An Analysis on the Current State of Doctoral Training in Physical Oceanography of Ocean University of China

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Abstract. Academic papers are important results of scientific research and an important quality indicator of the doctoral training programs. In this paper, the doctoral students majoring in Physical Oceanography who enrolled in the Ocean University of China from 2012 to 2017 serve as the study objects. The academic papers published by these students while studying for the doctoral degree serve as the study samples. Statistical analysis was carried out on the quantity and quality of the published papers. The results show that in recent years, the per capita number of academic papers published by the PhD students majoring in physical oceanography is relatively low. Students who have published less than 2 papers account for 70% of the total students. However, the overall quality of the papers is good with most of the papers in English language and 80% published in the Zones 1 and 2 journals in the Chinese Academy of Science (CAS) journal ranking. In order to promote the ability of doctoral students to write academic papers to a higher level, it is suggested that the college should conduct in-depth research and discussion in the improvement of the doctoral training programs and the cultivation of academic writing skills.

Keywords: Physical oceanography · Doctoral student · Academic paper · Journal impact factor (JIF)

1 Introduction

The 21st century is the century of the ocean. At a time when human society is under enormous pressure from population growth, resource shortage, and environmental deterioration, ocean exploration has been seen as a promising solution to these problems. Facing the Pacific Ocean to the east, China has a coastline of 18,000 km and an ocean area of more than 3 million square kilometers. The ocean is rich in resources. To be invincible in the fierce international competition, we must seize the opportunity to explore the ocean. However, our knowledge of marine science is far from enough. To have a deep understanding of the ocean, explore the ocean and effectively protect the marine resources, it is necessary to invest human, material and financial resources in the basic and applied research of Marine Science, and to build the research capacity of marine Science [1, 2]. To improve the competitiveness of marine science and technology, the

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cultivation of marine talents, especially the cultivation of high-quality research talents in marine science, is the important first step [3, 4]. Urban and Boscolo (2013) discussed the continual development of next-generation scientists and the special role of scientific meetings in their professional development [5]. Some scholars have discussed the key elements of education and training needed by marine planners and summarized the future development of training for professionals in marine planning [6, 7]. Research and experience in these fields is worthy of our learning.

The Ocean University of China (OUC) is a comprehensive university with particular strengths in oceanography and fisheries science. It was enlisted in China's "Double First-Class" Initiative in 2017 [8]. Established in 1946, the College of Oceanic and Atmospheric Sciences (COAS) is one of the oldest colleges in OUC, which is characterized by marine science and integrates teaching and scientific research. Undertaking different level talents training work——bachelors, masters, and doctors in ocean science, the department of the ocean in COAS is engaged in the basic research of physical oceanography. The right to award doctoral degree in Physical oceanography was conferred upon OUC in 1981. Physical oceanography was approved to be the State Key Discipline in 1987, which was reaffirmed in 2001. The college is regarded as the National Science Basic Scientific Research and Talent Training Base, and the cradle of physical oceanography talents and achievements in China [9]. At present, the college recruits about 15 doctoral students majoring in physical oceanography every year. These students will undoubtedly become the main force of the country's future physical oceanography research talents. Quality is the life of postgraduate education and the fundamental guarantee for the sustainable development of postgraduate education. The quality of doctoral programs in physical oceanography will affect whether a country successfully explore the ocean and gain a favorable position in the fierce international competition. Therefore, it is very necessary and urgent to study the academic performance of doctoral students majoring in physical oceanography.

Since the late 1990s, with the implementation of the marine power strategy, the professional education of marine science in China has been accelerating. In particular, the scale of graduate training in marine science has been expanding rapidly, which provides an important pool of capacities and support for China's marine science research. Graduate education is the "strategic resource" for the country to seize the commanding height of science and technology strategy, which is related to the national science and technology innovation. In the case of the massive expansion of graduate enrollment, how to ensure and improve the quality of graduate training is a problem worth studying. Many scholars have conducted research and discussion on the cultivation of graduates in marine science-related majors [10, 11]. They mainly investigate the establishment and curriculum of graduate programs and skill cultivation of graduate students. From the perspective of academic papers published during the study for the doctoral degree, this paper will discuss the academic performance of doctoral students majoring in physical oceanography in OUC. Because academic papers are important results of scientific research of students, which can reflect students' mastery of theoretical knowledge and application ability, excellent papers will promote the significant development of academic and scientific research. In China, as an important indicator of academic performance, academic papers published by the doctoral students affect whether a doctoral

