Exploration of Contributor Strategy to Improve Discipline Ranking Under ESI System—"Environment/Ecology" of Qingdao University of Science & Technology as an Example

Man WU¹, Chan WU²,* and Cheng ZUO³

¹Library, Qingdao University of Science & Technology, Qingdao, Shandong 266042, China
²Affiliated Drum Tower Hospital of Nanjing University, Nanjing 210000; China
³College of Chemical Engineering, Qingdao University of Science & Technology, Qingdao, Shandong 266042, China

*Corresponding author

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Abstract. Based on disciplines development analysis in university, this study provides relevant suggestions for the submission of subject, with a view to providing reference for the promotion of ESI disciplines in Chinese universities. Taking the “Environment/Ecology” of Qingdao University of Science & Technology (QUST) as an example, statistical comparisons were made from ESI and Incites databases data on distribution trends, journal distribution, faculty contribution, and cooperation using quantitative analysis. At the same time, on the basis of clarifying the current status of the disciplines, the journals of “Environment/Ecology” were combed. The paper proposes suggestions on promoting development of “Environment/Ecology” discipline, including optimizing selected contributing journals, increasing output of high-quality articles, enhancing cooperation with international first-class universities and research institutions, regulatory agency signature, and promoting academic exchange and influence with institutional repository.

Introduction

ESI (Essential Science Indicators) is a data source with the Web of Science database as the data source. The measurement index is fair and the international comparability is strong. It is one of the important evaluation tools [1, 2], which is widely used to evaluate the academic level and influence of universities, academic institutions, countries / regions in the world. At present, many well-known colleges and universities in the world have adopted ESI to measure and evaluate the strength of the subject. More and more universities have set the ESI rankings as one of the development goals [3, 4]. How to predict the entry of ESI or enhance the ESI subject ranking based on operation rules of ESI has gradually become the focus and hotspot of universities. Taking the Wuhan University mathematics as an example, Liu Binghong put forward some ideas and suggestions on discipline construction from the subject service to promote the promotion of the level of mathematics in Wuhan University [5]. Based on the InCites and ESI database, Shi Qin analyzed the chemistry of Xinjiang University, and pointed out that the subject should increase the quality of the document and increase the output of high-quality paper to improve the influence of the subject [6]. From the perspective of discipline service or discipline development, previous studies have put forward various integrated strategies, which provide a reference for the general direction of high-level discipline construction. [7-9] the contribution of the paper is very important to the publication of the paper. Therefore, according to the development of the university subject, it is very important for the improvement of the academic strength to put forward the appropriate strategy of contribution the development of scientific research.

Based on the citation analysis and tracking of ESI and Incites databases, this paper takes the "environmental ecology" of Qingdao University of Science & Technology (QUST) as an example, and makes a thorough analysis of the trend, distribution of periodicals, the contribution degree of
departments, cooperation and so on. In order to find out the key points of discipline construction, this paper will provide relevant references for the contribution of this subject, and provide support for China's universities to build world-class disciplines.

Data Sources and Research Methods

Based on InCites and ESI database, the data of QUST's "Environment/Ecology" were retrieved and analyzed. Therefore, in the InCites database, the retrieval strategy is "Qingdao University of Science & Technology" as the institutional name, the "Environment/Ecology" as the research direction in the ESI discipline classification system, the Article and Reviewtypes as ESI statistics, 2007 - 2017 as the time range. These papers published in the past ten years were analyzed statistically. The ESI database was updated in November 9, 2017, containing data from January 1, 2007 to August 31, 2017. The threshold of "Environment/Ecology" was 3782 times. The Incites database was updated in November 18, 2017, containing data from January 1, 2007 to September 30, 2017. "Environmental ecology" was cited 1087 times. The data export time is December 1, 2017.

Taking the subject of "Environment/Ecology" in QUST as an example, this paper makes a multi angle and in-depth analysis from the aspects of paper output, issuing periodicals, distribution of departments and scientific research. In order to boost the development and the influence of subject at home and abroad, the present situation of discipline construction was objectively evaluated by bibliometrics. While, some suggestions was puts forward on the contribution of this subject.

Analysis of Qingdao University of Science & Technology's "Environment/Ecology"

In order to have a deeper understanding of contributors to "Environment/Ecology", this paper makes an in-depth analysis of the papers from 2007 to 2017.

