17	77
	Medicine	741	652	566	615	948	3,522

Table 2. Number of articles and reviews by authors' country of affiliation in three subject areas

	Engineering						Materials science						Medicine					
	Korean			Foreign			Korean			Foreign			Korean			Foreign		
	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total
2012	2,050	46	2,096	1,440	62	1,502	654	6	660	233	6	239	3,294	579	3,873	858	162	1,020
2013	2,280	39	2,319	1,672	26	1,698	674	7	681	263	3	266	3,470	480	3,950	1,020	172	1,192
2014	2,469	24	2,493	2,375	35	2,410	662	9	671	279	15	294	3,550	408	3,958	1,193	158	1,351
2015	2,411	29	2,440	2,588	22	2,610	657	8	665	375	6	381	3,575	444	4,019	1,357	171	1,528
2016	2,308	37	2,345	2,632	32	2,664	634	8	642	451	9	460	3,495	643	4,138	1,543	305	1,848
Total	11,518	175	11,693	10,707	177	10,884	3,281	38	3,319	1,601	39	1,640	17,384	2,554	19,938	5,971	968	6,939

view), year (2012-2016), and countries with which authors were affiliated (Korean and foreign). Third, based on authors' affiliations, publication type, and subject area, 12 groups were created (Table 2). Fourth, we analyzed research performance by publication type to identify citation trends according to authors' affiliations.

Comparisons between groups were conducted without statistical tests because all data from each group were collected. To determine whether the number of citations was affected by the number of authors in the 12 groups, a regression analysis was performed using IBM SPSS Ver. 20.00 (IBM Corp., Armonk, NY, USA).

Results

Comparison of the citation impact of publications between Korean authors and foreign authors

We identified authors' countries of affiliation from the dataset, and their distribution for authors of articles and reviews is shown in Fig. 1. For articles by foreign authors in engineering, China was the most common country of affiliation (37.7%), followed by Iran (10.7%) and the United States (9.9%). For reviews in engineering, the percentage of authors from the United States was the highest (22.0%), followed by Chinese authors (15.8%) and Japanese authors (9.0%). For articles in materials science, the percentage of Chinese authors was the highest (31.9%), followed by Iranian (11.6%) and Indian (8.1%) authors. For reviews in materials science, the highest proportions of authors were from China (15.4%), Malaysia (15.4%), and the United States (15.4%). In the area of medicine, authors from the United States accounted for the highest proportion of both articles and reviews written by foreign authors (17.5% and 39.9%, respectively). Compared to engineering and materials science, the proportion of authors from the United States in medicine was quite high, which contributed to the citation impact.

As explained in the Methods section, we analyzed citations per publication and the publications in top 10 citation percentile to assess citation impact by publication type (article or review), authors' countries of affiliation (Korean and foreign), and subject areas (engineering, materials science, and medicine) (Tables 3, 4). Overall, the number of citations per publication by foreign authors was higher than the corresponding value for Korean authors by an average of 1.9, except for citations per review by Korean authors in materials science, which was 0.7 higher for reviews by foreign authors. Furthermore, the number of citations per review was generally higher than the number of citations per article except for citation per review by foreign authors in materials science. The number of citations per review by foreign authors in medicine was 13.8, which was the highest of the 12 groups analyzed, whereas the number of citations per article by Korean authors in engineering and materials science was relatively low (2.1 and 2.3, respectively). This finding shows that reviews received more attention from readers and researchers and more citations than articles. Citations per publication for medical subject were higher than for engineering and materials science for Korean authors, but this trend was not consistent for foreign authors in materials science.

As shown in Table 4, more articles by foreign authors than by Korean authors were in publications in top 10 citation percentile by 2.2% on an average in three subject areas. Reviews were more likely to be in the top 10 citation percentile than articles in engineering and medicine, while articles (4.1%) by foreign authors was higher than reviews (2.6%) in top 10 citation percentile for materials science. The following statistics support this trend. The percentage of reviews by foreign authors in medicine in the top 10 citation percentile was the highest (25.8%), followed by reviews by Korean authors in medicine (16.0%), reviews by foreign authors in engineering (11.3%), and reviews by Korean authors in engineering (10.3%). It is likely that reviews were more competitive than articles and that

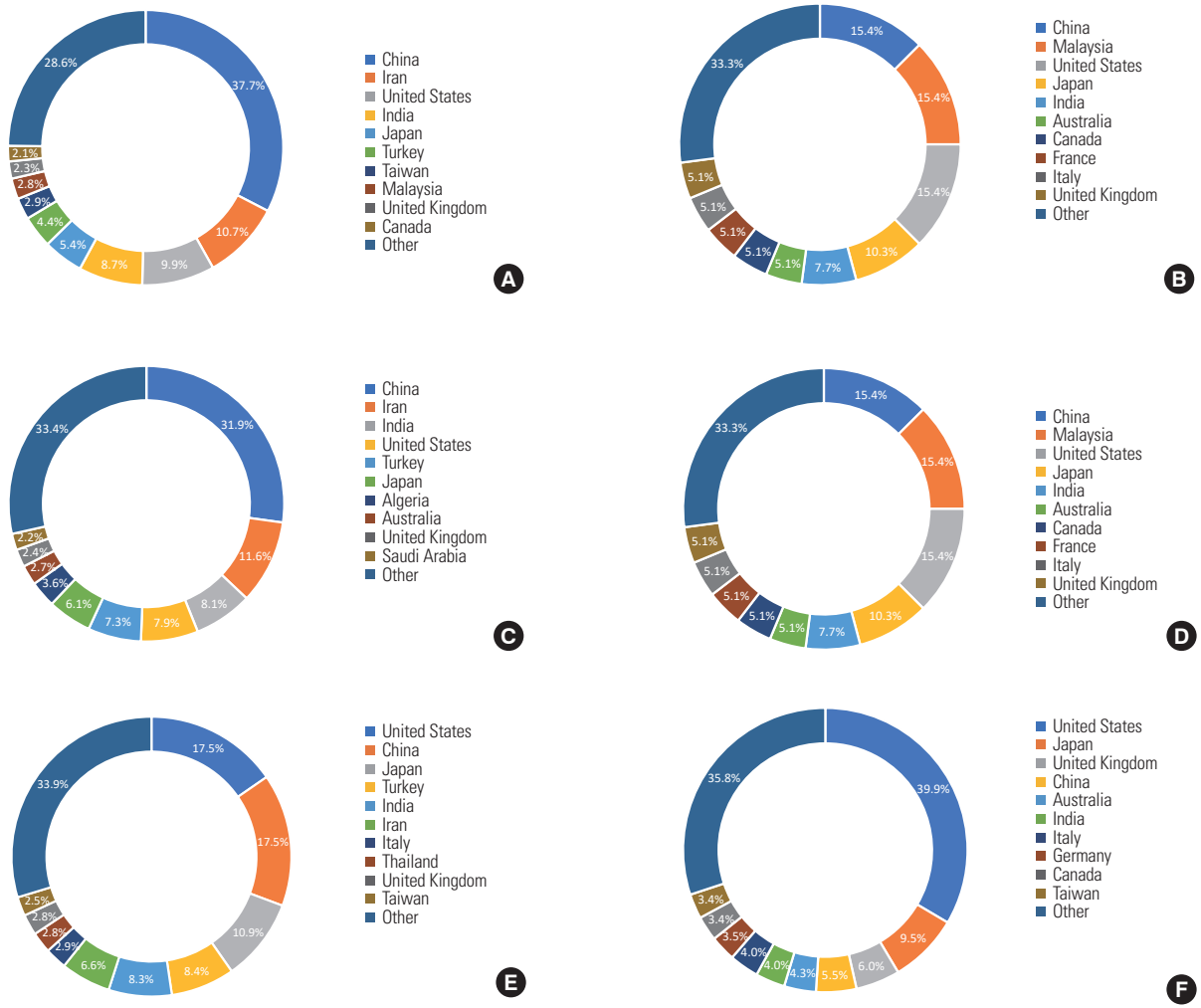


Fig. 1. Countries distribution ratio by authors group. (A) Article in engineering, (B) reviews in engineering, (C) articles in materials science, (D) reviews in materials science, (E) articles in medicine, and (F) reviews in medicine.

Table 3. Citations per publication by authors' country of affiliation in three subject areas

	Engineering						Materials science						Medicine					
	Korean			Foreign			Korean			Foreign			Korean			Foreign		
	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total
2012	3.4	10.3	3.6	6.9	9.2	7.0	3.3	4.2	3.3	6.4	5.7	6.3	6.4	11.9	7.2	7.1	24.1	9.8
2013	2.6	5.8	2.6	6.1	21.2	6.3	3.0	17.0	3.1	7.0	17.7	7.2	5.4	12.1	6.2	6.1	15.7	7.5
2014	2.1	8.0	2.2	4.2	11.9	4.3	2.3	3.4	2.3	4.7	3.8	4.7	4.1	11.1	4.9	4.9	18.7	6.5
2015	1.6	3.1	1.7	3.4	5.2	3.4	1.7	1.5	1.7	6.0	4.3	6.0	3.0	8.1	3.6	3.7	11.3	4.5
2016	0.8	2.6	0.9	1.7	2.0	1.7	0.9	3.4	1.0	2.5	2.4	2.5	1.5	4.2	1.9	1.7	6.0	2.5
Total	2.1	6.2	2.2	4.0	9.7	4.1	2.3	5.6	2.3	5.0	4.9	5.0	4.1	9.2	4.7	4.3	13.8	5.7

publications by foreign authors were more competitive than those by Korean authors in terms of the citation index, but

these trends showed variations across our dataset (Tables 3, 4).

Table 4. Output of papers in the top 10 percentile of citations by authors' country of affiliation in three subject areas

	Engineering						Materials science						Medicine					
	Korean			Foreign			Korean			Foreign			Korean			Foreign		
	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total
2012	0.5	10.9	0.8	2.2	6.5	2.3	0.0	0.0	0.0	0.4	0.0	0.4	1.3	9.5	2.6	2.3	21.6	5.4
2013	0.3	7.7	0.4	1.9	26.9	2.3	0.4	28.6	0.7	2.7	0.0	2.6	1.7	12.9	3.1	1.6	18.6	4.0
2014	0.3	12.5	0.4	1.5	14.3	1.7	0.3	0.0	0.3	1.4	0.0	1.4	1.7	17.4	3.3	2.7	29.1	5.8
2015	0.6	3.4	0.7	2.6	9.1	2.6	0.8	0.0	0.8	5.9	0.0	5.8	2.2	19.8	4.2	3.2	28.7	6.0
2016	1.0	16.2	1.3	4.1	6.3	4.1	1.3	12.5	1.4	7.1	11.1	7.2	3.2	20.7	5.9	4.7	28.9	8.7
Total	0.6	10.3	0.7	2.5	11.3	2.7	0.5	7.9	0.6	4.1	2.6	4.1	2.0	16.0	3.8	3.1	25.8	6.2

Values are presented as %.

Table 5. Number of authors per publication by authors' country of affiliation in three subject areas

	Engineering						Materials science						Medicine					
	Korean			Foreign			Korean			Foreign			Korean			Foreign		
	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total
2012	3.6	1.9	3.5	3.3	2.8	3.3	4.1	2.7	4.1	4.0	5.5	4.0	6.0	3.4	5.6	5.3	3.4	5.0
2013	3.4	2.2	3.3	3.4	3.2	3.3	3.9	3.7	3.9	4.1	2.3	4.1	5.9	3.0	5.6	5.5	3.2	5.2
2014	3.4	2.3	3.4	3.3	4.1	3.3	4.0	3.6	4.0	4.3	5.0	4.3	5.8	3.0	5.5	5.6	3.3	5.3
2015	3.4	3.4	3.4	3.4	4.0	3.4	4.0	3.1	4.0	3.9	4.8	3.9	6.1	3.4	5.8	5.7	3.3	5.5
2016	3.4	2.6	3.4	3.5	3.6	3.5	3.9	2.3	3.9	4.0	3.4	4.0	6.2	3.3	5.7	5.9	3.4	5.5
Total	3.4	2.4	3.4	3.4	3.4	3.4	4.0	3.1	4.0	4.0	4.5	4.1	6.0	3.2	5.7	5.6	3.3	5.3

Citation impact and the number of authors

From the perspective of research collaboration, more authors contributing to an article should lead to more traffic, thereby increasing opportunities for citation. Many studies have shown that research collaboration, as indicated by co-authorship, is essential for progress in scientific research. Over the past several decades, large-scale collaborative projects have become increasingly frequent in fields as diverse as high-energy physics, medicine, and genetics [6-8]. Although these large collaborations have received the lion's share of media attention [9], research collaboration on a smaller scale is also important for scientific productivity and influence [10]. For instance, within the field of bibliometrics, the total number of co-authors of a publication is positively correlated with the number of citations received by that study [11].

We investigated the number of authors per publication and the citation impact of publication in three subject areas (engineering, materials science, and medicine) by publication type (articles and reviews) and country of affiliation of the authors (Korean or foreign). Generally, articles had more authors than reviews, except for reviews by foreign authors in engineering.

In all three subject areas, the number of authors per review by foreign authors was larger than the number of authors per review by Korean authors. The difference in the number of authors per review between Korean and foreign authors was 1, 1.4, and 0.1 for engineering, materials science, and medicine, respectively (Table 5). In contrast, the number of authors per article was the same for Korean and foreign authors in engineering (3.4) and materials science (4.0), and the number of authors per article by Korean authors in medicine was higher than the corresponding value for foreign authors by 0.4. In medicine, the number of authors per article and review by Korean authors was larger than for articles and reviews by foreign authors (Table 5).

As shown in Fig. 2, there was a weak relationship between the number of authors per publication and citation impact. The number of authors per review by Korean authors in engineering and the number of authors per review by foreign authors in materials science showed a slight association with citation impact. Interestingly, the number of authors per review by foreign authors in materials science and medicine was negatively associated with citation impact (Fig. 2).

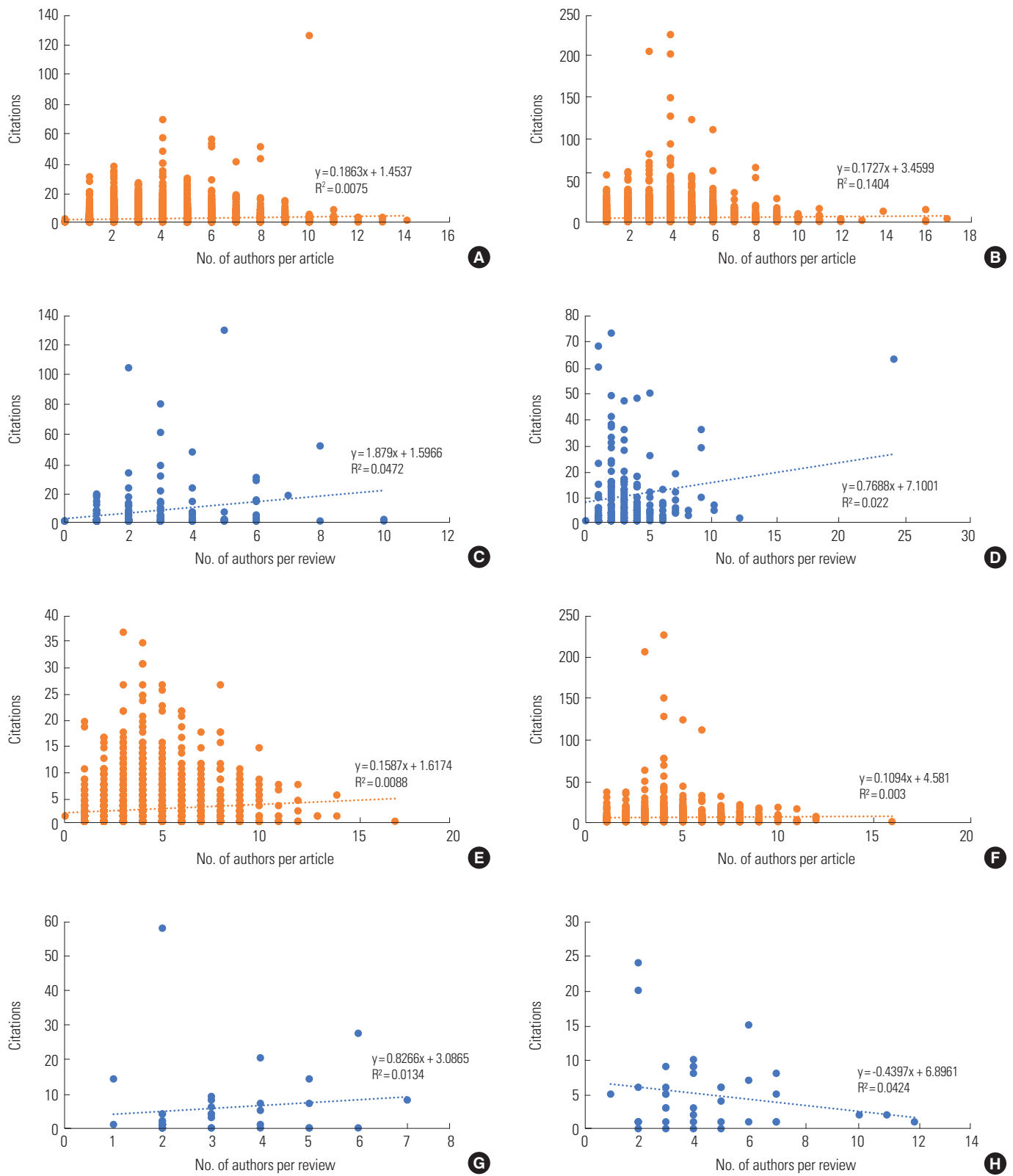


Fig. 2. (Continued to the next page)

