

Analysis on Research Strength of Universities and Countermeasure Research Based on InCites and ESI in China Mainland

—Taking Jiangxi Normal University as an Example

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Abstract—The paper reasonably selects main citation index of Jiangxi Normal University based on InCites and ESI, Then makes analysis of paper output, impact, collaborating institutions, advantage disciplines and potential disciplines by statistics, bibliometrics and comparative research methods. Then makes conclusions which the output and quality of the papers of Jiangxi Normal University are relatively weak, and the researchers with high influence are lacking. At last puts forward five feasible suggestions.

Keywords—InCites; ESI; bibliometrics; Citation Index; Research Strength

I. INTRODUCTION

On October 24, 2015, the state department issued the overall plan for the development of both the world's top universities and disciplines, which uncovered a new chapter in the development of Chinese education[1], after the construction of the 211 and 985 projects. In the first year of "double-class" construction, the key to development of top universities and advantageous subjects are whether universities could make scientific decisions and effectively allocate resources. How to use the method of information measurement to explain the present situation and development trend of universities or institutions, and to provide a strong decision-making basis for university orientation, subject development and optimization of resource allocation, which have become the key research content of the personalized service of the library[2]. This article is based on InCites and ESI database. With Jiangxi Normal University as an example, It reasonably selected main citation index and used statistics, bibliometrics and comparative research methods to make quantitative analysis, which aims to objectively reflect the institutions of scientific research strength, and provides objective basis and advice on scientific research development policies and the discipline construction for school related functional departments.

Humanities and Social Sciences Project of Jiangxi Higher Education Institutions(TQ162002); Social Science "13th Five-Year"(2017) Project of Jiangxi Province (17TQ02); Humanities and Social Sciences Project of Anhui Higher Education Institutions(SK2016A0766); Teaching Research Project of Anhui Higher Education Institutions((2015jyxm315)

II. ANALYSIS OF OUTPUT AND INFLUENCE OF OVERALL THESIS

A. Analysis of overall output and development trend of the thesis

In the InCites database, 2172 papers of Jiangxi normal university were listed in the web of science's seven index database(including SCIE, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S and BKCI-SSH) in 2012-2016. As shown in Fig. 1, we can see that the number of papers in this institution is growing well, excepting that the growth rate is less than 10% in 2014 and the other three years have exceeded 20%. It shows that our school's scientific research strength has been significantly improved in 2012-2016, and more and more scientific research results are published in the journal with high impact.



Fig. 1. Trend Chart and Growth Rate of Jiangxi Normal University' WOS Documents in 2012-2016

B. Analysis of the thesis's overall and relative influence

An important way to measure the impact of scientific research is to analyze the citations of scientific and technological papers[3]. The citation frequency is an important index to reflect the quality of the paper. Generally speaking, the peak of citation frequency is the 2 to 4 years after publication. Professor Qiu Junping, working in Evaluation research center of Wuhan University researched of literature information citation rules and citation analysis method and then put forward that the best scientific literature cited years for Chinese literature is approximately 2 to 5 years after the publication, and foreign literature about 3 to 8 years[4].

Between 2012 and 2016, the number of citations to web of science documents of Jiangxi Normal University was 12, 109.

And the average citation rate was 5.58, which is slightly higher than the global benchmark and the latter is 5.34. Fig. 2 shows the overall influence of the thesis and the influence of citation. The former generally shows an upward trend, while the latter shows a downward trend. It is consistent with the rule of citation, since publications published earlier have more time to gain more references to achieve higher average cited times. Based on the above theory, we can not only know the reason why the agency cited number was about 1421 times in 2016, but also will realize that this institution's papers, published during 2012-2016 years will continue to be referenced by fellow researchers.

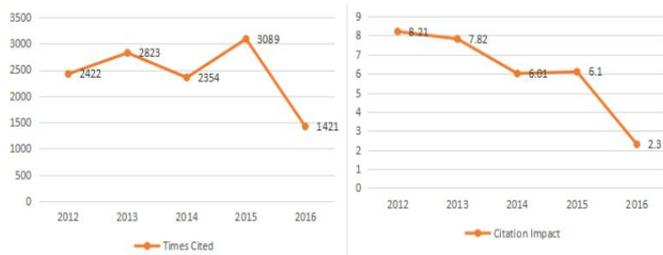


Fig. 2. Times Cited and Citation Impact of Jiangxi Normal University' WOS Documents in 2012-2016

In evaluating the impact of an institutional paper, two citation index (Times Cited and Citation Impact) has certain limitations without considering discipline, year, total paper output, paper type and other factors. Two quotation indicators of InCites database are introduced: Category Normalized Citation Impact (CNCI) and Journal Normalized Citation Impact(JNCI)[5]. Category Normalized Citation Impact is a very valuable and objective impact indicator, which is not affected by the year of publication, subject area and type of literature. Journal Normalized Citation Impact is similar to Category Normalized Citation Impact. The difference is that the Journal Normalized Citation Impact is not standardized in the research field but is normalized to the number of cited times published in specific journals. The Journal Normalized Citation Impact value of each publication is the ratio of the actual cited frequency of the publication to the average citation frequency of paper with the same publication year and the same type. The Journal Normalized Citation Impact value for a group of publications is the average of the Journal Normalized Citation Impact values for each publication.