Service Trends

As shown in Figure 1, the number of papers from 2007 to 2016 increased first and then decreased. In 2007, the "Environment/Ecology" sent only 1 articles and then increased to 19 in 2014, but the number of WoS papers published in 2015 and 2016 was reduced to 14 and 8 respectively. Although there were only 9 months' data in 2017, 13 papers were published. In the last ten years, the citation frequency of the paper is also rising first and then decreasing. The WoS paper published in 2011 has the highest cited frequency, 293 times, and then decreased, which is mainly related to the short time of the newly published papers.

![Figure 1. The trend of papers and times cited in the "Environment/Ecology" of QUST during the 10 years.](image)

Journal Analysis

According to the cluster analysis, these papers were published in 38 journals. Among them, the journals of CLEAN-SOIL AIR WATER have published 30 papers, 269 times cited. The periodical of ECOLOGICAL ENGINEERING has published 10 papers and 162 citation frequency. The two periodicals are significantly higher than other periodicals for sending and cited frequency, which is the highest two periodicals. In the 20 journals with the highest cited frequency in the published
articles, there are only 7 periodicals cited higher than the global average. This shows that the level of published periodicals needs further improvement.

**The Contribution of Departments**

The 117 SCI papers of "Environment/Ecology" of QUST were sorted out in order to clarify the contribution of the college to the subject. As shown in Figure 2, the articles on the subject of "Environment/Ecology" have been published in all the college of the school.

Among them, the Institute of environmental and safety engineering has made the greatest contribution to the subject, participating in the publication of 89 SCI papers, accounting for 76% of the total published articles. While, the College of Chemical Engineering has participated in 12 SCI papers, which account for 10% of the total. There are 66 articles published by the QUST as the first unit. Among them, the Institute of Environmental and Safety Engineering has made the greatest contribution to the subject, participating in the publication of 44 papers, accounting for 67% of the total articles. Then, the College of Chemical Engineering has participated in 8 papers, accounting for 12%.

The frequency of cited frequency is analyzed. For the 30 articles, the number of cited times was more than 10 times, accounting for 26% of the total number of document. For these 30 articles, the sum of the cited frequency is 832 times, accounting for 77% of the total frequency of the subject. The subjects ranking of ESI is calculated according to the frequency of the papers published by various subjects. Therefore, the publication of high cited papers in this subject has an important role in the promotion of the ranking of the ranking of ESI.

![Figure 2. The number of "Environment/Ecology" papers published by the colleges.](image)

**Analysis of Cooperation**

An analysis of the cooperative agencies can help us to find out the cooperation between the scientific research institutions and the cooperative organizations. For the 117 papers published in the "Environment/Ecology" of the QUST in the last ten years, only 3 papers were written independently or co-authored by the authors of this school, and the other 114 were completed in collaboration with other institutions. The distribution of cooperative countries / regions is analyzed, and the results are shown in Table 1. The most papers of the QUST "Environment/Ecology" are cooperated between the domestic institutions, accounting for 86% of all the papers. The second is the United States, there are 6 cooperative papers, accounting for 5.1%, then followed by the Canada, Philippines, Malaysia, Hongkong, Australia and so on. According to the influence of the disciplinary citations of these cooperative papers, the cooperation with the United States and Canada is successful, while, the influence of the paper is more than the global average. However, the influence on cooperation with other countries and regions is lower than the global average. Therefore, in order to improve the quality of scientific research papers and international influence, we should try to select the countries and regions leading the scientific research level in this field.
Table 1. The distribution of major cooperative Country/Region with QUST in the "Environment/Ecology".