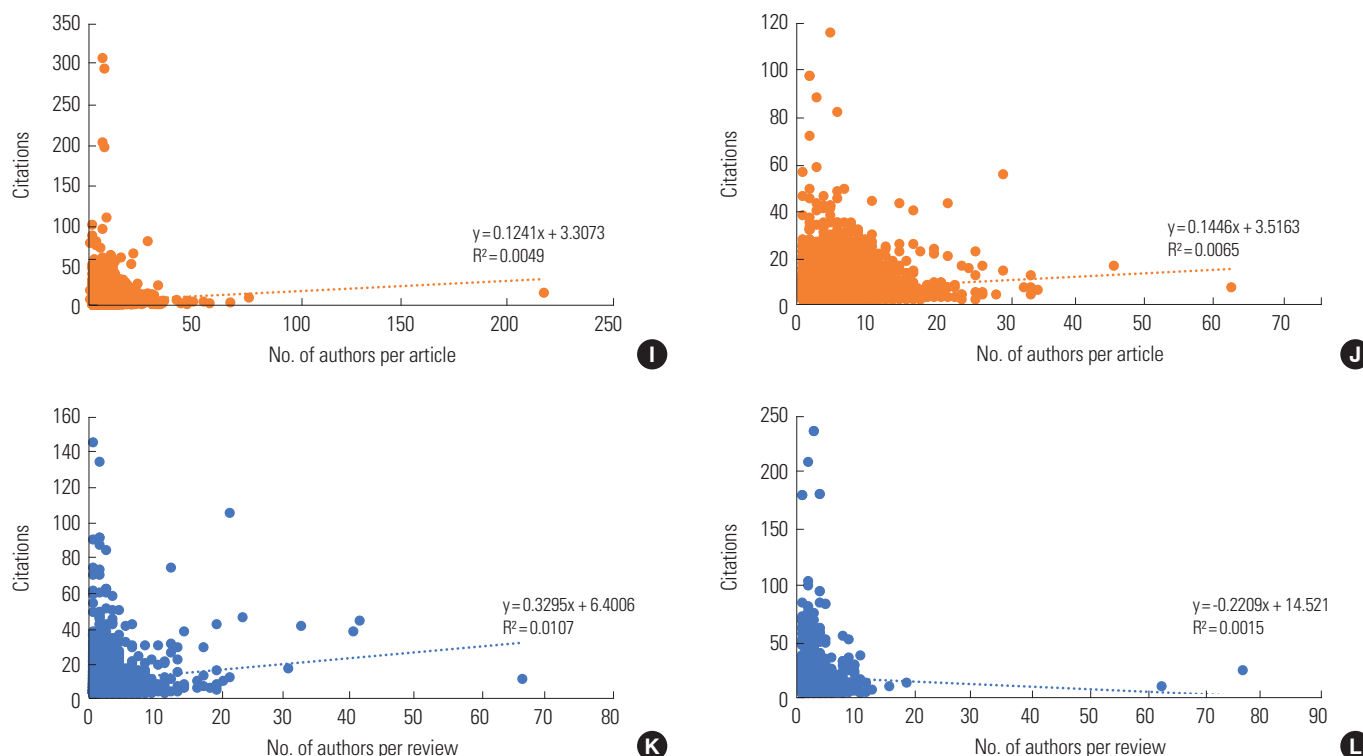


Fig. 2. (Continued) Relationship between No. of authors per publication and citations by author group in three subjects. (A) Articles by Korean author group in engineering, (B) articles by foreign author group in engineering, (C) reviews by Korean author group in engineering, (D) reviews by foreign author group in engineering, (E) articles by Korean author group in materials science, (F) articles by foreign author group in materials science, (G) reviews by Korean author group in materials science, (H) reviews by foreign author group in materials science, (I) articles by Korean author group in medicine, (J) articles by foreign author group in medicine, (K) reviews by Korean author group in medicine, and (L) reviews by foreign author group in medicine.

Table 6. Views count per publication by authors' country of affiliation in three subject areas

	Engineering						Materials science						Medicine					
	Korean			Foreign			Korean			Foreign			Korean			Foreign		
	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total	Article	Review	Total
2012	13.2	32.7	13.7	19.6	34.9	20.3	19.0	41.5	19.2	21.0	53.8	21.9	8.5	15.0	9.5	11.1	23.7	13.1
2013	12.5	24.1	12.7	18.6	62.2	19.2	19.1	56.7	19.5	25.1	73.3	25.7	8.7	16.1	9.6	11.6	21.2	13.0
2014	10.6	26.1	10.8	15.2	54.2	15.8	13.2	30.3	13.4	18.5	20.6	18.6	7.0	14.7	7.8	10.4	22.9	11.8
2015	10.8	25.4	10.9	14.4	41.3	14.6	12.5	13.6	12.5	18.4	39.8	18.7	6.4	11.0	6.9	10.1	14.8	10.6
2016	9.6	35.6	10.0	11.5	31.7	11.7	12.8	19.4	12.9	14.2	35.1	14.6	6.3	10.6	7.0	7.7	13.1	8.6
Total	11.3	29.3	11.5	15.2	42.9	15.7	15.3	31.1	15.5	18.7	36.1	19.1	7.4	13.3	8.1	9.9	18.2	11.1

Citation impact and view count per publication

Since scholarly publications are published and distributed through various online sources, several previous studies have addressed the importance of downloads and views count; researchers have attempted to measure scientific impact based on these parameters. Such data would allow scientific activities to be measured immediately after publication, rather than

having to wait for citations. Previous studies have proposed the “download impact factor” as a journal metric [12,13] reporting close correlations between citations and downloads [14].

In the present study, we extracted the record of clicks from the Scopus data on download usage and analyzed whether the views count was associated with citations of publications

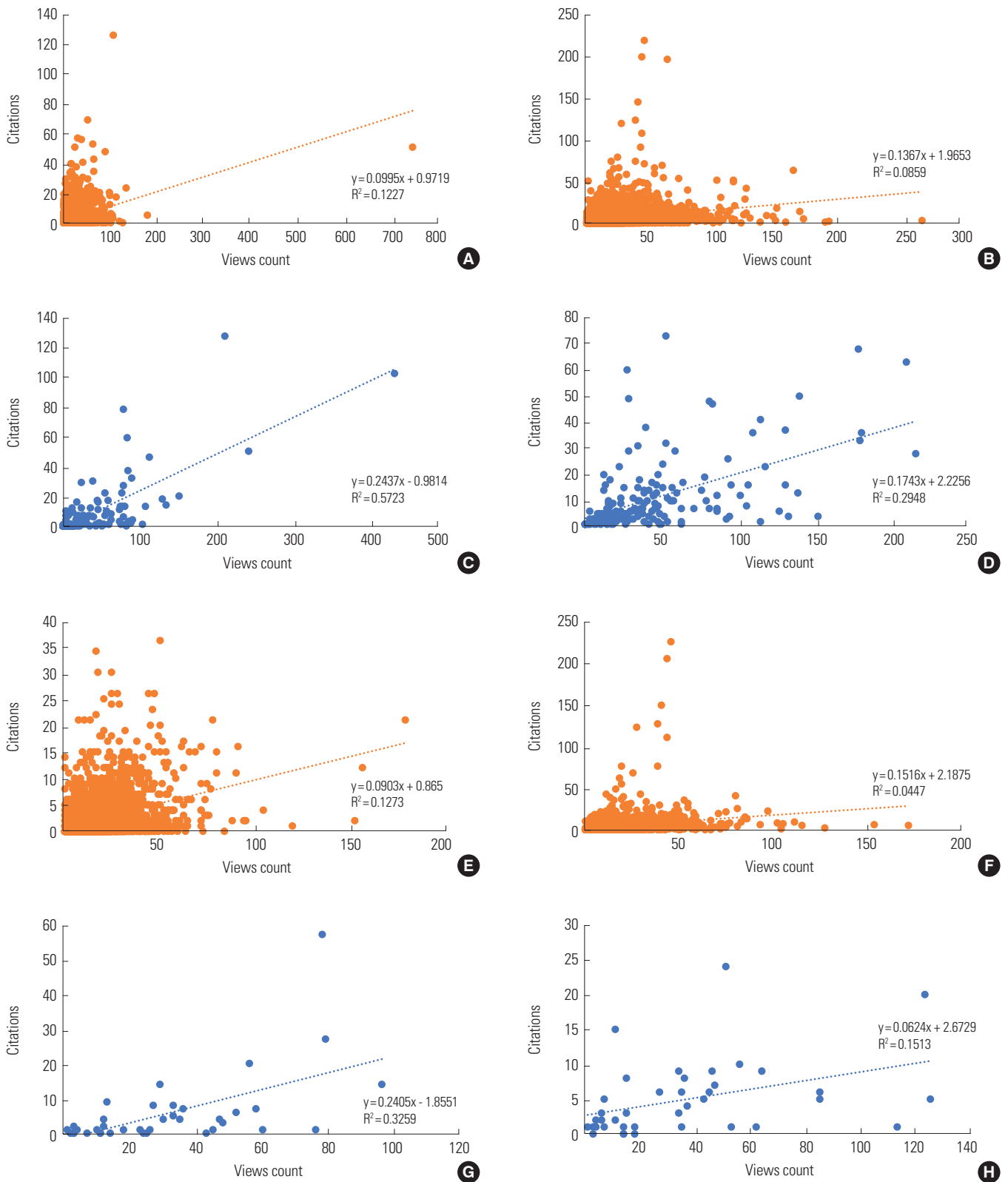


Fig. 3. (Continued to the next page)

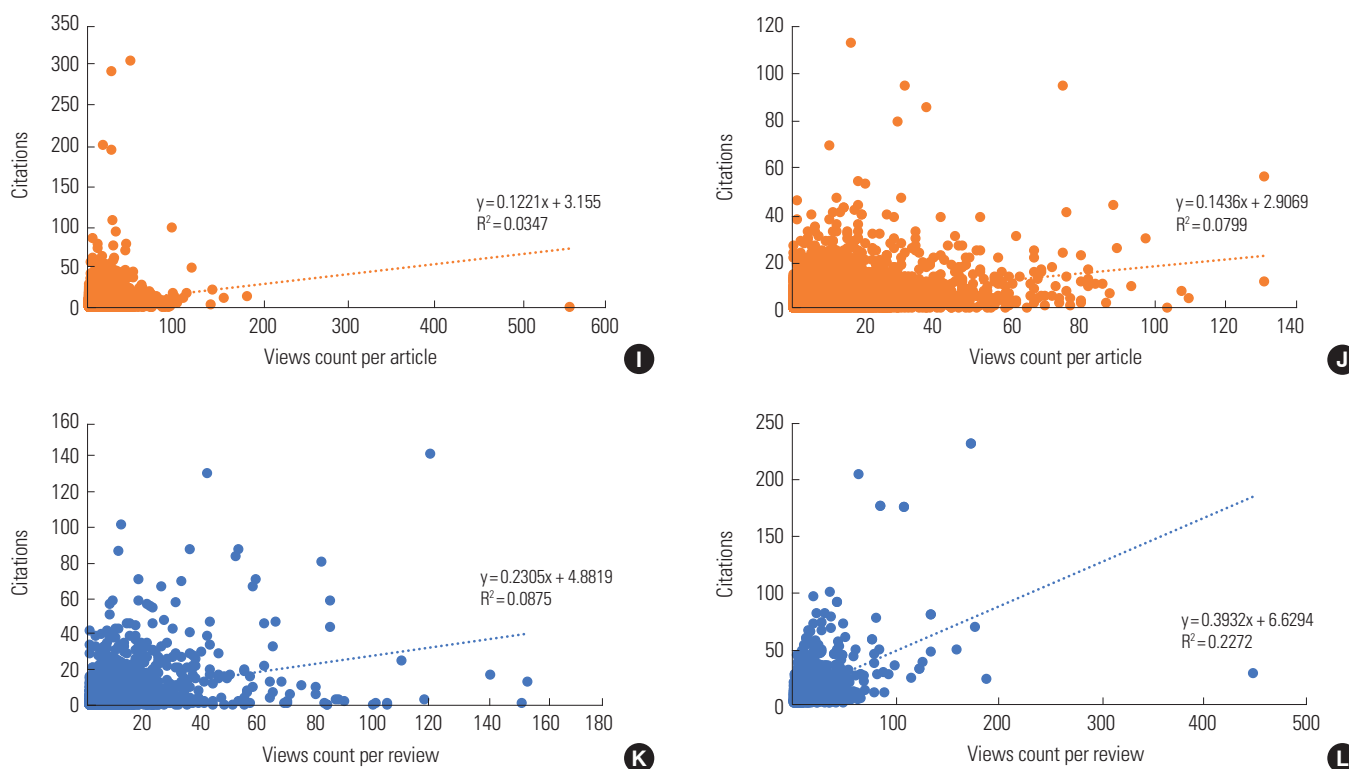


Fig. 3. (Continued) Relationship between views count per publication and citations by author group in three subjects. (A) Articles by Korean author group in engineering, (B) articles by foreign author group in engineering, (C) reviews by Korean author group in engineering, (D) reviews by foreign author group in engineering, (E) articles by Korean author group in materials science, (F) articles by foreign author group in materials science, (G) reviews by Korean author group in materials science, (H) reviews by foreign author group in materials science, (I) articles by Korean author group in medicine, (J) articles by foreign author, group in medicine, (K) reviews by Korean author group in medicine, and (L) reviews by foreign author group in medicine.

across our 12 different categories. We found two trends in the views count analysis. First, the view count of publications by foreign authors was higher than that for publications by Korean authors (by an average of 7.6). This result was in all three subject areas (Table 6). The views count per review by foreign authors in engineering was highest (42.9), and the views count for reviews (on average, 15.5) was higher than the views count per article. The difference between views count per article and per review was highest in publications by foreign authors in engineering (27.7), whereas it was relatively small for Korean authors writing on medical subject (6.0).

How is views count important in terms of citation impact? To provide an answer to this question, we analyzed the relationship between views count and citation impact across the 12 groups of publications (Fig. 3). There was a relatively strong relationship between views count per publication and citation impact compared to the number of authors per publication. In particular, views count per review by Korean authors in engineering and materials science and by foreign authors in engineering and medicine was strongly associated with citation impact. This finding underscores that views

count per review rather than views count per article is more closely related to citation impact.

Discussion

In this study, the citation impact of articles and reviews published by Korean and foreign authors in Korean journals in engineering, materials science, and medicine was examined, with the goal of determining whether bibliometric indicators, such as the number of authors and views count, affected citations of the publication. We found that citations and the publications in top 10 citation percentile in three subject areas were higher for reviews than for articles, except for reviews by foreign authors in materials science. In particular, citations and publications in top 10 citation percentile for reviews in engineering and medicine were quite high. The citation impact of articles and reviews by foreign authors was higher than that for articles and reviews by Korean authors, except for reviews by Korean authors in materials science. The number of authors per review by foreign authors was larger than the number of authors per review by Korean authors, and ar-

ticles in medicine had more authors than those in other subject areas.

Authors from the United States accounted for a large percentage (39.9%) of the reviews in medicine since journal publishers and editors routinely invite distinguished researchers to write reviews. The high percentage of authors from the United States contributed to the higher number of citations and publications in top 10 citation percentile for reviews in medicine. This finding suggests that inviting foreign authors to write reviews is a successful approach in terms of citation impact. The lower citation impact of reviews by foreign authors rather than by Korean authors in materials science can be interpreted as indicating that, world-wide, top-ranking researchers in Korea were invited to submit review in their specific fields. Materials science is known to be one of the most competitive research areas in Korea from a global perspective, as shown by the fact that the number of publications was third and the field-weighted citation impact was 1.38, which was the fourth-highest of 22 categories in Korea [15].

Globally, the publication share of authors from the United States, China, India and Japan was reported to be 25%, 22%, 5.4%, and 5%, respectively, based on a Department for Business, Energy and Industrial Strategy report [16]. This pattern is consistent with that shown in Korean journals, although authors from Malaysia, Iran, and Turkey are relatively over-represented in Korean journals because of their willingness to submit articles to Korean journals since original articles are considered voluntary in terms of publishing activities unlike reviews.

There was a weaker relationship between the number of authors per publication and citation impact. This trend depended on subject area, as the number of authors per review by foreign authors in materials science and medicine was negatively associated with citation impact. There was a positive relationship between views count per publication and citation impact. As the view count increased, the citation impact increased because the publication had more opportunities to be cited. Additionally, this effect of views count seemed to be higher for reviews than for articles.

The limitations of this study include the classification of authors and bibliometric indicators. If a Korean author contributed to a publication along with foreign researchers, the publication was classified as having foreign authors, which means that there were more publications reflecting international collaboration than publications involving national and institutional collaboration [5,17,18]. To identify additional bibliometric indicators that could be important for increasing the citation impact of articles and reviews, future research could extend our research methodology to cover more bibliometric indicators and journals published by Asian countries

in order to validate whether the findings we reported for Korean journals can be generalized.

Our findings imply that journal publishers and editors in Korea should attract more reviews by foreign authors, which are positively associated with increased citations. Doing so will help increase journal impact. Views count and citation impact were found to be positively associated. Hence, journal publishers and editors should support collaborative work, invite more publications from international authors, and promote their publications to increase view count, which is helpful for increasing opportunities to be cited and for promoting the visibility of research.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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The first year of the Crossref Ambassador Program: highlights and challenges

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Introduction

‘Crossref makes research outputs easy to find, cite, link, and assess. We’re a not-for-profit membership organization that exists to make scholarly communications better’ [1].

Crossref was founded in 2000 by a group of 12 publishers who wanted to find a way in which to effectively solve the issue of link-rot for citations and simplify the process of linking to research on other publisher platforms. Prior to Crossref, publishers needed to make individual agreements with one another in order to link to articles on other publisher’s websites, something which was essential given the fact that a references section in any one academic article can contain links to a number of articles from different publishers. Whilst manageable among a small group of publishers, this does not scale, and so Crossref, a not-for-profit, neutral, membership organization, was formed to make research outputs easier to find, cite, link and assess, providing open infrastructure for the scholarly community.

The ability to assign DOIs to content is still arguably the main reason organizations join Crossref. A DOI is a persistent link, expressed as a URL, which when clicked upon redirects to the publisher landing page where the reader can then gain access to that content. However, there is much more to Crossref than DOIs, they also hold an immense store of metadata for over 100 million scholarly content items [2]. When a member registers a piece of content with us, the DOI is only one part of the vast array of metadata that can be associated with it. Other vital information such as article title, author names, and identifiers (ORCID iDs), publication dates, affiliations, license information, abstracts, references, text mining URLs and data sets, and more, can be included. The more comprehensive the metadata that is deposited with Crossref, the more discoverable the piece of content is. Metadata is not only important for driving traffic to publications, but it can be used for a wide range of different purposes such as citation matching, tracking funded research outputs, in annotation tools, metrics, indexing services and library discovery systems to name but a few (Fig. 1).