degree can be granted. For example, doctoral students of key universities must publish one or more papers as the first author in SCI or journals at the equivalent academic level before they can be granted a doctoral degree [12]. The OUC also lists peer-reviewed publications as one of the requirements for application for doctoral degrees. Applying for Ph.D. Degrees, Doctoral students majoring in physical oceanography of OUC are required to publish at least one SCI paper (including one) in top journals, or at least two (including two) SCI papers, at least one of which is an international authoritative journal SCI paper.

The remainder of this paper will take the doctoral students majoring in physical oceanography enrolled from 2012 to 2017 as the research object, and papers published during their study as the research samples. With the statistical analysis method, we study the academic performance of doctoral students in COAS.

2 Data Source and Processing

2.1 Source of Doctoral Students List

Firstly, through the roster of graduate students of COAS, the list of doctoral students majoring in physical oceanography who are enrolled each year is obtained. Then, those who dropped out, did not finish their studies, or went abroad are excluded from the list, and the doctoral students in the final list were taken as research objects.

2.2 Source of Doctoral Student's Published Papers

Doctoral students' published papers refer to the academic papers published during their doctoral studies. First of all, the paper acquisition is based on the published paper records in the archives of graduates of COAS. The published papers in college graduates' archive material are submitted by graduate students themselves and approved by the College, and therefore the data source is reliable. For students without paper information in the archives, their publication records were obtained through the online database. The English papers are searched for mainly through the website https://www.researchgate.net/, and the Chinese papers mainly through website https://www.cnki.net/.

2.3 Source of Research Samples

According to the paper acquisition method mentioned above, the academic papers published by each research object during their doctoral studies were obtained, and those published by graduate students as the first author were selected as the final research sample. In this paper, doctoral students enrolled in the recent six years from 2012 to 2017 are selected as research objects, and their published papers are taken as research samples.

3 Data Statistical Analysis Methods and Results

In this paper, the bibliometrics method is used for statistical analysis. Okubo's report (1997) laid the foundation for bibliometrics, introducing the principal indicators and databases on which the bibliometrics is built [13]. The report points out that the number of published papers, impact factors, the number of citations, and the number of co-authors are usually taken as the main metrological indicators to evaluate scientific and technological activities. Based on this viewpoint, this paper makes a statistical analysis of the two main indicators – the number of papers published and the ranking of the journal in which paper are published, and draws some conclusions.

3.1 Study Sample Statistics

The total number of published papers and the number of published papers per capita were counted for each graduate student. Table 1 is the statistics for research objects and corresponding research samples. In order to make a more intuitive comparative analysis of data, a cluster histogram of research objects and the number of research samples is drawn according to Table 1 (Fig. 1). At the same time, according to Table 1, the per capita number of papers in Chinese and English language is plotted, as shown in Fig. 2.

From Figs. 1 and 2, it can be seen more intuitively that the number of subjects has been relatively stable at about 15 in the past six years, but there is a relatively large change in the number of samples, and there is no obvious correlation between them. The number of English papers published per capita of students in each class is much higher than the number of Chinese papers: the average number of papers published in English was more than 1.5, but the average number of Chinese papers is basically less than 0.6. In addition, the number of Chinese papers is less as time goes by. Reduction in the number of papers in Chinese is attributed to the fact that the English-language journals are more highly valued than before. At present in OUC, applicants for doctoral degrees should publish SCI papers in the top or authoritative journals, which include no Chinese journals. Therefore, the students will focus on the writing of English papers.

