The use of citation indicators to identify and support high-quality research in Poland

Andrzej Pilc

1 Institute of Pharmacology, Polish Academy of Sciences, Kraków, Poland
2 Institute of Public Health, Collegium Medicum of Jagiellonian University, Kraków, Poland

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Abstract

In large, mostly English-speaking countries, where the “critical mass” of scientists working in different subfields of science is achieved, the peer review system may be sufficient to assess the quality of scientific research. However, in smaller countries, outside the Anglo-American circle, it is important to introduce different systems to identify research of high quality. In Poland, a parametric system for assessing the quality of research has been introduced. It was largely based on the impact factor of scientific journals. While the use of this indicator to assess research quality is highly questionable, the implementation of the system in the Polish reality is even worse. Therefore it is important to change and improve the system currently used by the Ministry of Science and Higher Education to both evaluate and, more importantly, finance science in Poland. Here, a system based on three factors, i.e. the impact factor, the institutional h-index, and the institutional number of citations, is proposed. The scientific quality of institutions in Division VI: Medical Sciences of the Polish Academy of Sciences were evaluated and the results were compared with the existing system. Moreover, a method to identify high-quality researchers and institutions at the national level based on the quantity of highly cited papers is shown. Additionally, an attempt to identify the highest quality Polish research on an international level is proposed. This is based on the number of individual citations, the individual h-index, the number of publications, and the priority of the discovery.

Key words: h-index, citation number, impact factor, research quality.

INTRODUCTION

In the countries of the Anglo-American circle, where the critical mass of scientists working on specific fields is achieved in most of the disciplines of science, peer-review systems may be sufficient to assess the quality of research and to rank scientists and/or institutions. Furthermore, in these countries there is a long tradition of free scientific discussion. However, in smaller countries, especially those of the former Communist Block, the tradition of free discussion was suppressed during communist rule and, equally important, the number of scientists working in specific areas of science is sometimes quite small, not to mention the related publications in local languages. In these countries it is be important to introduce a system of evaluation of the quality of science to promote high-quality research and, perhaps, to finance it properly. Poland is definitely such a place.

THE PARAMETRIC EVALUATION OF POLISH SCIENTIFIC INSTITUTIONS APPLIED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION

The Ministry of Science and Higher Education introduced a system of so-called “parametric evaluation” a couple of years ago to evaluate the quality of the science. However, there are several obvious shortcomings to this system. First of all, when the ranking concerned the years 2002–2005, scientists learned about its parameters after the fact, at the end of 2005. The evaluation itself is based on the following three criteria: a) the scientific activity of an institution (e.g. the number of PhDs granted), b) the scientific quality, based on the impact factor of papers which the institution has published (e.g. an institution employing 100 scientists could present 200 high-quality publications), and c) the practical implementations of its scientific activity (e.g. the number of patents). The weight of each condition was not equal, and the heaviest in most of the fields of science was for the impact factor.
It was decided to analyze the results of this ranking using statistical methods and to focus on 61 institutions conducting medical research (http://www.nauka.gov.pl/mn/_gAllery/19/06/19063/Nauki_medyczne.pdf) which were categorized by the Ministry into five groups, with group 1 having the highest and group 5 the lowest quality. The data show (Fig. 1B) a clearly bimodal distribution of institutions, with a median of about 1.5%. The actual results of the ranking are shown in Fig. 1A, which clearly represents the virtual reality of Polish science. Of the 61 institutions ranked in the group of medical science, almost half (29) were assigned to the category of the highest quality. Only 3 of them were placed in the category 5. The scores for the first and the last institutions in category 1 of the ranking differed by a factor of 3, greater than the difference between the institutions ranked in groups 2–5 (with a factor of approx. 2). As financing was connected with the ranking group, the high-quality institution in the first group and the lower-quality institutions in the same group obtained identical financing. A similar situation also involved other fields of science in this country, and these results were perhaps due to the fact that the ranking was performed by scientists who actually work in the ranked institutions; therefore a profound conflict of interest must have existed and caused this distortion of the results. According to the statistics (Fig. 1B), if the Ministry had to divide institutions into five groups, 20 of them should have been placed in the fifth category (lowest quality), 10 in the fourth category, 11 in the third, 13 in the second, and 7 in the first category (highest quality). The data show that if the evaluation had been carried out properly, even using the existing system of evaluation, it would have produced meaningful results.

HOW THE PARAMETRIC EVALUATION OF POLISH SCIENTIFIC INSTITUTION SHOULD BE CONDUCTED IN THE FUTURE

Obviously, such mistakes should be avoided in the future. The world of science in this country has to be brought back to reality. First of all, the ranking conditions should be known before everything commences. The second point, i.e. not to take into account the results of such factors as the number of PhDs (this is not accounted for in the proposal for the newest ranking). Thirdly, while impact factors may be a proper measure of the quality of scientific journals, they cannot be used to evaluate the scientific quality of any single paper, individual scientist, or institution [3, 6]. Furthermore, such quantification is not only time consuming, but the data provided by institutions have to be thoroughly verified. However, the total impact factor can be regarded as a measure of the quality of the methodology used to publish a paper (it is impossible to publish in a high-impact journal using outdated methodology) and therefore can perhaps still be used as one of the factors of a parametric evaluation. The fourth and last point is that a better measure of scientific quality of institutions should be adopted, such as the institutional citation number or h-index [2]. Such data are easily obtainable from ISI or Elsevier databases and can be calculated in seconds by an independent evaluator.

AN EXAMPLE OF ASSESSMENT OF THE SCIENTIFIC QUALITY OF SCIENTIFIC INSTITUTIONS

Here are the calculations of the scientific quality of five leading Polish scientific institutions in the Division of Medical Sciences of the Polish Academy of Sciences which, according to the Ministry classification, occupied 5 of the 7 places at the top of the classification (Table 1, column 3). When the number of publications per person (column 4), the institutional h-index (column 4), and the number of citations per person (column 6) are compared and the overall number of points in each category is calculated (column 7), the institutions are ranked accordingly (column 8). A clear difference is observed.