Crossref also provides a variety of additional services which have been expanded and developed over the years with an increase in members and the collaborative power of their metadata. Services such as Crossmark enables publishers to display if content has been updated, corrected or retracted, whereas the Similarity Check service helps editors to ensure editorial originality, and the Event Data service captures where research is discussed and shared online.

Received: February 4, 2019
Accepted: February 7, 2019

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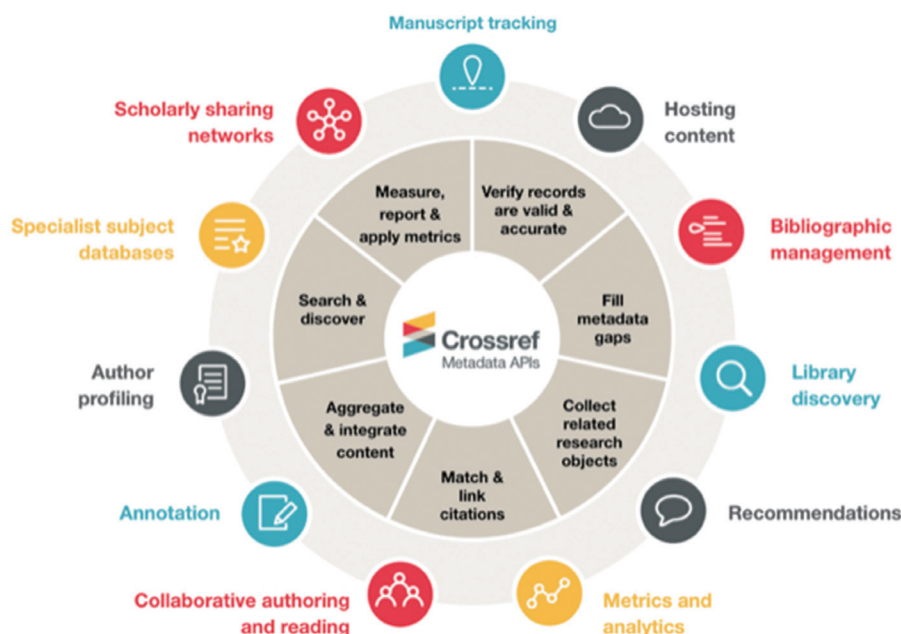


Fig. 1. The uses of Crossref metadata. API, application programming interface.

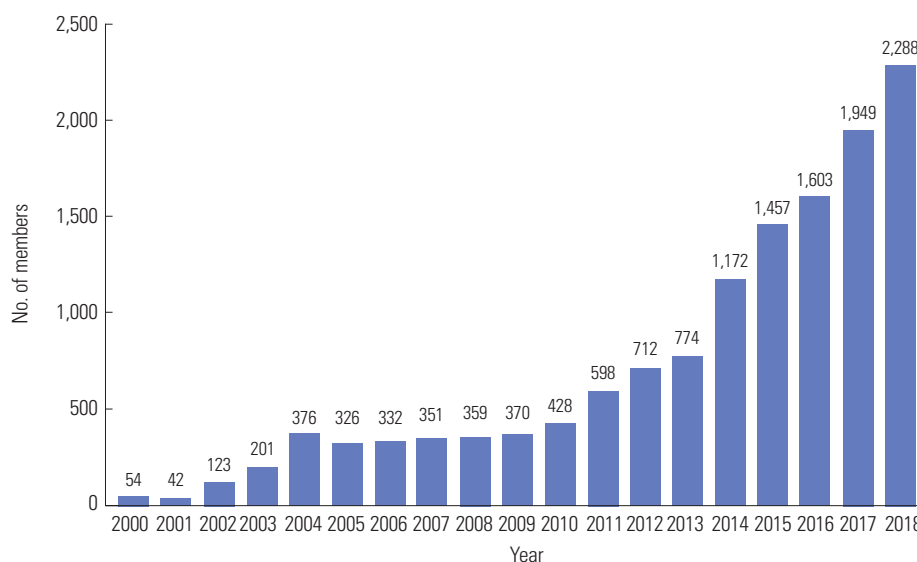


Fig. 2. Crossref members joining per year.

From humble beginnings of 54 members at the end of the first year, Crossref membership has grown substantially to over 11,000 members from 128 countries around the world and continues to grow year on year. Crossref therefore plays a vital role in ensuring linkages between global research outputs continue to be made and built upon (Fig. 2).

The Rationale behind the Ambassador Program

As of January 2019, Crossref has 38 members of staff [3] based primarily in Boston, US and Oxford, UK. The team is constantly striving for ways in which to meet the varied needs of their global and ever-increasing community and provide the levels of support that members require.

Feedback from members identified a need for greater sup-

port in different languages and time-zones. Members would like to see representatives from Crossref in their region, who could be present at industry events and to answer queries and provide information in non-English languages. This is particularly pertinent given that feedback from the community has shown that some members struggle with the technical aspects of membership, particularly when working with English as a second language. Additionally, as an innovative organization, new iterations and improvements to existing tools and services are constantly being developed, as such information and advice on best practice can get out-of-date quite quickly and it is important to provide members with both up-to-date and accurate information.

Having a wider spread of Crossref representatives around the world is not only incredibly useful in terms of dissemination of accurate and accessible information, but also to provide greater insight to Crossref of the different cultural, legal, technological, structural and social challenges members face in their countries.

Crossref also recognized that a number of organizations and individuals around the world were already working within their communities to solve these issues and provide support to others in joining and participating in Crossref. This included conducting training sessions, translating Crossref materials, and holding webinars in local languages. The Ambassador Program was therefore conceived as a way in which to empower and formally recognize those who already work with Crossref and help them to provide the best level of support in their communities.

In addition to feedback from their own community, further research was undertaken into what similar programs already exist within the wider scholarly research industry and what levels of success they have had. This also included discussions with other organizations about their experiences and challenges with running their own ambassador programs.

Following these internal and external conversations at Crossref, the team identified several priorities that the Ambassador Program should address: (1) to gain a deeper understanding of certain audiences or countries, (2) to increase outbound education, with both existing members and new audiences, (3) to improve communication with and between non-English speaking communities, (4) to empower Crossref members to help and advise one another, and (5) to help people to further their relationships with Crossref, deepen their knowledge, and aid their professional development.

The First Year of the Ambassador Program

Over the course of the first year, Crossref has recruited 16 new Ambassadors based in Australia, Brazil, Colombia, India,



Fig. 3. Geographical spread of Crossref Ambassadors, January 2019. Map created using MapCustomizer.com (<https://www.mapcustomizer.com>).

Indonesia, Mexico, Nigeria, Peru, Russia, Singapore, South Korea, UAE, Ukraine, USA, and Venezuela (Fig. 3) [4].

It was decided to keep the Ambassador Program small with 10 to 20 individuals in the first year at least. The total number envisioned has not been agreed upon but is likely not to exceed 50. The reason for this is to ensure that Crossref can build personal relationships with the Ambassador team, be on hand to answer questions that arise, help provide training and other support, and to enable the Ambassadors to build relationships with the other volunteers in the team.

Ambassadors are identified via existing working relationships with Crossref, or via the online application form (<https://www.crossref.org/community/ambassadors/>). The form allows an individual to make an expression of interest and asks some basic questions regarding their understanding of Crossref, their work preferences, areas they would like more knowledge of, as well as some more general information about themselves. Completion of the application form is not automatic approval to become an ambassador. The forms are reviewed internally, and a call is then scheduled to discuss the role and the individual's fit in more depth. With aiming at keeping the program small, it is important to select the correct people with a good level of knowledge of Crossref and the scholarly research industry, who are well connected, and passionate about the work that Crossref does.

After the initial selection process and introductory call, a group training session is scheduled. Although all Ambassadors have some level of familiarity with Crossref services and processes, this can vary greatly depending on their role and exposure to Crossref in their professional lives. The introductory training session not only provides a basic overview of Crossref, but it also helps to highlight any gaps in knowledge and areas for further training or ways in which the on-boarding process

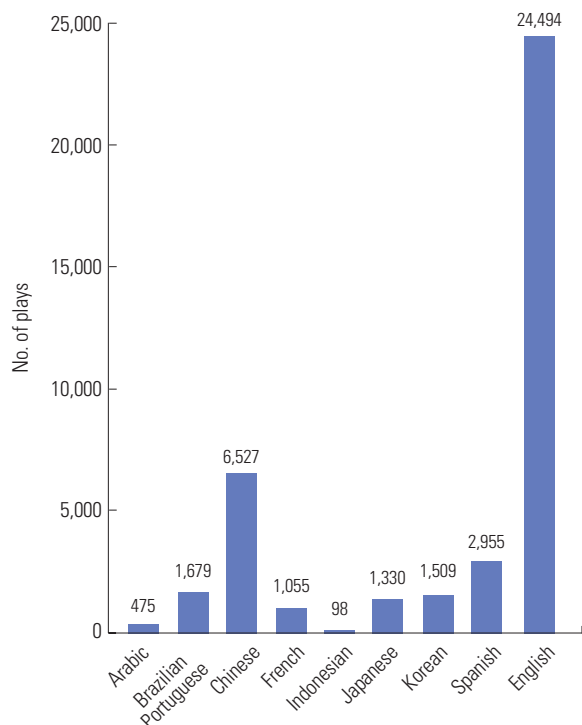


Fig. 4. Crossref service video plays per language.

can be improved. Ambassadors are also encouraged to contact the Crossref team as necessary and on-going check-ins and reviews ensure that the volunteers are happy with their level of support and provide a space to voice any concerns.

Key Highlights

Over the course of 2018, there were a number of key achievements which would not have been possible without the assistance of the Ambassador team. A big focus was to provide support in a wider array of languages. Ambassadors helped translate presentations, messaging, promotional and educational materials. There are now videos available for each of the Crossref services in nine languages including English, French, Spanish, Brazilian Portuguese, Chinese, Japanese, Korean, Arabic, and Bahasa Indonesia [5]. Many Ambassadors were actively involved in the production of these videos either by providing translation or proofreading services or by helping to promote the videos via social media and within their own networks once completed (Fig. 4).

Crossref has also been able to run a successful series of webinars in Russian, Brazilian Portuguese, Spanish and Arabic [6]. Several Ambassadors have taken a lead in running these webinars in their own languages with assistance from Crossref staff on producing materials and answering questions on

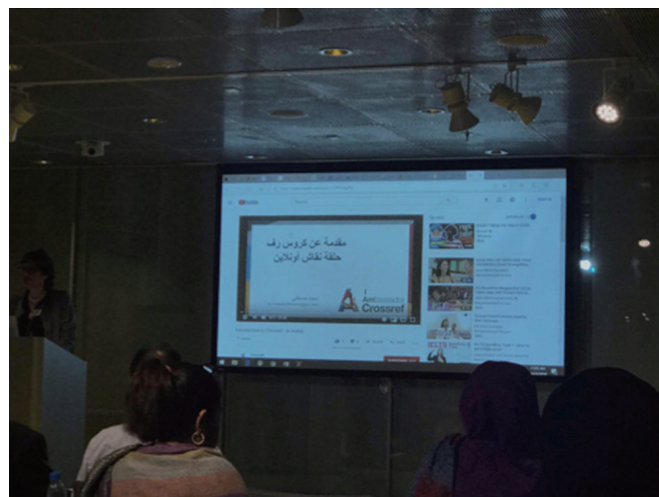


Fig. 5. Arabic webinars presented at Qatar National Library during an Open Access Week workshop.

the day. The webinars have been well attended on the day, as well as many members choosing to watch the recordings at their own leisure (Fig. 5).

Another of the ways in which Crossref has been expanding its international outreach activities is to hold a series of one-day 'LIVE local' events, in different locations around the world, providing information on developments and an opportunity to meet members face-to-face. In 2018 Crossref held events in Japan, South Africa, Russia, Germany, Brazil and India [7]. Ambassadors provide valuable help in organising regional events such as these from recommendations on venues, accommodation, travel and potential guest speakers, to attending and presenting at the events themselves. In addition to these events, Ambassadors are able to represent Crossref at other related industry events in their regions. Korean Ambassador Jae Hwa Chang attended ISMTE in Singapore, Edilson Damasio presented at SNBU and SciELO conferences in Brazil, and Arley Soto assisted at a Redalyc workshop in Peru. This enables greater reach and exposure of Crossref services and provides Ambassadors with a platform and the formal recognition to speak on behalf of the organization.

As Ambassadors are often interacting with the wider community as official representatives of Crossref, it is also important that they are kept up to date with new developments, and that they get to take a first look at new products or services. The ambassador team has participated in beta-testing of a number of new initiatives including the new Metadata Manager and Participation Reports tools and the upcoming Community Forum. By providing feedback from their own user perspective and from how they anticipate those in their communities will view and use these tools, it enables Crossref to make any changes before wider release.

Challenges and Opportunities

There have of course been challenges as well as successes over the course of the first year, as with any new initiative in an experimental phase. The Ambassador Program was designed with flexibility in mind, due to the voluntary nature of the role. Crossref also wanted to ensure that ambassadors enjoy the work that they do, that it compliments their existing professional roles and that they contribute to the program in ways that fit their skill set, interests and availability. Of course, this does mean that some ambassadors have had more opportunity to be involved with the work of Crossref than others within this first year. This is not necessarily a problem; however, it is important to manage expectations and ensure that everyone has the opportunity to participate fully, as well as maintaining that work is evenly spread and none feel overburdened. This is particularly important in regions where there is only one ambassador, or few with proficiency in a particular language.

Ambassadors have expressed a wish for further training materials, both for themselves to deepen their knowledge of Crossref, and to provide to members who approach them with questions and requests for information. This will also include translating more support documentation into other languages to make this accessible for a wider audience. In addition to underscoring the need for more multi-lingual support, the program has also highlighted the complexity of much of the current English support documentation. The breadth of activities Crossref enables members to achieve is valuable, however, this abundance of uses can cause some, especially those who have just joined, to become confused by how to participate and what obligations they need to fulfill. Therefore, there is a need to provide well-structured and simple English language support documentation.

Another somewhat unavoidable challenge for the Ambassador Program is on how to ensure the ambassadors build working relationships with one-another as well as with the Crossref team. Something which would aid them not only personally, but professionally, in making wider industry connections. Such a large geographical spread is essential for being able to reach a large, international audience, but makes meeting in person quite difficult with issues around cost, visas, and travel time. Online meeting software greatly helps with providing a cost-efficient and alternative way to meet, however still presents challenges in terms of time-zones. Additionally, although keeping the Ambassador Program small has benefits in terms of building interpersonal relationships, some countries, such as Brazil to take one such example, can be vast. There are issues of inter-country travel to take into consideration and Crossref may need to assess if more representatives are required in certain regions.

Future Plans

Initial feedback on the program has been overwhelmingly positive, both from the ambassador team themselves and the wider Crossref community. Crossref plan on expanding the number of ambassadors in 2019 and have already received a number of expressions of interest from individuals also interested in learning more and joining the team. Again, there is a need to be selective and ensure that new ambassadors possess the right skills, knowledge and time to dedicate to the role.

In early 2019 Crossref will be launching an online Community Forum. This will provide an open platform where members can pose questions to Crossref staff or to one another, participate in discussions, provide feedback, and share ideas and recommendations. This space will also provide members with the opportunity to post queries in their native language and receive responses from the group in that same language. Ambassadors will be actively engaged in the platform, both in answering queries and in the moderation of non-English content. The community forum will also have a dedicated space for ambassadors to discuss, share their plans and activities, and to facilitate relationship building within the team.

In response to feedback from ambassadors, further training will be provided on technical processes at Crossref and on how to clearly communicate Crossref's role and significance in the scholarly research space. A priority will be made to train ambassadors in the use of the new Metadata Manager tool, as this should simplify the process of registering content and updating metadata records, something of particular importance for new and smaller members. A series of interactive webinars is planned over the course of 2019 to introduce members to the tool and help them get to grips with the functionality. It is envisioned that once ambassadors have familiarity with it, they will also help run these webinars in other languages and time zones.

In May 2018 Crossref hired an Education Manager who is reviewing current documentation, creating a more streamlined and simplified English language support guide. Ambassadors are already involved in the Education Task Force driving this initiative forwards and will provide on-going consultation and feedback.

Continuing expansion of LIVE local events is also planned in 2019. These will focus on areas where Crossref has seen a significant increase of new members as well as identifying areas where uptake is fairly low. Finding partners to work with in these regions to help identify how to support and encourage organizations who are interested in participating will be important, as will the assistance of the ambassador team in maintaining and furthering existing relationships in their regions.

As a community-led organisation, Crossref will continue to

collaborate with others working in the scholarly communications space. This will help to ensure that both Crossref and the ambassador team stay engaged in wider discussions that impact this dynamic industry.

Conclusion

The Crossref Ambassador Program is still in its infancy but has had notable success in the first 12 months with concrete results produced. Improvements to enhance communication within the team and greater multi-lingual support will support our efforts to ensure the program continues to develop and support the wider work of Crossref, and of the Ambassadors, going forwards.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

Thanks goes to all Crossref Ambassadors for their feedback, in particular to Jae Hwa Chang for her assistance in the production of this article and for being Crossref Ambassador for South Korea.

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Scientific communication in the 21st century: Tweeting, Facebook Likes, and everything in-between

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Introduction

Science has always been about two fundamental goals: understanding our natural surroundings and using the acquired understanding to improve the quality of life of everyone in society. Given this relationship, everyone in society is a key stakeholder of all scientific endeavors. However, the dissemination of key research findings has arguably been restricted to exclusive groups of scientists with few attempts at educating and engaging the general society on research outcomes. True public engagement requires one to think beyond the traditional paradigms of research publication. While the traditional journal article serves the purpose of taking science forward one step at a time, there is an increasing need for new wider research dissemination platforms and new research content formats that are easy to digest and engage stakeholders beyond the academic and scientific community.