Now we will compared the global baseline 1 with two citation index of the Jiangxi Normal University during the 2012-2016, which is shown in Fig. 3. According to the figure, We have found that the influence of this institution in 2015 is relatively high, which is far above the global baseline 1, which indicates that this year's paper output brings higher influence and confirms the quality of the scientific research staffs' paper in that year. At the same time, in 2015, the value of JNCI was more than 1, indicating that the published papers of this institution were relatively well behaved in the journals. It can be seen from the whole picture that the two indexes of Category Normalized Citation Impact and Journal Normalized

Citation Impact have a certain correlation, and they have a small gap in the same year.

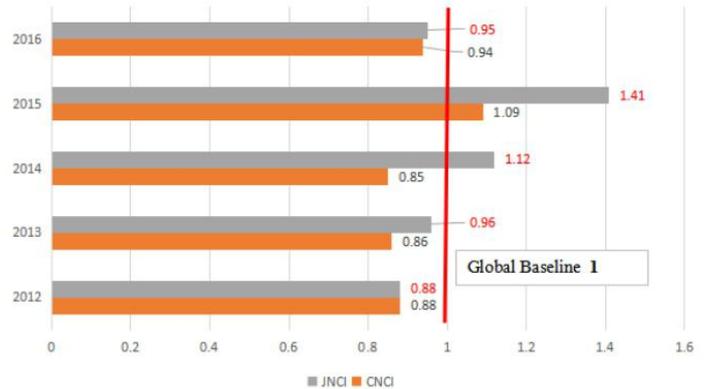


Fig. 3. Journal Normalized Citation Impact and Category Normalized Citation Impact of Jiangxi Normal University' WOS Documents in 2012-2016

III. COLLABORATING INSTITUTIONS AND INFLUENCE ANALYSIS

A number of empirical studies have shown that the results of collaborative research are generally more citations than those completed independently[6]. By cooperating, we can spread our scientific research results to the world more quickly. Of the 1798 papers of Jiangxi Normal University during 2012-2016 years, we have a wide range of cooperation, including 341 collaborating organizations, 36 collaborating countries. The top 10 countries and institutions in the number of papers are shown in Fig. 4.

Ordered by the cooperation number, we keep the most frequent collaborating country is United States, 100 cooperative papers (911 times' citations). In addition to Singapore, the Category Normalized Citation Impact of other countries' cooperation papers is well above global baseline 1. Strikingly, the average citation for collaborative papers with Germany and the UK is more than twice the global average, indicating high quality of collaborative paper.

The number of institutions that cooperate with Jiangxi Normal University is as high as 341 with 1141 cooperation papers, accounting for 52.5% of the total output. At the same time, 8205 citations were obtained with Category Normalized Citation Impact of 1.15 and citation influence of 7.19, both of which were above the global benchmark. Order by the number of cooperative papers, the Chinese Academy of Sciences (200) is the No. 1, followed by Wuhan University. Among the top ten institutions for collaborative essays, five institutions are excellent, including Fudan University, Wuhan University, and Chinese Academy of Sciences, Shanghai University, and University of Chinese Academy of Sciences. The Category Normalized Citation Impact collaborative essay with these five institutes far exceeds the global and all outcome benchmark values, and the percentage of the top 10% of cited citations is far higher than the other agencies, indicating that the quality of collaborative paper between Jiangxi Normal University and these four agencies are relatively high.