Table 1. Statistics of research objects and research samples

Year	Research Objects	Research Samples			Published English Papers Per Capita	Published Chinese Papers Per Capita
	Doctoral students	*English papers*	*Chinese papers*	*Subtotal*		
2012	17	33	9	42	1.9	0.5
2013	17	25	10	35	1.5	0.6
2014	17	27	11	38	1.6	0.6
2015	13	22	6	28	1.7	0.5
2016	18	41	4	45	2.3	0.2
2017	14	26	2	28	1.9	0.1
total	96	174	42	216	/	/

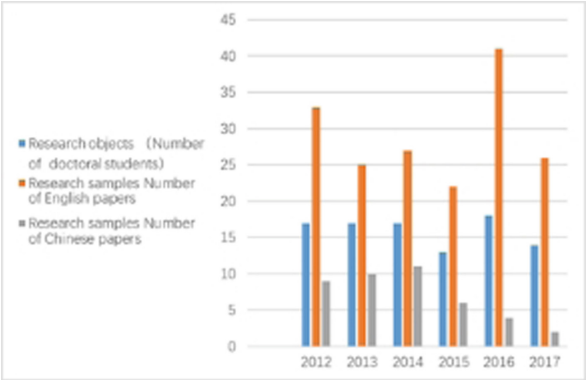

Fig. 1. Cluster histogram of research objects and research samples.

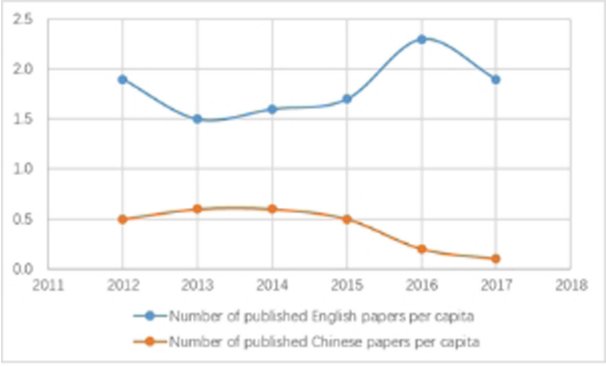

Fig. 2. The number of published papers per capita.

3.2 Statistical Analysis According to the Classification of the Number of Published Papers

All research objects were divided into three groups according to the number of their published papers, and then the proportion of each category in the total number of students was calculated, as shown in Table 2. As can be seen from the table, the proportion of those who publish 1 paper is 18.37%, and these students just meet the demand for graduation. The proportion of those who publish 2 papers was the highest – 51.02%. So students who published no more than two papers accounted for 70% of the total. This demonstrates that the number of papers published by doctoral students majoring in physical oceanography in OUC is generally low during their doctoral studies.

The data in Table 2 are further displayed by the stacked column chart, and the comparison between the three types is more obvious as shown in Fig. 3.

Table 2. Statistical analysis table according to the classification of the number of published papers

Year	1 Paper	2 Papers	≥3 Papers
2012	17	33	9
2013	17	25	10
2014	17	27	11
2015	13	22	6
2016	18	41	4
2017	14	26	2
total	96	174	42
Percentage	18.37%	51.02%	30.61%

Fig. 3. Statistical comparison chart of the number of people classified according to the number of published papers.

3.3 Assessment of Paper Quality

The influence of the journal in which the paper is published is an important indicator of the paper quality [14, 15]. The journal impact factor (JIF) is an important indicator to reflect the influence of the journal, even though many international experts have questioned the validity of using JIF to evaluate studies or researchers [16–18]. However, generally in the evaluation of academic papers, it is believed that the higher JIF is, the better the average quality of the papers published in the journal is and the higher its academic value is.

However, due to the huge differences among different disciplines, it is not reasonable to judge the quality of a paper only based on the JIF value. In Chinese universities, the journal ranking by Literature and Information Center of Chinese Academy of Sciences (CAS) is usually used to evaluate the quality of a journal or paper. The CAS ranking is based on the three-year averaged JIF for the SCI journals in the Journal Citation Reports (JCR) published by Thomson Reuters every year. It provides the ranking in two kinds of discipline classification systems: major division and subdivision. The major division

Table 3. Number of English journals and papers published by doctoral students in different zones (2012–2017).