Science communication and engagement are no longer restricted to a specific community but are instead now expected to target the public to engage funders, policy makers, and society at large. This changing landscape is affecting the way publishers and authors are thinking about scientific engagement. It is resulting in the adoption of newer platforms for research dissemination, developing newer research content formats, and supplementing traditional research impact measurement metrics with newer ones.

How Can We Achieve Public Scientific Engagement?

Traditional research articles have been the cornerstone of all research dissemination over print and online journals. Owing to the nature of the content and distribution channels, these articles have always focused on engaging an audience that was restricted to academia or had specific interests in certain research domains.

Studying the history and evolution of the scientific journal reveals that traditional research articles published in journals cannot be used as a tool for public engagement [1].

We need to first explore the possibility of research dissemination platforms and new research content formats as the basic building blocks for public engagement beyond traditional

Received: January 4, 2019
Accepted: January 28, 2019

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article formats (e.g., full text articles, essays, reviews, critiques, etc.) and journals. Increasingly, newer content formats (e.g., research video summaries, infographics, layman summaries, etc.) and dissemination platforms (e.g., Twitter, blogs, science news websites, etc.) are being adopted to better share science with a larger audience. These newer content formats are adapting to the dissemination platforms and audience engagement behaviors. Therefore, we are stepping into an era where the dissemination platform and its audience dictates the format of science communication.

Science communication is now essentially becoming goal oriented: 1) Science communication for peers and archiving continue to be via the traditional journal article format through online and print journals as the primary channels for dissemination. 2) Science communication for the public through content formats that vary depending on the platforms deployed for research engagement.

Changing Face of Scientific Communication: Content Formats and Impact Measurement

We note how science communication for public engagement has begun to change with the adoption of newer dissemination platforms and content formats.

To understand the changes in science communication, we need to first understand the incentive to adopt these dissemination platforms and content formats for the primary drivers of scientific progress and communication, namely, publishers and researchers.

Increasingly, research has become competitive with an exponential increase in the number of journals and researchers for every discipline. Some estimate that the global research output doubles every nine years [2]. Over time, this increase in research output leads to an information overload problem for readers like researchers across all scientific disciplines. This problem is even more exacerbated for people that are not directly related to research.

This information overload has clearly increased the need for scientific content discoverability as a focus for publishers and researchers.

The focus has now begun to shift from traditional content formats such as online/offline journals to content formats (video, audio, layman summaries, etc.) that are engaging and tailored for increasingly alternative dissemination platforms beyond traditional journals.

As these newer content formats and dissemination platforms take root, there has also been an increasing need to measure research impact for these newer content formats and dissemination platforms. For the longest time, citation rates and impact factor have arguably been considered as reliable

Table 1. The weightage of each research dissemination platform contributing to a research article's Altmetric Attention Score

Media stream	Weights per mention
News media	8
Blogs	5
Wikipedia	3
Policy documents	3
Twitter	1
F1000/Pubblons/ Pubpeer	1
Open Syllabus	1
Google+	1
Facebook	0.25
YouTube	0.25
Reddit	0.25

proxies to measure research impact for a research manuscript and journal, respectively. However, over the current decade, we have seen the rise of Altmetrics and its purported metric Altmetric Attention Score (AAS) emerge as a reliable measure of research impact. As we understand AAS better, it becomes clear that it is a measure of research impact with a positive but weak correlation [3] to citation scores. Therefore, as AAS becomes more widely accepted as a complementary metric of research impact that has a positive correlation to citation rates, it is evident that research dissemination platforms and the impact that AAS measures are evolving with increasing adoption. Thus, it merits further investigation through its evolution. This evolution of AAS significance for research impact measurement will be closely related to the evolving content formats used to effectively influence each of the AAS metrics (Table 1) [4].

Thus, it is intuitively evident that new impact measurements metrics emerging in tandem with new research content dissemination platforms will lead to new customized research content formats. We can now firmly say that we are witnessing the evolution of research content communication driven by the adoption of newer content sharing platforms and related content formats, leading to new impact measurement metrics. The face of science communication is changing!

How Can Publishers and Authors Adapt to This Changing Scenario?

It is clear that we are amidst a changing reality where research dissemination platforms are diversifying, resulting in newer research content formats and measurement metrics.

New content formats

Along with newer research content dissemination channels, it is observed that newer research content formats that are adapted to these channels are also gaining in popularity. We will briefly review these content formats below:

Visual summaries present key results in a snapshot, providing an at-a-glance summary. They require minimum time burden and have high recall values and can also be used as presentations. The variants of this format include infographics, graphical abstracts, and visual abstracts.

Video summaries bring the research to life with audio, graphics and animation. They have a high outreach potential because of an engaging format and are particularly helpful for a show-and-tell approach. The variants of this format include video summaries, figure explainers, and talking head videos.

Audio summaries present portable contents which listeners learn on-the-go. They build a community of listeners and share opinions and commentary on a critical topic. The variants of this format include podcasts, audio slides, and interviews.

Lay summaries present alternatives to abstracts that are accessible to a more general audience. They are more tailored for coverage on mainstream science media and easiest to convey research impact. The variants of this format include plain-language summaries, blog posts, news stories, and press releases.

AAS as a complementary research impact metric to citation rates

For simplicity, we will restrict the overview of newer research platforms for research sharing to the ones measured by AAS (Table 1), since this currently accounts for the most comprehensive

type of research dissemination platforms in terms of its research impact measurement assessments [4].

Case studies for alternative research dissemination channels and metrics

Publishers have started experimenting by accommodating these newer content formats to facilitate better research content dissemination; this is seen in some of the below mentioned experiments.

Annals of Surgery conducted the study presented in Fig. 1 to quantify the impact of content formats (Visual Abstract VS Title only) on article reads for Twitter [5]. Articles with a visual abstract were read nearly three times more than those that did not have a visual abstract.

Cell Press experimented with Figure360. These are talking figure videos embedded within manuscripts that replicate a conference presentation. These products were embedded in an article PDF as seen in Fig. 2. The key metric that Cell Press measured was “Do users perceive a high level of value in F360 videos?” Over 60% of the respondents responded positively. This was concluded as a successful experiment.

Annals of Laboratory Medicine conducted a short-term trial where they experimented with alternative article formats (video or infographics) alongside traditional formats of published articles. They found that those with alternative formats were cited nine times more than regular articles.

Journal of Bone & Joint Surgery began permitting alternate formats alongside articles (Fig. 3). The articles with these content formats performed much better than the articles without these, achieving 4-10X more social media views and interactions for posts with visual content.

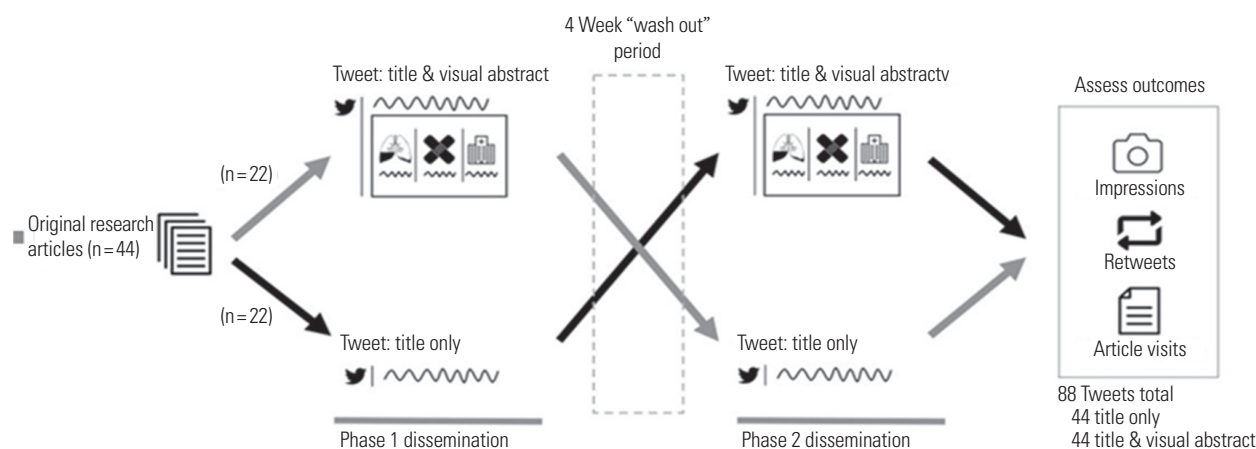


Fig. 1. Study design. Prospective, case-control crossover study to evaluate the impact of visual abstracts on Twitter. Study conducted between July 2016 and December 2016 using articles published the same year. All articles in this study were tweeted from Annals of Surgery account (Twitter: @AnnalsOfSurgery). Outcomes data were aggregated from Twitter Analytics and compared using matched-pair t-test analytics. Reproduced from Ibrahim AM, et al. Ann Surg 2017;266:e46-8, with permission from Wolters Kluwer Health [5].

One specific study showed that AAS in ornithology was a good predictor of future citations in lower impact factor journals [4]. For higher impact factor journals though, this correlation was weaker since higher impact factor journals were anyway highly circulated/read, leading to higher citation rates. This interplay of impact factor, probability of citation, and

AAS is seen in Fig. 4 [4].

Another study on ecological research showed that though articles in high impact factor journals tend to be heavily cited [6], those in lower impact factor journals can also be heavily cited when they generate significant Twitter activity (also reflected in AAS scores).

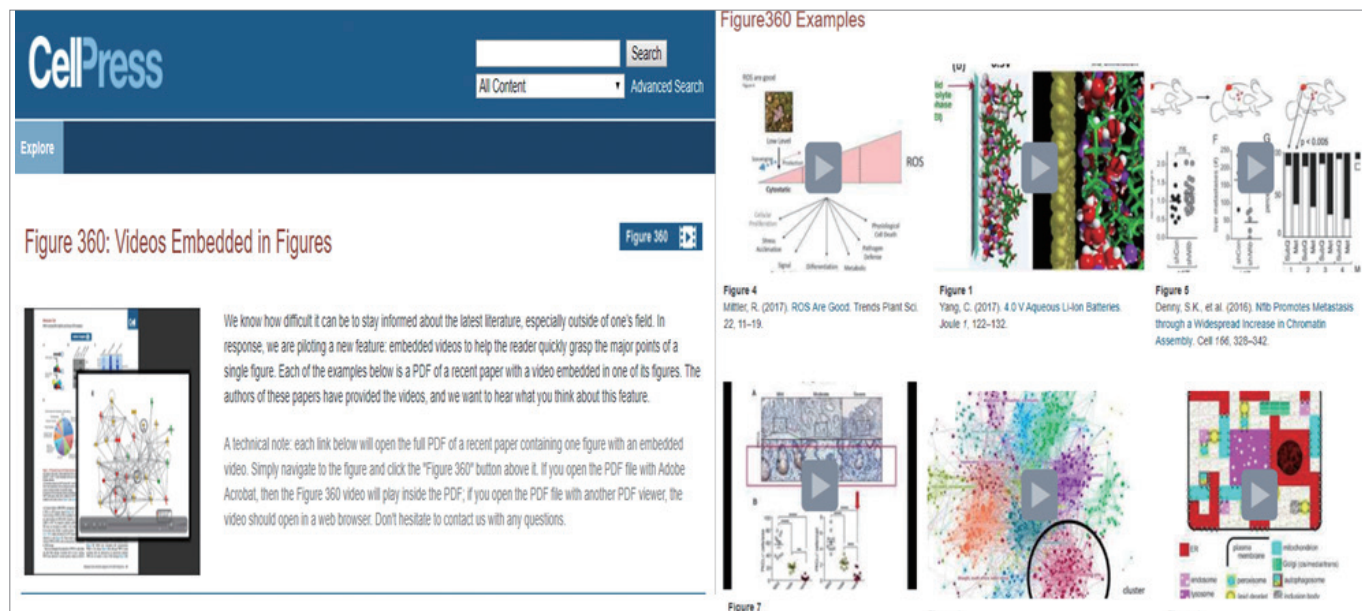


Fig. 2. Cell Press experimenting with Figure360 as an innovative 3D video embedded in figures (<https://www.cell.com/figure360>).

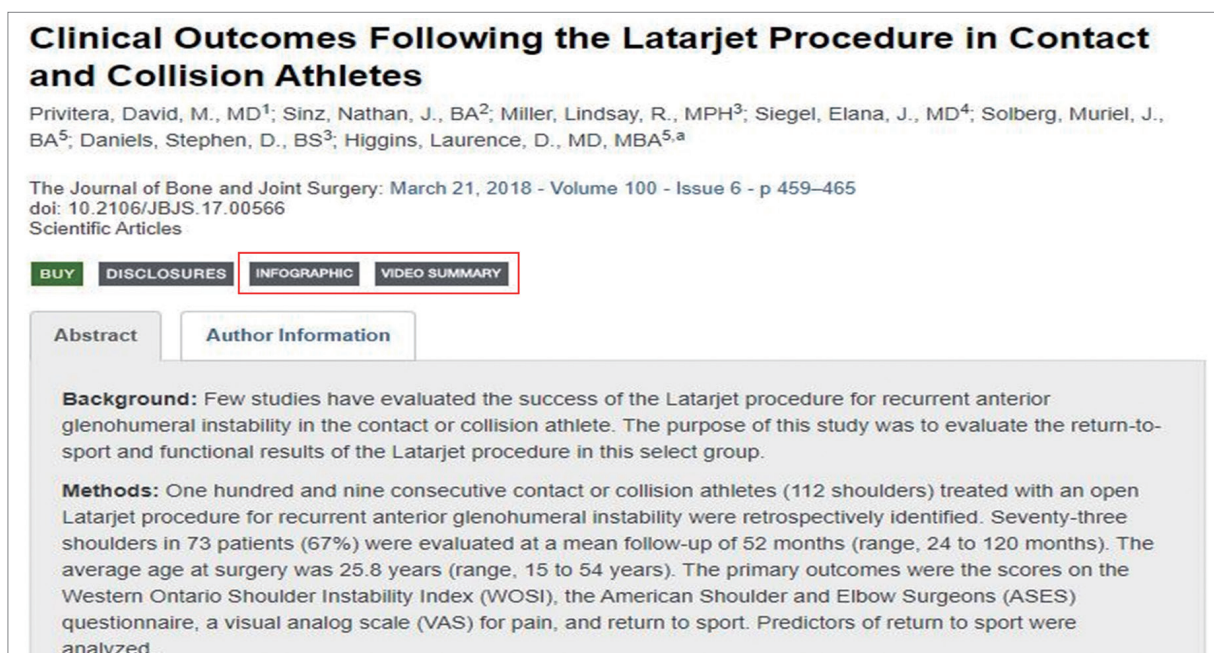


Fig. 3. Alternative content formats (indicated by the red square box) integrated with existing ones in *Journal of Bone & Joint Surgery* (https://journals.lww.com/jbjsjournal/Abstract/2018/03210/Clinical_Outcomes_Following_the_Latarjet_Procedure.2.aspx).

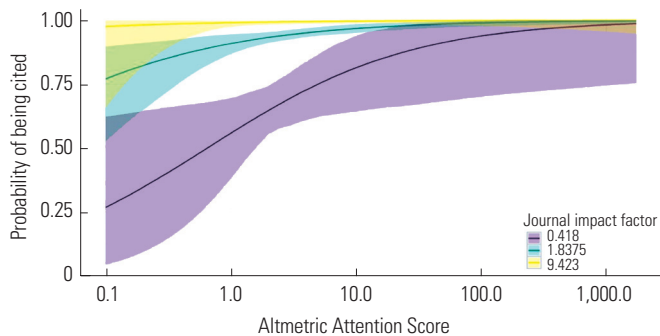


Fig. 4. Relationship between Altmetric Attention Score, journal impact factor, and probability of being cited. Lines show predicted citation probability $\pm 95\%$ confidence interval for journal impact factors of 0.418 (minimum), 1.838 (median) and 9.423 (maximum). Note: log-transformed axes.

These cases show a definite shift in some of the newer research content formats that are being adopted, platforms they are being shared on, and the increasing research and experiments being conducted by both authors and publishers on the future and correlation of these changes with traditional research content sharing platforms and content formats.

Conclusion

With the rapid increase in global scientific output [2] and competing research, the need to draw attention to published scientific articles and make them noticeable is rapidly becoming the need for both journals and authors. To do so, it is important to look at research sharing platforms and impact measurement beyond traditional ones such as journals and citation metrics, respectively. Social media platforms are fast gaining popularity for both sharing and consumption of scientific research output. AAS scores are rapidly being accepted as a means of measuring the research impact of scientific output published in social media. These developments, coupled with increasing research on discipline-specific positive correlation of citation rates and AAS [3,4,6], mean that the evolving trends of disseminating and measuring the impact of scientific articles will only continue; these trends will need con-

tinuous research so that their potential is fully explored from a societal impact perspective. As these trends evolve, scientific research content formats need to evolve from traditional journal articles to newer formats like visual, video, audio, and lay summaries to better leverage the new research dissemination and measurement trends that are gradually being adopted by the larger academic and scientific community.

Conflict of Interest

The author is business head for Editage Korea which is an editorial and research communication service provider for publishers and universities. No other potential conflicts of interest relevant to this article is reported.

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Bronze, free, or fourrée: an open access commentary

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Introduction

Open access publishing, where readers do not pay to access articles, became possible due to the electronic publishing revolution that is the Internet [1]. The seminal definition of open access, and one upon which most literature still draws, is that of the “Budapest Open Access Initiative” (BOAI):

By “open access” to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited [2].

To achieve this free access to scholarly literature, the BOAI recommends two complementary strategies. The first is self-archival of scholars’ work in dedicated online archives. The second calls for the establishment of open access journals that ensure immediate open access to the articles they publish without any access restriction or subscription fees to readers.

There are many other definitions of open access, and Bailey [3] gives a useful overview of others and of the evolution of terminology in this space. However, the BOAI still contains the fundamental principles and goes hand-in hand with Creative Commons which provides the most prevalent licensing architecture that enables open access.