<table>
<thead>
<tr>
<th>Name</th>
<th>WoS Documents</th>
<th>Category Normalized Citation Impact</th>
<th>Times Cited</th>
<th>% Docs Cited</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHINA MAINLAND</td>
<td>101</td>
<td>0.68</td>
<td>910</td>
<td>78.22</td>
</tr>
<tr>
<td>USA</td>
<td>6</td>
<td>1.19</td>
<td>34</td>
<td>83.33</td>
</tr>
<tr>
<td>CANADA</td>
<td>5</td>
<td>2</td>
<td>101</td>
<td>80</td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>5</td>
<td>0.84</td>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>MALAYSIA</td>
<td>3</td>
<td>0.8</td>
<td>12</td>
<td>66.67</td>
</tr>
<tr>
<td>HONG KONG</td>
<td>3</td>
<td>0.14</td>
<td>4</td>
<td>66.67</td>
</tr>
<tr>
<td>AUSTRALIA</td>
<td>2</td>
<td>0.9</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>JAPAN</td>
<td>2</td>
<td>0.32</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>SOUTH AFRICA</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>INDIA</td>
<td>1</td>
<td>1.08</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>SLOVAKIA</td>
<td>1</td>
<td>0.62</td>
<td>5</td>
<td>100</td>
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<tr>
<td>UNITED KINGDOM</td>
<td>1</td>
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<td>0</td>
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<td>JORDAN</td>
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<td>0</td>
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</tr>
<tr>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DENMARK</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Contribution Strategy of Improving the ESI Ranking

The selection of manuscript journals is one of the important links in the publication of academic papers. In order to improve the ESI ranking, the following strategies can be used for reference according to the characteristics of ESI and the university development.

Strengthen Cooperation with High-level Scientific Research Institutions at Home and Abroad

According to the ESI statistical rules, co-authors and the first author have the same ESI contribution, so cooperative research is particularly important. On the one hand, cooperative research can improve the ESI ranking of both sides. On the other hand, it also can strengthen the communication with the high level institutions, obtain new scientific research ideas, expand the perspective of research, stimulate new scientific research inspiration [5], and improve the influence of the scientific research of our school.

From the actual situation of "Environment/Ecology" in our school, we can cooperate with the Ocean University of China ("Environment/Ecology" in the first 1% of ESI) with the advantages of the same city. At the same time, as a high level scientific research institution, the Qingdao Institute of Bioenergy and Process, Chinese Academy of Sciences also has great geographical advantages. In addition, long-term cooperation between the Peking University, the Tsinghua University, Zhejiang University, Beijing Normal University and the Nanjing University, the California university system, the United States Department of agriculture and the United States Department of agriculture (USDA) can also be selected in the global ranking of the "Environment/Ecology" ESI.

Unification of the Signature of the Institution

ESI does not standardize the author and organization of the paper, nor does it establish identification code. Therefore, the name changes of the institution and the author cannot be merged automatically. This will result in the data dispersion statistics of the same organization and author and the phenomenon of different authors' chaotic statistics. Therefore, the unit "Qingdao University of Science & Technology" should be unified as far as possible, and avoid the mistake of unit spelling as far as possible.

Make Full Use of "Institutional Repository" to Promote Academic Exchange and Influence

In order to improve the visibility of the paper, the academic and intellectual achievements of researchers in QUST are collected and preserved. Then, a series of services such as archiving, management, publication, retrieval and open sharing are provided for the academic and exchanges
research between different institutions. The QUST has worked with Tongfang to build the "institutional knowledge base of Qingdao University of Science & Technology". In addition to the publication of high visibility periodicals, it is also possible to use institutional repositories and expand the open domain reasonably so that the more colleagues can easily retrieve, view and cite the results of the institutions and scholars [3]. For example, the WOS-CAS IR Grid seamless connection project is built by the Chinese Academy of Sciences and Thomson Reuters [11]. Therefore, the SCI full text of the CAS institutional repository can be direct attended by the global researchers at the first time. And the researchers also can directly inquire and obtain the scientific research results preserved by the CAS institutional repository. In this way, the international influence of CAS research achievement can be greatly enhanced.

The contribution data of the Department of "Environment/Ecology" in the QUST showed that this subject paper was mainly published by the Institute of environmental and safety engineering. Then, a certain number of "Environment/Ecology" articles were published by the Chemical Engineering Institute, the College of Materials Science and Engineering and so on. Therefore, in order to improve the ranking of "Environment/Ecology", scientific researchers from different departments should be encouraged to published the "Environment/Ecology" articles.

In short, the promotion of discipline rank under the ESI system is a long-term systematic project. The specific practical and application scenes of different universities or different universities in the construction of ESI are different. Therefore, the strategy of "Environment/Ecology" submitted by QUST is aimed at providing reference for the improvement of disciplines under the ESI system in universities.

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[11] Information on http://ir.las.ac.cn/handle/12502/7861.70