CAS	Zone 1	Zone 2	Zone 3	Zone 4	Others (Not included in JCR)	total
Journal number	5	11	14	8	4	42
Paper number	17	113	27	13	4	174

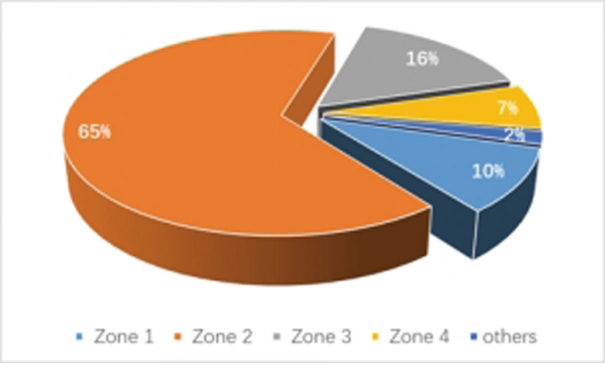

Fig. 4. Proportion of English papers published by doctoral students in different zones.

is a self-defined classification system consisting of 18 major disciplines, including earth science, physics and astrophysics. The subdivision system is based on the existing discipline classification system of JCR. The journals are divided into four groups. The criteria is that Zone 1 journals are the top 5% journals with the highest 3-year averaged JIF, and Zone 2–4 journals are divided based on the sum of 3-year averaged JIF.

The academic papers published by doctoral students are mainly in English. The total number of English papers published by doctoral students in 6 years is 174, which are published in 42 English journals. This paper makes statistical analysis and quality evaluation of the published English-language papers based on the ranking by CAS. The number of journals corresponding to the ranking of CAS is shown in Table 3. As can be seen from the table, there are journals published in the four zones, and some journals are not included in JCR. The number of journals in the second and third zones is the largest, of which the number of papers published in the second zone is larger, and the number of papers published in other zones is similar. This can be seen more clearly in the pie chart in Fig. 4, the number of papers published by the students in zones 1 and 2 accounted for 75% of the total.

The total number of Chinese papers published was 42, and they were published in 13 Chinese journals, which are all core journals included in Peking University Chinese Core Journal Catalogue. This fully shows that the papers written by doctoral students are published in journals of high level, and also reflects that the papers written by doctoral students are of high quality and level.

4 Conclusions and Recommendations

Based on the statistical analysis of the data about doctoral students majoring in physical oceanography and their published papers from 2012 to 2017, the following conclusions can be drawn.

(1) Most of the doctoral students majoring in physical oceanography enrolled from 2012 to 2017 published no more than 2 papers during their doctoral study, accounting for 70% of the total number of students. It indicates that the number of papers published by doctoral students majoring in physical oceanography in OUC is generally low during the period of pursuing the doctorate degree, mainly to meet the requirements of the number of papers published for graduation.
(2) The papers published by doctoral students are mainly in English, and the number of English papers is much higher than the number of Chinese papers every year, and the number of Chinese papers is less and less as time goes by. The low number of Chinese papers is mainly attributed by the graduation requirements: publishing papers in top or authoritative journals, which are all English-language journals.
(3) The English papers are mainly published in the Zones 1 and 2 journals ranked by literature and Information Center of CAS. The Chinese papers are published in core journal of Peking University. That not only shows that the journals in which students published papers are of high levels, but also reflects that the papers are of good quality. It can be inferred that the future development of doctoral training is promising.

In short, the quality of papers published by doctoral students majoring in physical oceanography in COAS is good, reflecting the excellence of the doctoral training program. But some students just content themselves with meeting the graduation requirements and lack initiative and innovation in scientific research. It is necessary to promote the cultivation of students to a higher level and improve students' academic writing ability. In the future doctoral training, it is suggested that COAS conducts a more in-depth discussion on the training of students majoring in physical oceanography from the following aspects.

(1) First of all, based on the statistical results, conduct scientific research, and revision of the training program for doctoral students, to develop a better action guide for students to study and research in school.
(2) Strengthen the training of students' academic paper writing and publication skills to improve their skills and lay a solid foundation for paper writing and publication. Doctoral students need to develop the research ability and advanced writing skills. Some scholars have also explored ways to improve international essay writing skills for Chinese students [19, 20], which provides an example to follow.
(3) Emphasis should be placed on cultivating students' initiative in innovation and scientific research. Innovation is the prerequisite for paper writing, publication, and communication.