The evolution of open access first centered around gold and green options. Green open access, or “the green way to open access,” is modeled on the practices of physicists who, from as far back as 1991, began archiving personal versions of their papers prior to publication on a central archive called ArXiv [4]. Gold open access, by contrast, refers to articles that are made available immediately at the point of publication by the publishing journal itself and as the manuscript’s final version of record. Such articles are “born free” [5]. How gold access comes about can vary. Authors may pay an article processing charge (APC), and this may be to a journal that is completely open access. The rise of open access mega-journals exemplifies an innovative form of a journal that successfully pursued this model [6]. Journals have also taken

Received: November 29, 2018
Accepted: December 24, 2018

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a “hybrid” approach, continuing to publish closed-access articles available only via subscription but alongside fully (gold) open access articles for which authors have paid an APC. Additionally, some open access journals do not charge any APCs. “Diamond open access” is one term posited to define this form of non-APC open access:

In the Diamond Open Access Model, not-for-profit, non-commercial organizations, associations or networks publish material that is made available online in digital format, is free of charge for readers and authors and does not allow commercial and for-profit reuse [7].

“Platinum” offers an alternative term to “diamond” for a journal that charges no APCs to authors. Regarding consistency of terminology, it has the advantage that platinum, like gold, is a metal and that it is more valuable than gold. Both diamond and platinum are now used and mean broadly the same thing. However, it will be a new term—bronze open access—that the remainder of this paper focuses on.

Bronze, Free or Fourrée?

Following a study of over 300,000 articles, Piwowar et al. [8] posited the term “bronze”:

We also add a novel subcategory, Bronze. Bronze shares attributes of Gold and Hybrid; like both, Bronze OA articles are publisher-hosted. Unlike Gold OA, Bronze articles are not published in journals considered open access in the DOAJ. Unlike Hybrid, Bronze articles carry no license information. Although this lack of identifiable license may not be intentional, without an identifiable license, the articles are free to read but do not allow extended reuse rights beyond reading.

Notably, the term “bronze access” also appears in a tweet from Ridgway as far back as 2014 [9].

A central finding of the Piwowar study was their suggestion of strong evidence for the existence of an Open Access Citation Advantage. Open Access Citation Advantage postulates that open access articles get cited more than their closed counterparts. It is difficult to prove this decisively in the absence of randomized controlled trials, as authors could conceivably only choose to publish their best work open access, particularly if high author fees are involved, but increasing evidence points in this direction [10]. Moreover, all other things being equal, it is hard to see how articles that have limited access can be read and cited as widely as those with no access restrictions.

So-called bronze articles also enjoy the benefit of greater citation. Piower et al. [8] found that half of bronze articles ap-

pear in “hidden Gold” journals: i.e., journals that look and act like open access journals in many ways but fail to reflect this in their licensing. In many parts of the world, the intellectual property legal architecture that is Creative Commons has yet to take hold. Creative Commons provides a comprehensible and accessible way to add open licensing to written works. It now operates as the de facto legal lingua franca of free access. Interestingly, research on the growth of medical journal publishing in Korea found a correlation between the adoption of Creative Commons by journals and their use of technical standards, such as DOIs, Crossmark, Funder Registry, ORCID ID, and XML languages that aid article discoverability and description by research indexing services such as journal article tag suite (JATS) XML [11]. Hence, it can be useful to think of open access as a socio-technical concept. It has roots in a philosophical movement to widen access to the heritage of human knowledge but is intertwined with the development of a set of technologies and standards that allow data to be described and shared by computers. Moreover, this could suggest a possible confounding factor to the open access citation advantage that has not been hitherto considered by researchers; i.e., that technologies generally found alongside Creative Commons may aid article indexation and discoverability. However, this is not to imply that some parts of the world are necessarily playing catch-up to others regarding open access. Many journals in the global north remain fully closed or even offline. Meanwhile, initiatives such as the SciELO (Scientific Electronic Library On-line) project in Brazil have made massive advances in open access publishing in Latin America and the Caribbean before spreading to Portugal, Spain, and South Africa [12].

However, another of Piwowar et al. [8]’s significant findings was a high prevalence of bronze articles in many traditional closed and hybrid journals. This would appear to be an increasing trend with major publishers, but not a lot is known about this phenomenon. A casual perusal of the prominent hybrid journals from the biggest commercial publishers can reveal that several articles are marked as “free.” Yet this “free” label may mean that it is free to read only on the journal website. The publisher can, in theory, revoke this access at any time. Harnad [13] has derided this practice as “peek-a-boo open access.” The value of this free access is clear to the publisher: It can make some articles free, such as those that it thinks will drive readers, attention, and citations to its journal. This increases the reputation of the journal, but because it does not make all of its articles free all of the time, it can still charge subscription fees to institutions and readers.

These “free” or Bronze open access articles grant no reuse rights. It may not even be clear that the articles can be legally downloaded from the journal website and retained. There are certainly no rights to share or redistribute them. Combined

with the fact that the “free” access may cease at any time on the publisher’s whim, it is clear that there are limited uses to these articles. For instance, they cannot be used as open educational resources with students in a teaching scenario. A “free” article cannot be shared with students, such as a PDF in a learning environment, as there is no license to allow this. It cannot be reliably linked to either, as the publisher could revoke access at any time, leaving a broken link. Indeed, the words “free,” “bronze,” and even “open access” seem less relevant the more one examines the issue.

The terms *gratis* and *libre* [14] sprang from the free and open source software movements to distinguish between two types of access: *Libre*, where rights are only granted to read articles, and *Gratis*, which gives rights to use and reuse literature. Hilton et al. [15] and Wiley [16] have expanded these terms to detail the five Rs of Open, which grant rights to reuse, revise, redistribute, remix, and retain a given work. This last addition, the right to retain a work, brought the original four Rs to five and is interesting because the inability to retain a copy of a “free” article is problematic, as we have discussed.

It is worth going back, however, to an earlier example from the debate over the difference between “free” and “open.” The Free Software Foundation gave simple but evocative metaphors to distinguish between “free” and “open.” They contrasted “free beer” with freedom of speech.

“Free software” means software that respects users’ freedom and community. Roughly, it means that the users have the freedom to run, copy, distribute, study, change and improve the software. Thus, “free software” is a matter of liberty, not price. To understand the concept, you should think of “free” as in “free speech,” not as in “free beer.” We sometimes call it “libre software,” borrowing the French or Spanish word for “free” as in freedom, to show we do not mean the software is *gratis* [17].

There is another useful phrase we can draw on here, which is of uncertain provenance, but dates back at least to the 1970s [18], when it was used regarding television advertising: “If you are not paying for it, you are the product.” What might this mean in relation to “free” articles? Publishers may gain many advantages of extra traffic to their website that results from “free” articles. Because articles cannot be redistributed, it perhaps the only way one can share them legally is via links. Hyperlinks to articles can increase the search engine optimization of a journal website, given that a key component of the Google search engine algorithm is that pages with more incoming links appear more prominently in search results. Increasingly, journals now feature “most viewed” or “most accessed” tabs on their homepages. Views clearly matter, and publishers seek ways to maximize them.



Fig. 1. The open access logo icon.

An interesting feature of such articles in hybrid journals is that they often include an icon of an opened lock. This appears to directly mimic the open access symbol created by PLOS One (Fig. 1). If so, it could be classified as an example of “openwashing” [19]. “Openwashing” refers to an arguably deceptive practice, insofar as it purports to be open but does so only to make itself more attractive. In reality, it does not adhere to a majority of the principles of openness. It is derived from “greenwashing,” where vendors opportunistically label their products “green” in the hope of increased sales. With the increased focus on open access, we may expect not just an increased commodification of openness [20], but also more confusion as associated concepts, symbols, and language are co-opted or copied by various actors.

Free lunches are hard to come by. Theoretically, a publisher could deprive me of access to a “free” article before I had finished reading it; i.e., at any time. Hence, “bronze” seems too strong a word. We need something that captures the fleeting, unfair, and asymmetrical nature of power that this type of access embodies. One that shows that individuals—both readers and authors—derive benefits only when and for as long as they serve those of the publisher. Perhaps the “fourrée,” the ancient Greek or Roman term for counterfeit coin? A *fourrée* comprised base metals coated in gold or silver. It was crafted to fool an unsuspecting purchaser too eager to trust a gleaming exterior. It may prove an apt metaphor for so-called bronze or free access articles.

Conclusion

Whatever we call these articles—bronze, free, or *fourrée*—it is vital that we have an open and critical debate about what they are and whose purposes they most serve. The language and concepts of both freedom and openness are contestable, and we would do well to engage critically in this debate. This essay has sought to shine a light on some of the issues involved and hopefully stimulate further discussion amongst scholars and publishers about this pressing topic.

Conflict of Interest

The author is the lead editor of the *Irish Journal of Technology Enhanced Learning*, the journal of the Irish Learning Technology Association, and an associate editor of the *Australasian Journal of Educational Technology*, the journal of the Australasian Society for Computers in Learning in Tertiary Education. Both journals are gold open access, charging no article processing charges to authors. Except for that, no potential conflict of interest relevant to this article was reported.

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Personal data protection of academic journals in the age of the European General Data Protection Regulation: guidelines for Korean journals

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Introduction

There are many publications addressing the General Data Protection Regulation (GDPR) of the European Union (EU), which came into force in May 2018. Many writers have acknowledged that Korean companies handling EU customers and their personal data are subject to the GDPR. These writers also explain the differences between the GDPR and Korea's Personal Information Protection Act (PIPA) [1,2] and how to cope with the GDPR [3,4]. The question is whether the GDPR affects Korea-based academic journals. Some readers may have ignored the GDPR, assuming that it has little bearing on academic journals, unlike business entities that trade personal data and companies whose success often depends on how much personal data they retain. Other readers, if they manage journals whose contributors or reviewers include EU citizens, might have wondered if they are subject to the GDPR as well.

What Does the GDPR Signify for Korean Journals?

Technically speaking, non-EU based journals, including Korea-based journals, cannot completely escape the GDPR, as the Regulation is applicable to all persons and entities—regardless of whether they are EU-based or not or they are acting for-profit or not—that process (e.g., collect, store, and use) the personal data of people who are in the EU for the purpose of offering goods or services [GDPR Art. 3(2)]. To be more specific, a non-EU based (e.g., Korean) journal that accepts the EU user registrations and subscriptions becomes a “data controller” according to Articles 3(2) and 4(7) of the GDPR. A data controller is a person or other body that determines the purposes of and means for processing personal data. Consequently, Korean journals must take the GDPR into account. As a result, the editor of a Korean journal should also be mindful of how the GDPR affects his or her journal's activities because the editor, under the direct authority of the journal [data controller], is authorized to process (e.g., retrieve or share with others, if necessary) personal data.

Received: November 26, 2018
Accepted: December 11, 2018

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In addition, it is noteworthy that PIPA's definition of "data subjects" includes any living person, regardless of his or her nationality [5]. The PIPA Art. 2(5) provides for *gaeinjeongbocheorija*, defined as a public body, legal person, organization, individual, *et cetera*, that processes personal data for the performance of a task, which is equivalent to a data controller under the GDPR. Korean journals serve this function. The PIPA defines the term *gaeinjeongbocheorichwigeubja* (i.e., journal editor) as a person processing personal data under the command or supervision of the controller [PIPA Art. 28(1)]. In other words, Korean journals and their editors assumed the duty of protecting the personal data of European citizens under the terms of the PIPA before the GDPR came into force. This means that the enforcement of the GDPR will not require meaningful changes in the general practices of academic journals in Korea, so long as the PIPA provisions that apply to academic journals do not differ from provisions in the GDPR.

With this in mind, the present article focuses on the implications of the GDPR and the PIPA for academic journals. To begin, a basic understanding of the concept of personal data and the laws protecting such personal data—the GDPR and the PIPA—are necessary.

How Can We Define "Personal Data"? Why Should We Care About Them?

"Personal data" refers to any information relating to a data subject—an identified or identifiable living person (not a legal entity). Different pieces of information that, when collected together, can lead to the identification of a particular person also constitute personal data [6-8]. For example, all the information that *Science Editing* requires for registration, such as a user's ORCID, email, name, affiliation and department, degree, address, and phone and fax numbers, falls in the category of personal data. Moreover, any information about registered users that was created after their registration (e.g., the results of a peer review, editorial decisions, turnaround time, and/or any comments on authors or reviews) also falls under this umbrella [5,9,10].

The EU laws provide that everyone has a fundamental right to the protection of his or her personal data [11,12]. Similarly, both Korea's Constitutional Court and Supreme Court have recognized individuals' rights to informational self-determination as a fundamental constitutional right. This is derived from the right to privacy (Korean Constitution Article 17) and the right to dignity and the pursuit of happiness (Korean Constitution Article 10) [13,14]. The GDPR and the PIPA embodied this fundamental right as the right to be informed, the right to consent, the right of access, the right to rectification and erasure, and so on under, which are basic

laws protecting personal data in both the public and private sectors in the EU and Korea, respectively [GDPR Arts. 12–22, 34; PIPA Arts. 4, 35–37]. If a journal violates the GDPR or the PIPA, the journal might be subject to punishment or an administrative fine [GDPR Arts. 83, 84; PIPA Arts. 70–76]. Of course, an individual may also bring a civil claim against a journal that breached his or her personal data rights [GDPR Arts. 79, 82; PIPA Arts. 39, 39-2].

The GDPR Also Considers Academic Journals' Interests

There is also good news for academic journals. The right to the protection of personal data is not absolute [GDPR Art. 23]. GDPR Recital (4) states, "Personal data must be considered in relation to its function in society and be balanced against other fundamental rights, in accordance with the principle of proportionality." Indeed, the GDPR provides for many derogations or exemptions from its certain provisions based on "journalistic purposes and the purposes of academic, artistic or literary expression" or "archiving purposes in the public interest, scientific or historical research purposes, or statistical purposes" [15,16]. The PIPA also provides for some provisions on derogations or exemptions [PIPA Arts. 35(4)(ii), 37(2)(ii), (iv), 58(1)].

What Should Academic Journals Then Do Or Not Do With Personal Data?

Collection of personal data

Journals should not collect more personal data than needed. Collect the data in a lawful manner and for specified, explicit, and legitimate purposes [GDPR Art. 5(1)(a) and (b); PIPA Arts. 3(1), (2), 16(1)]. Journals collect personal data for publication and communication regarding journal activities. Thus, in general, the scope of personal data that journals collect will likely not exceed the scope of information that *Science Editing* collects, as illustrated above. If sensitive personal data (e.g., race, political opinions, and religious or philosophical beliefs) are necessary for a journal, the journal must inform the data subject of its purpose and obtain informed and explicit consent from the data subject [GDPR Art. 9 (2); PIPA Art. 22(3)].

Journals may also collect personal data on potential authors or reviewers from publicly available information. This collection method is generally lawful because the data subject can be deemed to have consented to the collection or processing of his or her personal data within certain parameters [17]. A journal, however, should keep a record of the sources of the data, of which his or her journal has a legal duty to inform the data subject [18,19].

Disclosure of personal data protection policy

For a data subject to exercise his or her rights, the data subject must be aware of who collects his or her personal data, how the data is used, and, if the data is provided to a third party, which third parties receive the data. Therefore, a journal must establish and disclose such matters (i.e., a journal's personal data protection policy) to a data subject when collecting personal data, not only when the journal collects personal data from the data subject but also when obtaining personal data from other sources [PIPA Art. 30].

Sharing personal data with others

Journals should treat personal data as confidential information and share it only for the purpose of the journal activities of which a data subject has been informed. When sending newsletters regarding a journal's activities to multiple recipients, for example, using the "Bcc" field will conceal recipients' personal details from each other. If a journal provides offline subscriptions or sends hard copies to authors or reviewers, it can share recipient names and addresses with the printers. However, it must make sure that the printers do not use this information for any other purpose.

Considering that some reviewers or contributors are in foreign countries (especially countries outside the EU), some journals that adopt single-blind peer review or open-peer review policies might have concerns about the issue of transferring personal data to a third country, which is often mentioned in connection with the enforcement of the GDPR. The GDPR has restrictions about transferring personal data to a non-EU member state and allows it only when special conditions are satisfied [GDPR Art. 44]. Academic journals, however, need not be unduly concerned because the GDPR allows exemption or derogation for them [GDPR Arts. 49 (1) (b), 85(2)].

The rights to access, rectification, and erasure

In general, a journal, as a data controller, should be able to provide, rectify, or remove information upon a request from a contributor, a reviewer, or a subscriber [GDPR Arts. 15–17; PIPA Arts. 35–36]. For instance, if a reviewer wants to check his or her record on a journal, such as turnaround time, rating, or ranking, the journal is supposed to comply with that request. If the reviewer finds inaccurate data and requests rectification of that data, the journal must comply with that request as well.

In some cases, however, journals may have difficulty complying with certain requests from a data subject: if a contributor wants to access confidential comments on his or her article made exclusively for use by an editor; if a reviewer requests deletion of all the records on himself or herself; or if a rejected contributor requests deletion of all the data created regarding

his or her contribution and its review. Although the laws are not discernable in all situations, the relevant laws consider not only the rights of a data subject but also the interests and rights of the other party—in this case, a journal [GDPR Arts. 17(3)(a), (d), 85(1), (2), 89(2); PIPA Art. 35(4)(ii)]. In other words, if a data subject's demand is deemed to undermine an academic journal's special function of publishing research and scholarship and the journal's needs that are pertinent to retaining a historical record of the process involved in reviewing and editing such research and scholarship, the journal can (at least partially) refuse such a demand from a data subject if it explains its reasons for doing so.

Conclusion

There is some criticism that the GDPR imposes a heavy burden in today's information-oriented society. However, it must be noted that the GDPR aims to balance the need to protect personal data with other important interests, including freedom of expression and information. In that regard, a journal that has treated personal data with respect need not be very concerned about the GDPR. For a comparison of the GDPR and the PIPA, see Appendix 1.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

This work was supported by the research program at Dongguk University.

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 19. Personal Information Protection Act. Article 20.