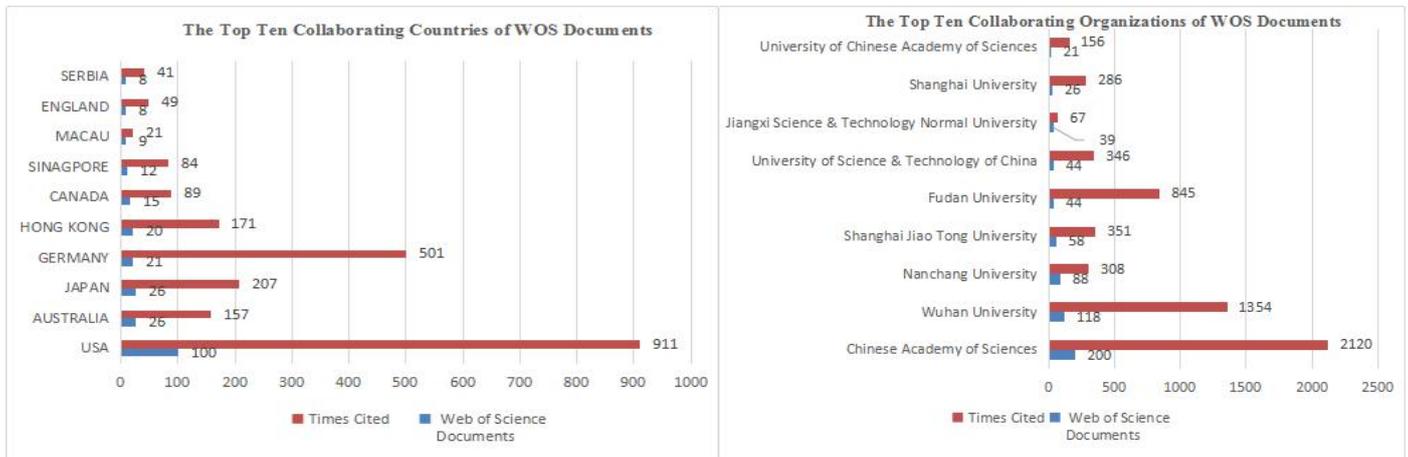


Fig. 4. Top Ten Collaborating Countries and organizations by WOS Documents

IV. ANALYSIS ON PREPONDERANT DISCIPLINE AND POTENTIAL DISCIPLINE

A. Discipline analysis based on ESI

The discipline classification of the Essential Science Indicators is a broader pattern. Based on the periodical classification, it is composed of 22 subjects of natural science and social science. Through statistics and the use of INCITES, we build the radar chart of the top 5 disciplines of the output of papers in the institution. From Fig. 5, not a regular pentagon can be found, which means there exist some problems in the development of various schools in this institution. It can be seen that the overall development trend of chemistry discipline is positive, with only two indicators lower than engineering disciplines, including Category Normalized Citation Impact and the percentage of these highly cited papers. Another is the engineering discipline, which has been printed in our eyes. Why is this discipline so much more influential? Combining all the multiple indicators, we can easily find the reasons. Though only 87 papers about engineering discipline, there are seven highly cited papers, which raised its Category Normalized Citation Impact. It shows that some papers about engineering discipline in this institution are of high quality.

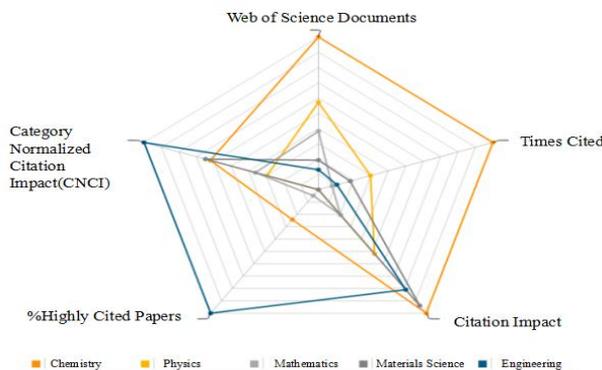


Fig. 5. Radar chart of 5 disciplines

For this reason, I have removed the engineering discipline and built a radar chart 2 about the top four disciplines in the

output of papers. From chart 2, it is found that the development trend of chemistry discipline in this organization is positive.