(4) Give full play to the role of the tutor in guiding the students in learning and scientific research, and encourage students to participate in academic exchanges and cooperation with others. Publishing papers is a very good way of written communication, and good for summarizing learning outcomes, and forming their academic point of view.

References

1. Resolution adopted by the General Assembly on 4 December 2009--64/71. Oceans and the law of the sea. Available online: http://daccess-ods.un.org/access.nsf/Get?Open&DS=A/RES/64/71&Lang=E (accessed on 15 December 2021).
2. R.J. Morrison , J. Zhang , E.R. Urban, J. Hall , V. Ittekkot , and B. Avril, Developing human capital for successful implementation of international marine scientific research projects. Marine Pollution Bulletin ,vol. 77, pp. 11-22, 2013.
3. J. Ducrotoy, S. Shastri, and P. Williams, P. Coastal sciences and management: the need for networking in higher education. Ocean & Coastal Management vol. 43, pp. 427-444, 2000.
4. Marija Kataržytė, Sven Hille, and Regina Terlecka, Promoting marine science: International science camp as a platform. Marine Policy, vol. 84, pp. 76 -81, 2017.
5. R. Edward, JR. Urban, and R. Boscolo, Using scientific meetings to enhance the development of early career scientists. Oceanography ,vol. 26, pp. 164-170, 2013.
6. G. Glegg, Training for marine planners Present and future needs. Marine Policy , vol. 43, pp. 13-20, 2014.
7. S. Jay, and H. Jones, Towards a framework for higher education for marine spatial planning. Marine Policy , vol. 99, pp. 230-238, 2019.
8. Ocean University of China: General Information. Available online: http://eweb.ouc.edu.cn/weneralwnformation/list.htm (accessed on 15 December 2021).
9. College of Oceanic and Atmospheric Sciences: About the College. Available online: http://eweb.ouc.edu.cn/coasouc/1703/list.psp (accessed on 15 December 2021).
10. J. A. Langholz, and A. Abeles, Rethinking postgraduate education for marine conservation. Marine Policy, vol. 43, pp..372-375, 2014.
11. N. Vinhateiro, K. A. Sullivan, and C. G. McNally, Training for the next generation of coastal management practitioners. Journal of Coastal Research, vol. 28, pp. 1297-1302, 2012.
12. Y. Li, Writing for International Publication: The case of Chinese doctoral science students. Ph.D. thesis, City University of Hong Kong, Hong Kong, 2006.
13. Y. Okubo, Bibliometric Indicators and Analysis of Research Systems: Methods and Examples. OECD Science, Technology and Industry Working Papers 1997, No. 1997/01, OECD Publishing, Paris.
14. C. Huang, X. Yue, J. Chen, W. Xu, and J. Li, The effect of "openaccess" on journal impact factors: Acausal analysis of medical journals. Physica A, vol. 533, pp. 1-10, 2019.
15. A.P. Kurmis, Understanding the limitations of the journal impact factor. The Journal of Bone and Joint Surgery , vol. 85-A (12), pp. 2449–2454, 2003.
16. K. Simons, The misused impact factor. Science, vol. 322, pp. 165, 2008.
17. B. Alberts, Impact factor distortions. Science ,vol. 340, pp. 787, 2013.
18. R. Brito, and Rodríguez-Navarro, A. Evaluating research and researchers by the journal impact factor: Is it better than coin flipping? Journal of Informetrics ,vol.13, pp.314–324, 2019.

19. M. Cargill, X. Gao, X. Wang, and P. O'Connor, Preparing Chinese graduate students of science facing an international publication requirement for graduation: Adapting an intensive workshop approach for early-candidature use. English for Specific Purposes ,vol. 52, pp. 13-26, 2018.
20. M. Ho, Navigating scholarly writing and international publishing: Individual agency of Taiwanese EAL doctoral students. Journal of English for Academic Purposes ,vol. 27, pp. 1-13, 2017.