Appendix 1. Comparison of the GDPR and the PIPA

		GDPR	PIPA
Definition	Personal data & data subject	Art. 4(1)	Arts. 2(1),(3)
	Data controller/ <i>Gaeinjeongbocheolija</i>	Art. 4(7)	Art. 2(5)
	<i>Gaeinjeongbocheolichwigeubja</i>	Art. 29	Art. 28(1)
	Data processing	Art. 4	Art. 2(2)
Basic principles		Art. 5	Art. 3
Rights of the data subject	Right to be Informed	Arts. 12, 13, 14, 19	Arts. 4(1), 15(2), 20
	Right to consent	Arts. 4(11), 7	Arts. 4 (2), 22
	Right of access	Art. 15	Arts. 4(3), 35
	Right to rectification and erasure	Arts. 16, 17	Arts. 4(4), Arts. 21, 36
Restrictions to rights of data subjects		Arts. 23, 85, 89; Arts. 14(5), 17(3), 18(2), 20(3), (4), 21 (6), 22 (2)	Arts. 35(4), 36(1), 37(2), 58(1)
Notification of a personal data breach		Arts. 33, 34	Art. 34
Compensation		Arts. 79, 82	Arts. 4(5), Arts. 39, 39-2
Fines/penalties		Arts. 83, 84	Arts. 70–76

GDPR, General Data Protection Regulation; PIPA, Personal Information Protection Act.

Review of the Board of Editors in the Life Sciences certification examination

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The Board of Editors in the Life Sciences (BELS) certification examination was held by the BELS at the University of Seoul on December 1, 2018 (Fig. 1). It has not been conducted in last 4 years since 2014 in Korea. BELS is a specialized institution established in the United States in 1991 to evaluate the quality of manuscript editors (MEs) in the field of life sciences. It has fostered professional MEs in the life sciences by holding examinations in the United States, Asian countries, and European Medical Writers Association.

Since May, the Korean Council of Science Editors has conducted elementary and intermediate-level training course for MEs, and some of those who completed the course took this examination. Those who took the exam had to solve 106 questions within 3 hours. There were various types of questions, ranging from knowledge of academic journals overall to manuscript-editing practices, but most of them were about substantive editing. Above all, the BELS examination requires academic knowledge of the life sciences, a thorough understanding of English grammar, and training in scientific writing. Therefore, those who are only responsible for the administrative tasks related to academic journal publication and reviews, but who entrust a specialized agency with editing and proofreading despite being an associate editor or ME, would not be able to take the examination. The BELS examination concentrates heavily on editing ability, so it requires specialized training and effort from domestic MEs who do not speak English as their native language.

While preparing for the examination, I had to read a vast amount of data and relevant books, which were helpful to me, personally, regardless of the examination result. In particular, the intermediate-level course for MEs, which was hosted by Korean Council of Science Editors, made me address the necessities of grammar, such as rules for editing, punctuation for style, and the composition of tables and graphs, which were very useful. I would recommend this examination for those who manage the editing and proofreading at a society or specialized institute and want to be recognized as a certified international ME expert in the field of life sciences. Unfortunately, however, it is not guaranteed that the BELS examination will be held annually in Korea, despite its popularity with both domestic MEs and foreigners, many of whom took it in Korea because it was unavailable in their countries. Thus, even if you want to take this examination, you cannot assume that you can register for it in Korea whenever you want. You should check the schedule calendar carefully on the BELS website and see the country and region you can visit (Table 1).

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Accepted: January 31, 2019

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Fig. 1. Photo of Board of Editors in the Life Sciences examinees in Korea (December 1, 2018).

Table 1. Board of Editors in the Life Sciences BELS Certification Examinations in 2019

Date	Day	Time	City	Site	Register by
February 3, 2019	Sunday	1:00 p.m.–4:00 p.m.	Mumbai, India	M. L. Dahanukar College, Dixit Road, Vile-Parle (East), Mumbai – 400057 Maharashtra	January 13, 2019
March 16, 2019	Saturday	1:00 p.m.–4:00 p.m.	Dallas, TX	Meadows Conference Center, 2900 Live Oak Street	February 23, 2019
May 4, 2019	Saturday	1:00 p.m.–4:00 p.m.	Columbus, OH	Hyatt Regency	April 13, 2019
November 6, 2019	Wednesday	9:00 a.m.–12:00 noon	San Diego, CA	Sheraton San Diego Hotel and Marina	October 16, 2019

Adapted from <https://bels.memberclicks.net/assets/docs/2019%20Calendar%20v.6.pdf>.

While preparing for the BELS examination, I encountered the following sentence: “Remember that, as writers and editors, it’s our job to make our materials clear, not the readers’ job to figure out what we meant.” In other words, it can be editors’ fault rather than readers’ fault if readers of an academic journal do not understand articles. If you are preparing for the BELS examination, you should remember that the role of the ME is to make articles clear and easy to understand.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Publication ethics workshop: how to cope with predatory journals

Jong-Ho Park

Nuclear Chemistry Research Division, Korea Atomic Energy Research Institute, Daejeon, Korea

Date: October 26, 2018

Venue: Content talent campus-Grand conference room, Korea Creative Content Agency, Seoul, Korea

Theme: Predatory journals: current status and countermeasures

Workshop organizer: Korean Council of Science Editors

Since various false academic conferences were reported this year, investigations on the participants and follow-up investigations have been carried out rapidly. Research institutes are also creating a whitelist of academic conferences. In particular, the whitelist includes not only academic conferences but also credible journals, in order to prevent the publication of manuscripts to predatory journals.

As an editorial board member of the Analytical Science & Technology and the Korean Society for Mass Spectrometry that are striving to become recognized, I had many concerns. Although I encouraged relevant researchers to submit their papers to our journals, thus actively promoting our journals to improve publication rates and diversify our writer pool, I might have accidentally invited misunderstanding and doubt in connection with recent issues surrounding false academic conferences and predatory journals. To avoid such misunderstandings, I had to familiarize myself with predatory journals and their current status. I attended the publication ethics workshop held by the Korean Council of Science Editors under the topic of “Predatory journals: current trends and countermeasures” to help address these issues (Fig. 1). On the day of the workshop, it was raining somewhat heavily, but people attended, despite the inclement weather, and filled the lecture hall.

Fake academic journals are generally called “predatory journals.” These journals have an unqualified, fraudulent editorial staff and publish manuscripts without any proper review processes. Predatory journals only exist to receive article processing charge rather than for sharing academic and technological achievements, as most academic journals do, so they do not hold any value as legitimate academic journals. In principle, academic journals without academic value die out, but the deceptive commercial purposes of these false academic journals satisfy the interests of some dishonest researchers, in that they easily address the pressure from research achievements, thereby prolonging the existence of these fake academic journals.

The first presentation “Current trends and countermeasures” and the second “Current status/

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Accepted: January 31, 2019

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Fig. 1. Group photo from the Publication Ethics Workshop.

cases/countermeasures” included explanations and discussion about the current status of predatory journals. Predatory journals are exploiting the recent development of open access (OA) journals. OA journals, which grant public access to research, often require article processing charge from manuscript writers to maintain the journals. Predatory journals attempt to justify their fees in a similar way to these OA journals.

According to a 2015 report, there were about 8,000 predatory journals in 2014, and about 410,000 articles were published in these journals. I was surprised to learn that the number of predatory journals listed in Scopus or SCI is continuously increasing. Eventually, researchers may grow to trust an academic journal listed in the internationally recognized citation index and unintentionally submit their manuscript to a predatory journal. This means that it is not always easy to distinguish between predatory journals and relatively unknown international journals with proper academic values, like many domestic journals. Thus, international citation databases are reinforcing the examination of listed academic journals and are deleting journals that have been caught. In addition, they are reassessing research ethics and management regulations nationwide and striving to monitor predatory journals. However, the research ethics of researchers who resist the temptation of fast and easy research achievements and who share their research results through proper channels and the aca-

demical world's efforts to reform itself are most important.

The third presentation was titled, “The survey results of the researchers’ recognition about false conference World Academy of Science, Engineering and Technology (WASET) and countermeasure,” which summarized survey results for 13 items using data from 1,100 researchers from universities, national organizations, research institutes, and companies in Republic of Korea in 2018. Although this survey investigated false academic conferences rather than predatory journals, I was interested in the results because I thought that they could provide insight on the current status of predatory journals. According to this report, a majority of respondents answered that the problems with the quantitative research project evaluation index were the main reasons for the recent issue of false academic conferences, and only 33% of respondents said that this issue resulted from academic dishonesty of individual researchers. This suggests that as long as research project evaluations are highly dependent on the number of academic achievements, researchers will constantly be exposed to the temptation of false academic conferences and predatory journals. I found the opinion that hasty punishment in response to critical public opinion or the addition of regulations may violate the autonomy and efficiency of the research field highly persuasive.

The fourth presentation was “Problems on academic communication.” Predatory journals only pursue a commercial

goal, so they publish articles without any qualitative examination to maximize their profits. Therefore, I believe that transparent peer review is the key to preventing the prevalence of predatory journals. This is in line with open science, a system that is transparently validated by disclosing research results to more researchers. Various platforms for implementing open science have been established and utilized. The emergence of predatory journals is not the only reason the open science system is necessary; the open science system will significantly assist in addressing the negative effects of predatory journals. In conclusion, academic journals will develop in parallel with open science along with introduction of digital publication, open access, and various identifiers.

After the workshop ended, I thought about why I attended this workshop. As an editorial board member, what can I do to differentiate our journal from other journals so that it is not confused for a predatory journal? We had only made efforts to list our journal in international citation indices, such as Scopus and SCI, and believed that the qualitative and ethical issues of journals would automatically be solved if our journal

was listed; however, the negative effects of predatory journals have shown that this is not the case. In the end, only by bolstering an expert review system that strictly and transparently evaluates papers submitted to journals can the intrinsic value of academic journals be recognized. I will consider this fact to be a starting point and contemplate what editors and editorial board members should do to establish such a system.

I think that all researchers, as well as editors, should be interested in this workshop, because every researcher needs to take a healthy and progressive approach to presenting their research. Although we should support institutional efforts to improve the environment that results in researchers being attracted by predatory journals, researchers are responsible for producing sound research based on integrity. To do so, we should reassess our research ethics and reject dishonest shortcuts.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

2018 Intermediate-level training course for manuscript editors

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Department of Orthopedic Surgery, Inje University Seoul Paik Hospital, Seoul, Korea

Date: Once a month, May 17 to August 23, 2018

Venue: National Library of Korea, Seoul, Korea

Theme: 2018 Intermediate-level training course for manuscript editors

Organizer: Korean Council of Science Editors

From May 17 to August 23, 2018, I participated in the 2018 intermediate-level training course for manuscript editors, which was hosted by the Korean Council of Science Editors (KCSE). Afterward, I took and passed the third Korean Manuscript Editors Certification by KCSE. Because I am currently serving as the associate editor of the *Journal of Bone Metabolism*, I have been interested in the process of manuscript editing.

Due to the increasing importance on research achievements and evaluations, young professors in Korea need to publish more academic papers either willingly or by pressure from their institutions. While the joy of publishing a paper is momentary, the writing process can be a difficult, long-lasting ordeal. Therefore, I wanted to learn how to write papers more efficiently. After I started working as an associate editor for the *Journal of Bone Metabolism*, I became interested in paper formatting and the composition of academic journals. While managing the academic journal, I found areas for improvement and deficiencies in our journal through submitting my papers to other journals. Having anticipated that this training would help improve the quality of my papers and our academic journal, I participated in the training course for manuscript editors.

The first part of training concerned English grammar for academic writing. I never had a full understanding of English grammar nor found it very interesting before this course. If I had known how necessary English grammar would be during my middle- and high-school years, I would have studied English grammar much more. The middle part of the training involved a lecture about sentence types and structures, such as inconsistent participles. Anyone who has peer-reviewed papers would recognize a strange sentence structure but would not be able to explain the reasoning behind it in detail. I learned the rules that determine proper sentence structure and how to correct it, which was really helpful. The last part of the training covered the use of punctuation and rules for academic writing, and I was surprised at the many instructions and meanings. When writing papers, clinicians tend to write sentences that seem meaningful on the surface, as have I. However, I learned about the relevant rules through this

Received: January 23, 2019

Accepted: January 31, 2019

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course, and it will help me write better papers. I feel really great that this course has helped me organize my experience accumulated by submitting papers to several academic journals and editing.

When I started taking this course last summer, I was highly motivated. However, over time, whenever I was busy, I struggled, wondering if studying was worth the effort. After the course was over at the end of August, I organized a study group to prepare for an international manuscript editor certificate examination (Board of Editors in the Life Sciences) in December in Korea. During break time, I had instructive conversations with other members, and a bond developed between group members because each of us was doing our best at our position.

Considering that it is important for clinicians to conduct beneficial research and publish the findings in prestigious journals, proofreading and editing papers is critical. This course shared the perspective of those who edit and proofread academic journals and provided a good opportunity for me to master the basics of academic writing. I really appreciate the colleagues who studied with me, and I will not forget the summer of 2018 how my learning and studying has benefitted me.

Many universities and institutions require that professors demonstrate research achievements, so writing academic papers is not optional but mandatory for clinical researchers. In addition, many domestic and international academic journals request manuscripts be submitted in English. However, there is no opportunity to receive education about academic writing or academic journals as part of the medical school curriculum or residency. This course has helped me learn to recognize awkward sentences and understand difficulties that accompany writing English manuscripts. Although I am not able to fully memorize the vast amounts of information I learned in the course, it has allowed me to reflect on the process of writing and reviewing manuscripts during the course, which will help me carry out future research. Lastly, I would like to express my sincere gratitude for KCSE, which continuously offers good curricula.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

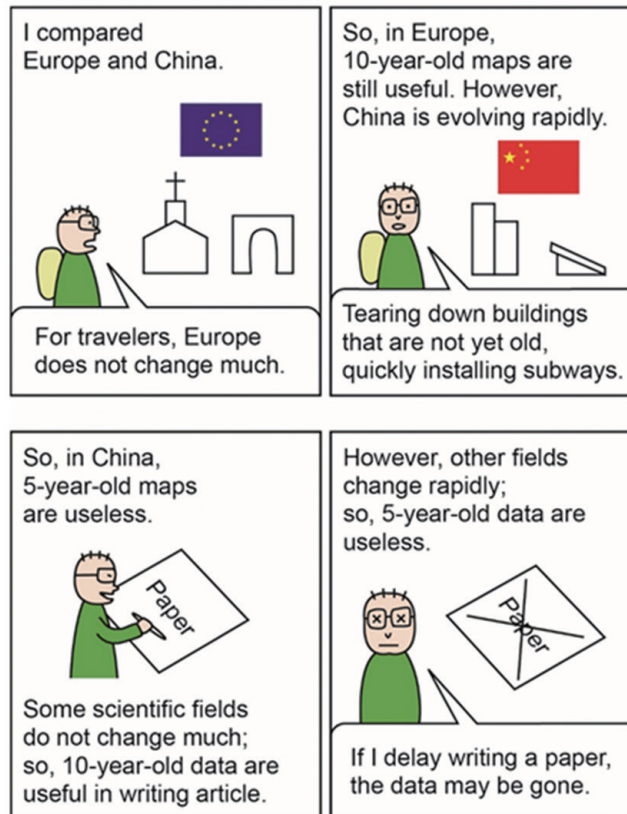
Europe and China differ

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Europe and China differ.



Received: August 23, 2018
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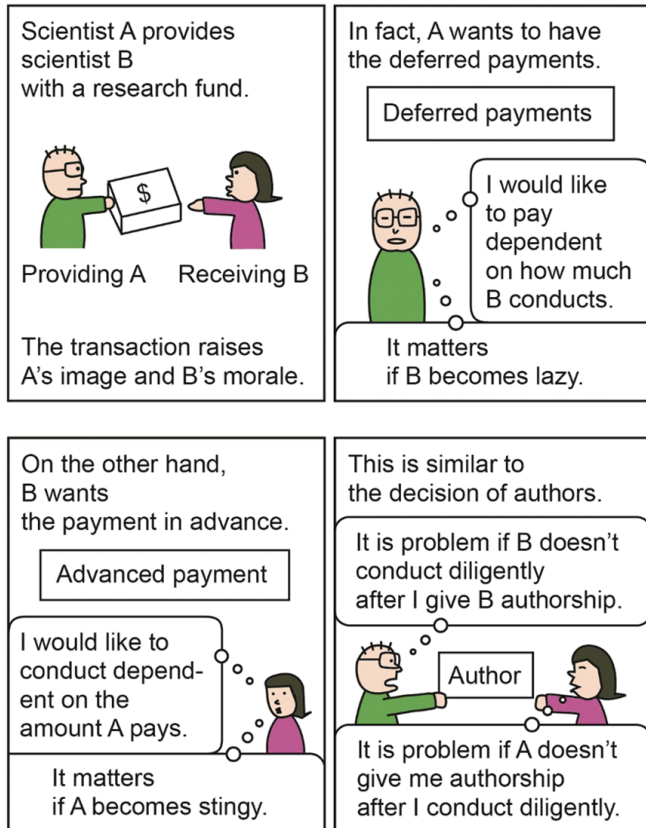
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Firenze in Italy is the home of the Renaissance. The roads and buildings of the old city were constructed during the Renaissance and they have not changed a bit. There is a picture of the whole old city from the Renaissance era, and surprisingly, it is completely the same as it is today. The roads are narrow and uncomfortable to walk on and are even more uncomfortable for people commuting by cars, since cars had not been invented during the Renaissance. However, there are still lots of tourists in Firenze. Tourists care about the peculiarity, not the convenience.