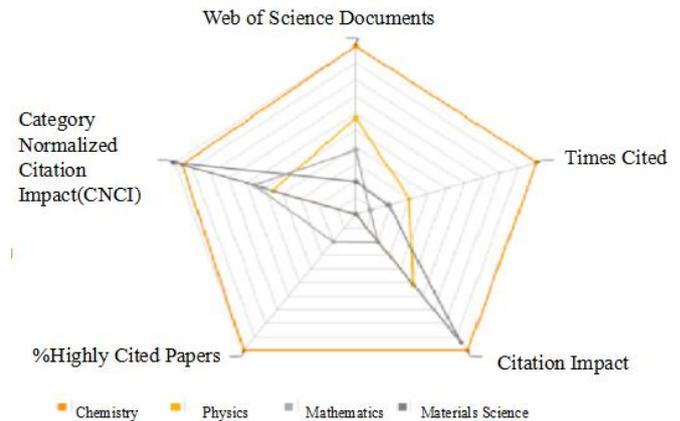


Fig. 6. Radar chart of 4 disciplines

B. Predictive analysis on potential discipline entering ESI

In order to get close to ESI data, the time is set in the period from 2006 to 2016 in InCites database with the documents type limited to article and review. Through the statistical analysis of citation indicator of the four disciplines during ten years and eight months, including material science, engineering, physics and mathematics, and the comparison of the threshold of each discipline in ESI, chart 7 is obtained. It is shown that the most potential discipline in Jiangxi Normal University to enter the next ESI is material science, followed by engineering. However, from the data in the current ten years, the gap between the material science, engineering and ESI discipline is quite wide. All of the index values of these two disciplines are shown above by radar graphs. It is found that the Category Normalized Citation Impact of these two disciplines is higher than that of chemistry discipline and also far higher than the global benchmark values. The most important reason for the gap between the two disciplines and ESI is that the output of papers is relatively low, resulting in the low total citation frequency and widening the gap of threshold values with ESI. Therefore, the quantity and quality of papers are equally important and indispensable. While the

main reason for the big gap of threshold values between physics, mathematics and ESI is that the influence of the papers is not great.

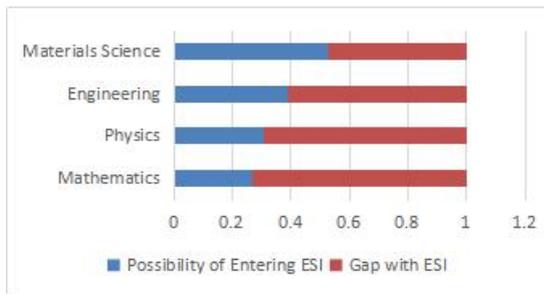


Fig. 7. The gap between the four disciplines and the ESI threshold

V. ANALYSIS ON FUNDING AGENCIES

2172 Papers, papers' funding agencies total are 74, most of the funding agencies are National Natural Science Foundation of China, and the second is Natural Science Foundation of Jiangxi Province. The top 10 funding agencies in the number of papers are shown in Fig. 8. From the discipline analysis above, we can see preponderant disciplines and potential disciplines are natural science. And the funding agencies are all natural science funds. It is obvious that the paper output of Jiangxi Normal University in web of science is mainly natural science, and the quantity of social science output is relatively low.

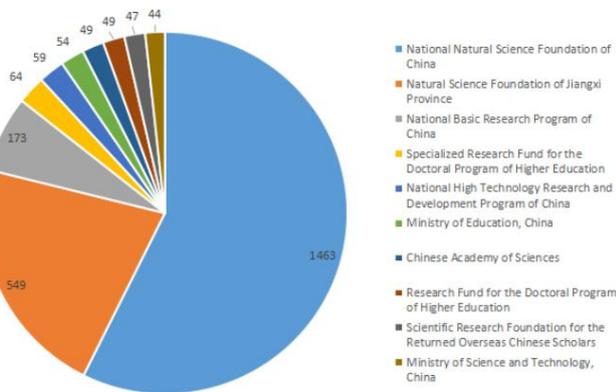


Fig. 8. Top Ten funding agencies by WOS Documents

VI. CONCLUSION AND SOLUTIONS

A. Conclusion

In view of the analysis above, it can be concluded that the research strength of Jiangxi Normal University has been significantly improved and the quantity and quality of the output of papers are both on a stable upward trend in 2012-2016. However, compared with the first-class universities in China, some problems still exist, such as the serious shortage of the total output and the general quality of the paper. In addition, through the statistics of the researchers of this institution, Professor Hou Haoqing is on the top of the

lists on the contribution of three disciplines, chemistry, material science and engineering, which have greater influence among the outputs of research. It shows that the output of high quality research papers in the school is produced by some stationary scientific research personnel and the researchers with high influence are lacking.

B. Solutions

In view of the current situation of research and development of Jiangxi Normal University as well as its existing problems, the following suggestions are put forward to help improve its scientific research strength.

- In view of the lack of high influence scientific research personnel in this institution, we should actively introduce and cultivate the leader of key disciplines.
- Aiming at the relatively low amount of the output of scientific research, we should continue to increase the award of the output of WOS papers. More teachers and graduate students should be encouraged to publish papers in the international journals to increase the overall paper output of our institution. At the meanwhile, we should strengthen the training and guidance of the teachers and students in the international high influence periodicals, such as paper writing, contribution and so on.
- Various conditions should be created, such as academic visit, conferences and so on, which can promote better communication and cooperation between researchers and excellent scholars in our institution so as to bring more output of cooperative papers.
- Relevant policies can be formulated for the key scientific research groups, such as the authors with high productivity and influence, to further improve their output of scientific research. For example, the teaching and administrative affairs can be accordingly reduced; some aspects should be supported, such as scientific research projects, academic exchanges at home and abroad.

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