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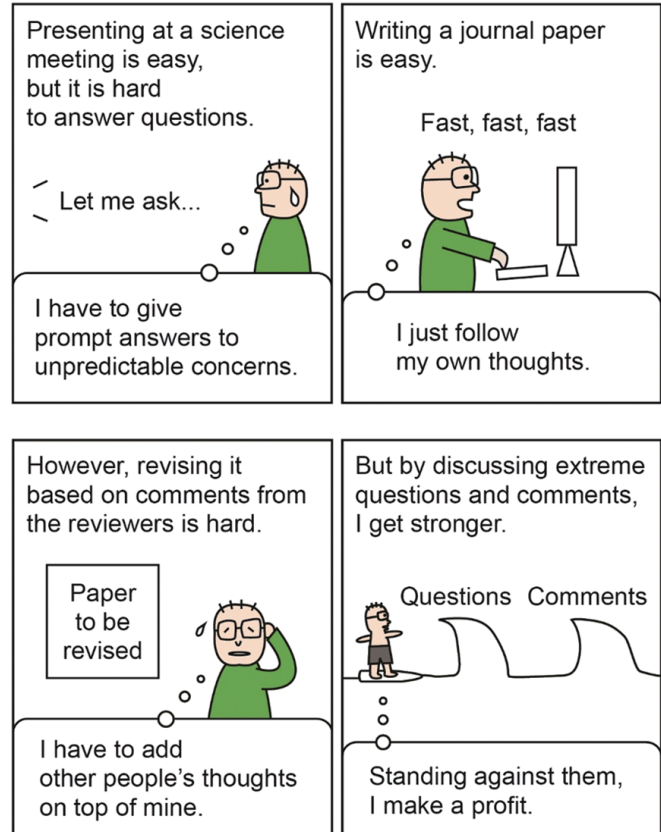
Relationship of A and B



Once I had too much to drink at a meeting with an important person who had funded my research. After we sobered up, we felt quite awkward, and I regretted having done such a thing. It is okay to have a drink with someone important. However, do not drink too much. A is A, B is B.

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Fussy questions and comments



Let's say the reviewer of my journal paper had 30 comments. Then I not only have to revise it based on these 30 comments but also specify how these 30 comments are reflected in the revised paper. If I choose not to make changes, I have to explain my reasoning. As this is quite difficult for me, I often end up finishing right before the deadline. I say to myself that if I become an evaluator, I will make more lucid and simple request of revision to help author's work to be presented more scientifically.

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Eight cases

I can take three outcomes from conducting research.

There are eight possible cases if these three outcomes are combined. Taking none (1 case), one (3 cases), two (3 cases), and all three (1 case).

In reality, it is hard to take even one outcome. Even if I barely take two, there is still problem.

It is the reason why research is such a difficult task.

This is another example of a combination. Have you ever been to any of these countries: China, Japan, or America? One possibility is that you have not been to any of them. Another possibility is that you have been to only one country, two countries, or all three of them. There are a total of 8 cases which can be drawn from the equation $2 \times 2 \times 2 = 8$. This is called the binominal distribution. Like this, you can think and talk with logic if you count the number of cases.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Dream big.

I nagged at a graduate student.

Don't dream of being a professor,

but dream of being a scientist known all over the world.

If you are an exceptional, highly published research scientist, you will be a professor naturally.

Even if you are slightly outstanding, you can still become a professor.

Don't pester others to make you a professor,

make others pester you to be a professor.

Academic journal Cooperative scientist

Funding foundation

Make others want you.

There are people who accomplish 5 out of 10 goals when originally hoping to achieve all 10. There are also people who want 3 and complete all of them. The former is better since they have a better result. The process is also better. The bigger your dream, is the harder you will try. Also, you will have more fun if you dream big. You need not be disappointed just because you could not fulfill all of them. Trying wouldn't hurt.

Acknowledgments

This research was financially supported by the Ministry of Trade, Industry and Energy (MOTIE) and the Korea Institute for Advancement of Technology (KIAT) through the International Cooperative R&D program (grant no. N0002249).

Events in 2019

The Korean Council of Science Editors announces the schedule of the events in 2019. Precise schedule and registration of the workshops were or will be available from: <https://www.kcse.org>.

Table 1. Schedule of the events by the Korean Council of Science Editors in 2019

	January	February	March	April	May	June
<i>Science Editing</i> (twice a year)		Vol.6 No.1 (20)				
Newsletter (4 times a year)			No. 29 (31)			No. 30 (30)
Editor's Workshop	2019 Preconference Workshop (25)		Editor's Workshop (21-22, Jeju)			
Manuscript Editor's Training & Workshop			Basic Manuscript Editing (5, 12, 19, 26)	Basic Manuscript Editing (2, 9, 16, 23)		
Publication Ethics Workshop			Manuscript Editor's Workshop (7)			
			Publication Ethics Workshop (29)			
	July	August	September	October	November	December
<i>Science Editing</i> (twice a year)		Vol.6 No.2 (20)				
Newsletter (4 times a year)			No. 31 (30)			No. 32 (31)
Editor's Workshop			Editor's Workshop (27, Daegu)		Editor's Workshop (29)	
Manuscript Editor's Training & Workshop	Manuscript Editor's Certificate Workshop (12-13)		Basic Manuscript Editing (3, 10, 17, 24)	Basic Manuscript Editing (1, 8, 15, 22)	Examination for Korea Manuscript Editors Certification (16)	
Publication Ethics Workshop		Publication Ethics Workshop (23)			Publication Ethics Workshop (22)	

Instructions to Authors

Enacted January 1, 2014

1st revised August 20, 2018

Recently revised February 20, 2019

1. General information

Science Editing (Sci Ed) is the official journal of the Korean Council of Science Editors (KCSE) and Council of Asian Science Editors (CASE). Anyone who would like to submit a manuscript is advised to carefully read the aims and scope section of this journal. Manuscripts should be prepared for submission to *Science Editing* according to the following instructions. For issues not addressed in these instructions, the author is referred to the International Committee of Medical Journal Editors (ICMJE) "Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals" (<http://www.icmje.org>). It also adheres completely to the Principles of Transparency and Best Practice in Scholarly Publishing (joint statement by COPE, DOAJ, WAME, and OASPA; <http://doaj.org/bestpractice>) if otherwise not described below.

2. Copyright and Creative Commons Attribution license

A submitted manuscript, when published, will become the property of the journal. Copyrights of all published materials are owned by KCSE. The Creative Commons Attribution License available from: <http://creativecommons.org/licenses/by/4.0/> is also in effect.

3. Research and publication ethics

The journal adheres to the ethical guidelines for research and publication described in Guidelines on Good Publication (<http://publicationethics.org/resources/guidelines>) and the ICMJE Guidelines (<http://www.icmje.org>).

1. Authorship

Authorship credit should be based on 1) substantial contributions to conception and design, acquisition of data, and/or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; 3) final

approval of the version to be published; and 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Every author should meet all of these four conditions. After the initial submission of a manuscript, any changes whatsoever in authorship (adding author(s), deleting author(s), or re-arranging the order of authors) must be explained by a letter to the editor from the authors concerned. This letter must be signed by all authors of the paper. Copyright assignment must also be completed by every author.

- Corresponding author and first author: *Science Editing* does not allow multiple corresponding authors for one article. Only one author should correspond with the editorial office and readers for one article. *Science Editing* does accept notice of equal contribution for the first author when the study was clearly performed by co-first authors.
- Correction of authorship after publication: *Science Editing* does not correct authorship after publication unless a mistake has been made by the editorial staff. Authorship may be changed before publication but after submission when an authorship correction is requested by all of the authors involved with the manuscript.

2. Originality, plagiarism and duplicate publication

Submitted manuscripts must not have been previously published or be under consideration for publication elsewhere. No part of the accepted manuscript should be duplicated in any other scientific journal without the permission of the Editorial Board. Submitted manuscripts are screened for possible plagiarism or duplicate publication by Similarity Check upon arrival. If plagiarism or duplicate publication is detected, the manuscripts may be rejected, the authors will be announced in the journal, and their institutions will be informed. There will also be penalties for the authors.

A letter of permission is required for any and all material that has been published previously. It is the responsibility of the author to request permission from the publisher for any material that is being reproduced. This requirement applies to text, figures, and tables.

3. Secondary publication

It is possible to republish manuscripts if the manuscripts satisfy the conditions of secondary publication of the ICMJE Recommendations (http://www.icmje.org/urm_main.html).

4. Conflict of interest statement

The corresponding author must inform the editor of any potential conflicts of interest that could influence the authors' interpretation of the data. Examples of potential conflicts of interest are financial support from or connections to companies, political pressure from interest groups, and academically related issues. In particular, all sources of funding applicable to the study should be explicitly stated.

5. Statement of human and animal right

Clinical research should be done in accordance of the Ethical Principles for Medical Research Involving Human Subjects, outlined in the Helsinki Declaration of 1975 (revised 2013), available from: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>. Clinical studies that do not meet the Helsinki Declaration will not be considered for publication. Human subjects should not be identifiable, such that patients' names, initials, hospital numbers, dates of birth, or other protected health-care information should not be disclosed. For animal subjects, research should be performed based on the National or Institutional Guide for the Care and Use of Laboratory Animals, and the ethical treatment of all experimental animals should be maintained.

6. Statement of informed consent and institutional review board approval

Copies of written informed consent documents should be kept for studies on human subjects, which includes identifiable information or sensitive information. For clinical studies of human subjects, a certificate, agreement, or approval by the Institutional Review Board (IRB) of the author's institution is required. If necessary, the editor or reviewers may request copies of these documents to resolve questions about IRB approval and study conduct.

7. Process for managing research and publication misconduct

When the journal faces suspected cases of research and publication misconduct such as redundant (duplicate) publication, plagiarism, fraudulent or fabricated data, changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the resolution process will follow the flowchart provided by the Committee on Publication Ethics ([\[ethics.org/resources/flowcharts\]\(http://publication-ethics.org/resources/flowcharts\)\). The discussion and decision on the suspected cases are carried out by the Editorial Board.](http://publication-</p></div><div data-bbox=)

8. Process for handling cases requiring corrections, retractions, and editorial expressions of concern

Cases that require editorial expressions of concern or retraction shall follow the COPE flowcharts available from:<http://publicationethics.org/resources/flowcharts>. If correction needs, it will follow the ICMJE Recommendation for Corrections, Retractions, Republications and Version Control available from:<http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/corrections-and-version-control.html> as follows:

Honest errors are a part of science and publishing and require publication of a correction when they are detected. Corrections are needed for errors of fact. Minimum standards are as follows: First, it shall publish a correction notice as soon as possible detailing changes from and citing the original publication on both an electronic and numbered print page that is included in an electronic or a print Table of Contents to ensure proper indexing; Second, it shall post a new article version with details of the changes from the original version and the date(s) on which the changes were made through Crossmark; Third, it shall archive all prior versions of the article. This archive can be either directly accessible to readers; and Fourth, previous electronic versions shall prominently note that there are more recent versions of the article via Crossmark.

9. Editorial responsibilities

The Editorial Board will continuously work to monitor and safeguard publication ethics: guidelines for retracting articles; maintenance of the integrity of the academic record; preclusion of business needs from compromising intellectual and ethical standards; publishing corrections, clarifications, retractions, and apologies when needed; and excluding plagiarism and fraudulent data. The editors maintain the following responsibilities: responsibility and authority to reject and accept articles; avoiding any conflict of interest with respect to articles they reject or accept; promoting publication of corrections or retractions when errors are found; and preservation of the anonymity of reviewers.

4. Author qualifications, language requirement, and reporting guideline

1. Author qualifications

Any researcher throughout the world can submit a manuscript if the scope of the manuscript is appropriate.

2. Language

Manuscripts should be submitted in good scientific English.

3. Reporting guidelines for specific study designs

Research reports frequently omit important information. As such, reporting guidelines have been developed for a number of study designs that some journals may ask authors to follow. Authors are encouraged to also consult the reporting guidelines relevant to their specific research design. A good source of reporting guidelines is the EQUATOR Network (<http://www.equator-network.org/home/>) and the United States National Institutes of Health/National Library of Medicine (http://www.nlm.nih.gov/services/research_report_guide.html).

5. Submission and peer review process

1. Submission

All manuscripts should be submitted via e-submission system available from: <https://submit.escienceediting.org/>. If any authors have difficulty in submitting via e-submission system, please send a manuscript to kcse@kcse.org by the corresponding author.

2. Peer review process

Science Editing reviews all manuscripts received. A manuscript is first reviewed for its format and adherence to the aims and scope of the journal. If the manuscript meets these two criteria. It is checked for plagiarism or duplicate publication with Similarity Check. After confirming its result, it is dispatched to three investigators in the field with relevant knowledge. Assuming the manuscript is sent to reviewers, *Science Editing* waits to receive opinions from at least two reviewers. In addition, if deemed necessary, a review of statistics may be requested. The authors' names and affiliations are removed during peer review (double-blind peer review). The acceptance criteria for all papers are based on the quality and originality of the research and its scientific significance. Acceptance of the manuscript is decided based on the critiques and recommended decision of the reviewers. An initial decision will normally be made within 4 weeks of receipt of a manuscript, and the reviewers' comments are sent to the corresponding author by e-mail. The corresponding author must indicate the alterations that have been made in response to the reviewers' comments item by item. Failure to resubmit the revised manuscript within 4 weeks of the editorial decision is regarded as a withdrawal. If further revision period is required, author should contact editorial office through form mail available from: <https://www.escienceediting.org/about/contact.php>. A final decision on acceptance/rejection for publication is forwarded to the corresponding author from the editor.

3. Peer review process for handling submissions from editors, employees, or members of the editorial board

All manuscripts from editors, employees, or members of the editorial board are processed same to other unsolicited manuscripts. During the review process, submitters will not engage in the selection of reviewers and decision process. Editors will not handle their own manuscripts although they are commissioned ones.

6. Manuscript preparation

1. General requirements

- The main document with manuscript text and tables should be prepared in an MS Word (docx) or RTF file format.
- The manuscript should be double spaced on 21.6 × 27.9 cm (letter size) or 21.0 × 29.7 cm (A4) paper with 3.0 cm margins at the top, bottom, right, and left margin.
- All manuscript pages are to be numbered at the bottom consecutively, beginning with the abstract as page 1. Neither the author's names nor their affiliations should appear on the manuscript pages.
- The authors should express all measurements according to International System (SI) units with some exceptions such as seconds, mmHg, or °C.
- Only standard abbreviations should be used. Abbreviations should be avoided in the title of the manuscript. Abbreviations should be spelled out when first used in the text—for example, extensible markup language (XML)—and the use of abbreviations should be kept to a minimum.
- The names and locations (city, state, and country only) of manufacturers should be given.
- When quoting from other sources, a reference number should be cited after the author's name or at the end of the quotation.

Manuscript preparation is different according to the publication type, including original articles, reviews, case studies, essays, training materials, editorials, book reviews, correspondence, and video clips. Other types are also negotiable with the Editorial Board.

2. Original articles

Original articles are reports of basic investigations. The manuscript for an original article should be organized in the following sequence: title page, abstract and keywords, main text (introduction, methods, results, and discussion), conflict of interest, acknowledgments, references, tables, figure legends, and figures. The figures should be received as separate files. Maximum length: 2,500 words of text (not including the ab-

stract, tables, figures, and references) with no more than a total of 10 tables and/or figures.

- **Title page:** The following items should be included on the title page: 1) the title of the manuscript, 2) author list, 3) each author's affiliation, 4) the name and e-mail address of the corresponding author, 5) when applicable, the source of any research funding and a list of where and when the study has been presented in part elsewhere, and 6) a running title of fewer than 50 characters.
- **Abstract and keywords:** The abstract should be concise content of equal to or less than 250 words in an structured format including purpose, methods, results, and conclusion. Abbreviations or references are not allowed in the abstract. Up to 5 keywords should be listed at the bottom of the abstract to be used as index terms.
- **Introduction:** The purpose of the investigation, including relevant background information, should be described briefly. Conclusion should not be included in the Introduction.
- **Methods:** The research plan, materials (or subjects), and methods used should be described in that order. The names and locations (city, state, and country only) of manufacturers of equipment and software should be given. Methods of statistical analysis and criteria for statistical significance should be described.
- **Results:** The results should be presented in logical sequence in the text, tables, and figures. If resulting parameters have statistical significance, P-values should be provided, and repetitive presentation of the same data in different forms should be avoided. The results should not include material appropriate for the discussion.
- **Discussion:** Observations pertaining to the results of the research and other related work should be interpreted for readers. New and important observations should be emphasized rather than merely repeating the contents of the results. The implications of the proposed opinion should be explained along with its limits, and within the limits of the research results, and the conclusion should be connected to the purpose of the research. In a concluding paragraph, the results and their meaning should be summarized.
- **ORCID (Open Researcher and Contributor ID):** ORCID of all authors should be described.
- **Conflict of interest:** Any potential conflict of interest that could influence the authors' interpretation of the data, such as financial support from or connections to companies, political pressure from interest groups, or academically related issues, must be stated.
- **Acknowledgments:** All persons who have made substantial contributions, but who have not met the criteria for authorship, are to be acknowledged here. All sources of

funding applicable to the study should be stated here explicitly.

- **Appendix:** If any materials are not enough to be included in the main text such as questionnaires, they can be listed in the Appendix.
- **Supplementary materials:** If there are any supplementary materials to help the understanding of readers or too great amount data to be included in the main text, it may be placed as supplementary data. Not only text, audio or video files, but also data files should be added here.
- **References:** In the text, references should be cited with Arabic numerals in brackets, numbered in the order cited. In the references section, the references should be numbered and listed in order of appearance in the text. The number of references is limited to 20 for original articles. All authors of a cited work should be listed if there are six or fewer authors. The first three authors should be listed followed by "et al." if there are more than six authors. If a reference has a digital object identifier (DOI), it should be supplied. Other types of references not described below should follow *The NLM Style Guide for Authors, Editors, and Publishers* (<http://www.nlm.nih.gov/citingmedicine>).

Journal articles:

1. Jeong GH, Huh S. Update: Bibliometric analysis of publications from North Korea indexed in the Web of Science Core Collection from 1978 to July 2018. *Sci Ed* 2018;5:119-123. <https://doi.org/10.6087/kcse.135>
(In case number of authors is over 6)
2. Seo JW, Chung H, Seo TS et al. Equality, equity, and reality of open access on scholarly information. *Sci Ed* 2017;4:58-69. <https://doi.org/10.6087/kcse.97>

Books and book chapters:

3. Morris S, Barnas E, LaFrenier D, Reich M. *The handbook of journal publishing*. New York, NY: Cambridge University Press; 2013.
4. Cho HM, editor. *KOFST journals 2011*. Seoul: The Korean Federation of Science and Technology Societies; 2012. http://dx.doi.org/10.5082/Kofst_J_2011
5. Booth BA. Peer review. In: Coghill AM, Garson LR, editors. *The ACS style guide*. 3rd ed. New York, NY: Oxford University Press; 2006. p. 71-6.

Online sources:

6. Committee on Publication Ethics. Guidelines for retracting articles [Internet]. Committee on Publication Ethics; 2009 [cited 2013 Sep 20]. Available from: <http://publicationethics.org/files/retraction%20guidelines.pdf>
7. Testa J. *The Thomson Reuters journal selection process* [Internet]. Philadelphia, PA: Thomson Reuters; 2012 [cit-

ed 2013 Sep 30]. Available from: <http://wokinfo.com/esays/journal-selection-process/>

Conference papers:

8. Shell ER. Sex and the scientific publisher: how journals and journalists collude (despite their best intentions) to mislead the public. Paper presented at: 2011 CrossRef Annual Member Meeting; 2011 Nov 14-15; Cambridge, MA, USA.
9. Kim HW. Challenges and future directions on journal “perspectives in nursing science” in Korea. Poster session presented at: Asia Pacific Association of Medical Journal Editors Convention 2013; 2013 Aug 2-4; Tokyo, Japan.

Scientific and technical reports:

10. Kim SN, Park JR, Bae HS, et al. A study on the meta evaluation of Korean university evaluation. Seoul: Korean Educational Development Institute; 2004. Report No.: CR 2004-45.

News articles:

11. Kim R. SNU ranked 51st in university evaluation. Korean Times [Internet]. 2007 Nov 8 [cited 2013 Sep 25]. Available from: http://www.koreatimes.co.kr/www/news/nation/2007/11/117_13423.html

Dissertations:

12. Kim K. Quantum critical phenomena in superfluids and superconductors [dissertation]. Pasadena, CA: California Institute of Technology; 1991.

- **Tables:** Tables are to be numbered in the order in which they are cited in the text. A table title should concisely describe the content of the table so that a reader can understand the table without referring to the text. Each table must be simple and typed on a separate page with its heading above it. Explanatory matter is placed in footnotes below the tabular matter and not included in the heading. All non-standard abbreviations are explained in the footnotes. Footnotes should be indicated by ^{a)}, ^{b)}, ^{c)}, Statistical measures such as standard deviation (SD) or standard error (SE) should be identified. Vertical rules and horizontal rules between entries should be omitted.
- **Figures and legends for illustrations:** Figures should be numbered, using Arabic numerals, in the order in which they are cited. Each figure should be uploaded as a single image file in either uncompressed EPS, TIFF, PSD, JPEG, and PPT format over 600 dots per inch (dpi) or 3 million pixels (less than 6 megabytes). Written permission should be obtained for the use of all previously published illustrations (and copies of permission letters should be includ-

ed). In the case of multiple prints bearing the same number, English letters should be used after the numerals to indicate the correct order (e.g., Fig. 1A; Fig. 2B, C).

3. Reviews

Reviews are invited by the editor and should be comprehensive analyses of specific topics. They are to be organized as follows: title page, abstract and keywords, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. There should be an unstructured abstract of no more than 200 words. The length of the text excluding references, tables, and figures should not exceed 5,000 words. The number of references is limited to 100.

4. Case studies

Case studies are intended to report practical cases that can be encountered during editing and publishing. Examples include interesting cases of research misconduct and publication ethics violations; experience of new and creative initiatives in publishing; and the history of a specific journal development. They are to be organized as follows: title page, abstract and keywords, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. There should be an unstructured abstract of 200 words maximum. The length of the text excluding references, tables, and figures should not exceed 2,500 words. The number of references is limited to 20.

5. Essays

Essays are for the dissemination of the experience and ideas of editors for colleague editors. There is no limitation on the topics if they are related to editing or publishing. They are to be organized as follows: title page, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. The length of the text excluding references, tables, and figures should not exceed 2,500 words. The number of references is limited to 20.

6. Training materials

Training materials are for training editors or publishers. If there are new standards, policies, technologies, guidelines or trends, they can be submitted for training editors or publishers. It may be unsolicited or commissioned. This publication type will be able to provide the practical information for the journal advancement. They are to be organized as follows: title page, abstract and keywords, main text (introduction, text, and conclusion), conflict interest, acknowledgments, references, tables, figure legends, and figures. There should be an unstructured abstract of 200 words maximum. The length of the text excluding references, tables, and figures should not exceed 2,500 words. The number of references is limited to 20.

7. Editorials

Editorials are invited by the editor and should be commentaries on articles published recently in the journal. Editorial topics could include active areas of research, fresh insights, and debates in all fields of journal publication. Editorials should not exceed 1,000 words, excluding references, tables, and figures. References should not exceed 10. A maximum of 3 figures including tables is allowed.

8. Book reviews

Book reviews are solicited by the editor. These will cover recently published books in the field of journal publication. The format is same as that of Editorials.

9. Correspondence

Correspondence (letters to the editor) may be in response to a published article, or a short, free-standing piece expressing an opinion. Correspondence should be no longer than 1,000 words of text and 10 references.

In reply: If the Correspondence is in response to a published article, the Editor-in-Chief may choose to invite the article's authors to write a Correspondence Reply. Replies by authors should not exceed 500 words of text and 5 references.

10. Video clips

Video clips can be submitted for placement on the journal website. All videos are subject to peer review and must be sent directly to the editor by e-mail. A video file submitted for consideration for publication should be in complete and final format and at as high a resolution as possible. Any editing of the video will be the responsibility of the author. *Science Editing* accepts all kinds of video files not exceeding 30 MB and of less than 5 minutes duration, but Quicktime, AVI, MPEG, MP4, and RealMedia file formats are recommended. A legend to accompany the video should be double-spaced in a separate file. All copyrights for video files after acceptance of the main article are automatically transferred to *Science Editing*.

11. Commissioned or unsolicited manuscripts

Unsolicited manuscript with publication types of original articles, case studies, essays, training materials, video clips, and correspondence can be submitted. Other publication types are all commissioned or invited by the Editorial Board.

Table 1 shows the recommended maximums of manuscripts according to publication type; however, these requirements are negotiable with the editor.

Table 1. Recommended maximums for articles submitted to *Science Editing*

Type of article	Abstract (word)	Text (word) ^{a)}	References	Tables & figures
Original article	250	2,500	20	10
Review	200	5,000	100	No limits
Case study	200	2,500	20	10
Training material	200	2,500	20	10
Essay	No	2,500	20	10
Editorial	No	1,000	10	3
Book review	No	1,000	10	3
Correspondence	No			
Letter to the editor	-	1,000	10	3
In reply	-	500	5	3
Video clip	No	30 MB, 5 min	-	-

^{a)}Maximum number of words is exclusive of the abstract, references, tables, and figure legends.

7. Final preparation for publication

1. Final version

After the paper has been accepted for publication, the author(s) should submit the final version of the manuscript. The names and affiliations of the authors should be double-checked, and if the originally submitted image files were of poor resolution, higher resolution image files should be submitted at this time. Color images must be created as CMYK files. The electronic original should be sent with appropriate labeling and arrows. The EPS, TIFF, Adobe Photoshop (PSD), JPEG, and PPT formats are preferred for submission of digital files of photographic images. Symbols (e.g., circles, triangles, squares), letters (e.g., words, abbreviations), and numbers should be large enough to be legible on reduction to the journal's column widths. All of the symbols must be defined in the figure caption. If the symbols are too complex to appear in the caption, they should appear on the illustration itself, within the area of the graph or diagram, not to the side. If references, tables, or figures are moved, added, or deleted during the revision process, they should be renumbered to reflect such changes so that all tables, references, and figures are cited in numeric order.

2. Manuscript corrections

Before publication, the manuscript editor may correct the manuscript such that it meets the standard publication format. The author(s) must respond within 2 days when the editor

contacts the author for revisions. If the response is delayed, the manuscript's publication may be postponed to the next issue.

3. Galley proof

The author(s) will receive the final version of the manuscript as a PDF file. Upon receipt, within 2 days, the editorial office (or printing office) must be notified of any errors found in the file. Any errors found after this time are the responsibility of the author(s) and will have to be corrected as an erratum.

8. Page charges or article processing charges

No page charge or article processing charge applies. There is also no submission fee.

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NOTICE: These instructions to authors will be applied beginning with the February 2019 issue.

Compliance of *Science Editing* to the Principles of transparency and best practice in scholarly publishing

(joint statement by COPE, DOAJ, WAME, and OASPA; <http://doaj.org/bestpractice>)

Posted in July 7, 2018 and printed in February 20, 2019

1. Website:

- i. The URL address of official journal web site: <https://www.escienceediting.org/>
- ii. 'Aims & Scope' statement: It is described at the masthead page.
- iii. Readership: It is primarily for scientific journal editors and personnels who works for scientific journals. Its readership can be expanded to other positions: Researchers on journal publishing and bibliometrics can get the recent topics of journal publishing and editing; Professors on communication can access and adopt a variety of data for education; Students can understand the recent trends of the journal publishing and editing; Policy makers are able to reflect the results of the articles to the nation-wide science promotion policies; The scientists are able to read the advancement in the journal to be submitted so that they have a better knowledge on the journal selection.
- iv. Authorship criteria: It is described at the Instructions to authors.
- v. Duplicate submission and redundant publication: It is described at the Instructions to authors.
- vi. pISSN: 2288-7474 eISSN; 2588-8063

2. Name of journal

The official journal title is *Science Editing*. Abbreviated title is Sc Ed.

3. Peer review process

It is described at the Instructions to authors. We adopts double-blind peer review.

4. Ownership and management

- i. Information about the ownership: This journal is owned by the publisher, the Korean Council of Science Editors (<https://www.kcse.org/>).
- ii. Management team of a journal
 - Journal management team (2017–2019)

- Journal Manager: Jisoo Yoon, Korean Council of Science Editors, Korea
- Manager of the Review Process: Jung A Kim, Associate Editor of *Science Editing*, Hanyang University, Korea
- Ethics Editor: Eun Seong Hwang, University of Seoul, Korea
- Statistics Editor: Yong Gyu Park, The Catholic University of Korea, Korea
- Manuscript Editors: Jae Hwa Chang, Infolumi, Korea; Jisoo Yoon, Korean Council of Science Editors, Korea
- Layout Editors: Da Hye Lee, Academya, Korea; Hyeon Jung Park, Academya, Korea
- Website and JATS XML File Producers: Jeonghee Im, M2community, Korea

5. Governing body

The governing body is the journal's editorial board.

6. Editorial team and contact information

- i. Editorial team is available from Editorial Board page at the front part of the journal.
- ii. Contact information
 - Jisoo Yoon
 - Managing editor
 - The Korea Science & Technology Center 2nd floor, 22 Teheran-ro 7-gil, Gangnam-gu, Seoul 06130, Korea, Tel: +82-2-3420-1390, Fax: +82-2-563-4931, E-mail: kcse@kcse.org

7. Copyright and licensing

- i. Copyright policy: All published papers become the permanent property of the Korean Council of Science Editors. Copyrights of all published materials are owned by the Korean Council of Science Editors. Permission must be obtained from the Korean Council of Science Editors for any commercial use of materials. Every author should sign the copyright transfer agreement forms.
- ii. Licensing information: This is an open-access journal distributed under the terms of the Creative Commons Attri-

bution Non-commercial license, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited for non-commercial purpose (<http://creativecommons.org/licenses/by/4.0/>).

iii. Deposit policy: According to the deposit policy (self-archiving policy) of Sherpa/Romeo (<http://www.sherpa.ac.uk/>), authors cannot archive pre-print (i.e. pre-refereeing), but they can archive post-print (i.e. final draft post-refereeing). Authors can archive publisher's version/PDF.

8. Author fees

Neither page charge, article processing fee nor submission fee will be applied. It is the platinum open access journal.

9. Process for the identification and dealing with allegations of research misconduct

When the journal faces suspected cases of research and publication misconduct such as redundant (duplicate) publication, plagiarism, fraudulent or fabricated data, changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the resolution process will follow the flowchart provided by the Committee on Publication Ethics (<http://publicationethics.org/resources/flowcharts>). The discussion and decision on the suspected cases are carried out by the Editorial Board.

10. Publication ethics

i. Journal policies on authorship and contributorship: It is described at the Instructions to authors.

ii. How the journal will handle complaints and appeals; The policy of the journal is primarily aimed at protecting the authors, reviewers, editors, and the publisher of the journal. If not described below, the process of handling complaints and appeals follows the guidelines of the Committee of Publication Ethics available from: <https://publicationethics.org/appeals>

- Who complains or makes an appeal?: Submitters, authors, reviewers, and readers may register complaints and appeals in a variety of cases as follows: falsification, fabrication, plagiarism, duplicate publication, authorship dispute, conflict of interest, ethical treatment of animals, informed consent, bias or unfair/inappropriate competitive acts, copyright, stolen data, defamation, and legal problem. If any individuals or institutions want to inform the cases, they can send a letter to editor For the complaints or appeals, concrete data with answers to all factual questions (who, when, where, what, how, why) should be provided.
- Who is responsible to resolve and handle complaints and appeals?: The Editor, Editorial Board, or Editorial Office is responsible for them.

• What may be the consequence of remedy?: It depends on the type or degree of misconduct. The consequence of resolution will follow the guidelines of the Committee of Publication Ethics (COPE).

iii. Journal policies on conflicts of interest / competing interests: It is described at the Instructions to authors.

iv. Journal policies on data sharing and reproducibility; Open data policy: For clarification on result accuracy and reproducibility of the results, raw data or analysis data will be deposited to a public repository after acceptance of the manuscript. Therefore, submission of the raw data or analysis data is mandatory. If the data is already a public one, its URL site or sources should be disclosed. If data cannot be publicized, it can be negotiated with the editor. If there are any inquiries on depositing data or waiver of data sharing, authors should contact the editorial office. Clinical data sharing policy: This journal follows the data sharing policy described in "Data Sharing Statements for Clinical Trials: A Requirement of the International Committee of Medical Journal Editors" (<https://doi.org/10.3346/jkms.2017.32.7.1051>). As of July 1, 2018 manuscripts submitted to ICMJE journals that report the results of interventional clinical trials must contain a data sharing statement as described below. Clinical trials that begin enrolling participants on or after January 1, 2019 must include a data sharing plan in the trial's registration. The ICMJE's policy regarding trial registration is explained at <https://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>. If the data sharing plan changes after registration this should be reflected in the statement submitted and published with the manuscript, and updated in the registry record. All of the authors of research articles that deal with interventional clinical trials must submit data sharing plan. Based on the degree of sharing plan, authors should deposit their data after deidentification and report the DOI of the data and the registered site.

v. Journal's policy on ethical oversight: When the Journal faces suspected cases of research and publication misconduct such as a redundant (duplicate) publication, plagiarism, fabricated data, changes in authorship, undisclosed conflicts of interest, an ethical problem discovered with the submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and other issues, the resolving process will follow the flowchart provided by the Committee on Publication Ethics (<http://publicationethics.org/resources/flowcharts>). The Editorial Board will discuss the suspected cases and reach a decision. We will not hesitate to publish errata, corrigenda, clarifications, retractions, and apologies when needed.

vi. Journal's policy on intellectual property: All published papers become the permanent property of the Korean Coun-

cil of Science Editors. Copyrights of all published materials are owned by the Korean Council of Science Editors.

- vii. Journal's options for post-publication discussions and corrections: The post-publication discussion is available through letter to editor. If any readers have a concern on any articles published, they can submit letter to editor on the articles. If there founds any errors or mistakes in the article, it can be corrected through errata, corrigenda, or retraction.

11. Publishing schedule

It is to be published biannually. Supplement issues may be published.

12. Access

This is an open access journal distributed under the terms of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

13. Archiving

Is accessible without barrier from National Library of Korea (<http://nl.go.kr>) in the event a journal is no longer published.

14. Revenue sources

Revenue sources of journal were from the support of publisher (the Korean Council of Science Editors), Korea Government's support, and advertising rates.

15. Advertising

Science Editing accepts advertisements on the following basis:

Eligibility of the advertised products or services

All products or services should be safe and reliable, and not cause any harm to the health and welfare of humans. Advertisements may promote information and technologies relevant for authors, editors, reviewers, and readers. Pharmaceutical products may also be considered.

- Advertising is separate from content. Advertisers and sponsors have no advance knowledge of our editorial contents, nor do the editors have advance knowledge of advertisers. Content is never altered, added, or deleted to accommodate advertising. Advertisers and sponsors have no in-

put regarding any of our editorial decisions or advertising policies.

- We reserves the right to decline or cancel any advertisement at any time.
- Advertisements for pharmaceutical products must conform to all regulations and policies of the Ministry of Food and Drug Safety, Republic of Korea in every respect.

Orders

Any individuals or organizations who are interested in advertising their products or services in the print copies of the journal or on its website are encouraged to contact the editorial office. The acceptance of advertisement will be discussed by the editorial board and will be ultimately approved by the publisher.

Advertisement fee

For one print copy issue, the advertisement price for one whole page is USD 1000 (or KRW 1,000,000). If the advertisement is half a page, the price is reduced by half. For a quarter of the page, this price is reduced by one quarter. For banner advertisements on the website, the price is negotiable according to the duration of its exposure on the journal homepage. The price is usually greater than that for print copies.

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Liability: Neither the publisher nor the editors will be legally liable for advertisements presented in the journal. In addition, they cannot guarantee the accuracy, completeness, or usefulness of the information provided.

Endorsement: The publisher and the editors do not endorse any products or services that are advertised.

Disclaimer: Neither the publisher nor the authors will be legally liable for any of the content of advertisements, so readers must keep this in mind when reading or seeing advertisements.

16. Direct marketing

Journal propagation has been done through the journal web site and distribution of an introduction pamphlet. Invitations to submit a manuscript are usually focused on the presenters at conferences, seminars, or workshops if the topic is related to the journal's aims and scope.

Enacted on February 20, 2019

This is a guideline for reviewers who voluntarily participate in peer review process of the journal. All of the journal's contents including commissioned manuscripts are subject to peer-review.

Double blind peer review

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