On the Evolution of Journal of Biological Education's Hirsch Index in the New Century

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ABSTRACT

Citation analysis has become a proven tool in research evaluation and policy relevant studies. Recently, J.E. Hirsch has suggested a new indicator, one single index for the assessment of the research performance of individual scientists. In a short time, Hirsch' definition was easily adapted to citations of journals and articles. The aim of this study is to discuss both what Hirsch index evolution explains us for Journal of Biological Education (JBE) and biological educational subjects which affect h-index of that journal. A case study is conducted for the h-index of JBE over period 2000-2005. By the term variable citation window h-index it meant that it was considered as a fixed moment in time when citations were collected from Web of Science.

The evolution of JBE Hirsch index is shown with the self citations and the elimination of journal self citations in related figures. From the data, the Pearson correlation coefficients of regression lines are determined. The quantitative findings show that the h-index evolution of JBE has a positive trend determined in the case of the self and elimination self-citations of the journal over period 2000-2005. Furthermore, the most cited articles are about understanding of students on biological subjects, developing concept mapping in biology and students' attitutes towards biology teaching.

Keywords: Journal of Biological Education; Hirsch Index; Citation Analysis; Most Cited Subjects On Biological Education

INTRODUCTION

Up to now, several citation-based indicators have been used to measure research performance, defined by criteria such as the number of citations for each of the articles most cited, the total number of citations, the citations per paper, the number of highly cited published papers. There are valid reservations about using above mentioned indicators to measure performance because some papers are cited for reasons that are unrelated to the quality or utility of a study (Kelly & Jennions, 2006; Miller, 2006). Recently, taking into account above citation-based indicators with advantages and disadvantages, Jorge E. Hirsch has suggested a new indicator called Hirsch index (*h*-index), which means one

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single index for the assessment of the research performance of an individual scientist. Regarding to the definition by Hirsch (2005), "*A scientist has index h if his/her N papers have at least h citations each, and the other (N-h) papers have fewer than h citations each*". Hirsch's article has generated considerable interest and almost immediately provoked reactions in the scientific community (Burrell, 2007; Rousseau, 2006; 2007; Orbay & Karamustafaoğlu, 2007; Cronin & Meho, 2006; Egghe & Rousseau, 2006; Egghe 2006; Glanzel, 2006a; Ball, 2005; Braun, Glanzel & Schubert, 2005; Glanzel & Persson, 2005).

The *h*-index has been generally well received by the research groups. Of course, the *h*-index has also a number of disadvantages as pointed out by some authors (Kelly & Jennions, 2006; Van Raan, 2006). After all these beneficial arguments, Glanzel (2006b) has summarized some *pros* and *cons* of *h*-index in his excellent recent paper. After a short time, the *h*-index definition has been adapted into journals and article citations, as *h*-type index-equal to *h* if you have published *h* papers, each of which has at least *h* citations (Braun, Glanzel & Schubert, 2006). Braun et al. (2006) stressed that the *h*-type index for journals would advantageously supplement journal impact factor (*IF*), the total number of citations divided by the number of articles (Garfield, 1976), at least two aspects: respectively, *a)* It is robust in the sense that it is insensitive to an accidental excess of uncited articles, and to one or several highly cited articles, and *b)* It combines the effect of "quantity" and "quality" in a rather specific.

Normally, the journal *h*-index would not be calculated for a "lifetime contributions", as defined by Hirsch for the scientific output of a researcher, but for a definite period-in the simplest case for a given year. Using this procedure, Rousseau (2007) studied the evolution of the *Journal of American Society of Information Sciences' h*-index and introduced relative *h*-index. In addition to this, Orbay, Karamustafaoğlu and Öner (2007) determined the *Turkish Journal of Chemistry's h*-index over the period 1995-2005 with this method.

The aim of this study is to discuss both what Hirsch index evolution explains us for *Journal of Biological Education (JBE)* and biological and science educational subjects which affect *h*-index of that journal. So in this study, the evolution of *h*-index of *JBE* over period 2000-2005 is studied and determined in the case of the self and without self-citation.

METHODOLOGY

As is well known, the *Web of Science* database offers a very simple way to determine the annual *h*-index of a journal, retrieving all source items of a given journal from a given period and sorting them by the number of "times cited", and so it is easy to find the *h*-index of the journal for the given year. This paper is conducted as a case study for *h*-index of *JBE* over period 2000-2005. Meanwhile, it is considered as a fixed moment in time when citations are collected from *Web of Science* (URL, 2007).

FINDINGS AND DISCUSSIONS

Citation parameters of *JBE* are shown in Table 1, and *h*-index of *JBE* over the period 2000-2005 is determined in the case of the self and without self-citations, as shown in Figure 1, respectively. Between 2000-2005 years total number of documents is 247 but three letters and one correction document types were not included into the evaluation.

Table 1. *Citation Indicators of the Journal of Biological Education*

Years	Published Papers	h-index	h-index (without self citations)	Normalized h-index	Normalized h-index (without self citations)	IF (Impact Factor)
2000	43	7	4	0,163	0,093	0,278
2001	37	5	3	0,135	0,081	0,356
2002	33	4	3	0,121	0,091	0,356
2003	42	2	2	0,048	0,048	0,281
2004	45	3	2	0,067	0,044	0,255
2005	43	1	1	0,023	0,023	0,262
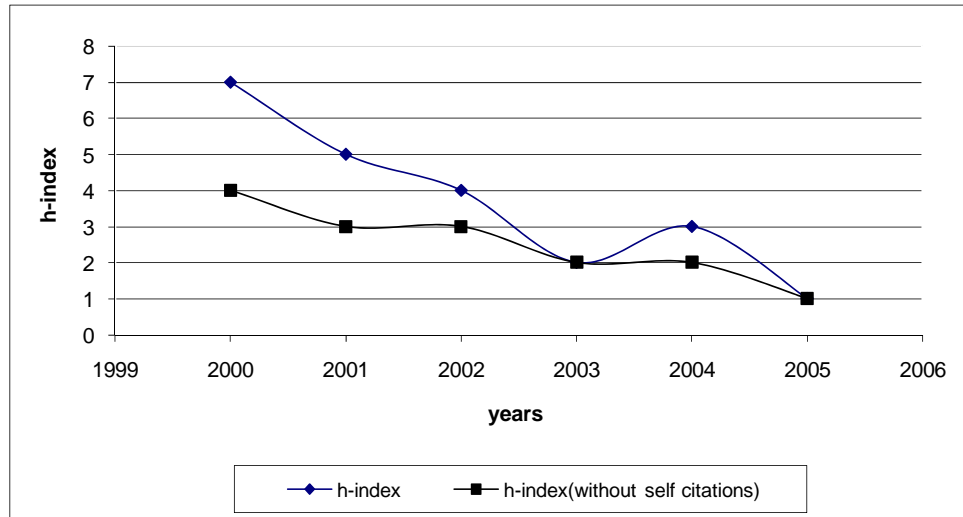
Figure 1. *h-index of JBE Over The Period 2000-2005.*

However, besides the period over which a volume can collect citations, also the number of published articles in that volume influences the *h*-index. For this reason, the *h*-index must be divided by the number of published articles, leading to a normalized (or relative) *h*-index (Rousseau, 2007). In this case, the results are shown in Figure 2 and 3, respectively.
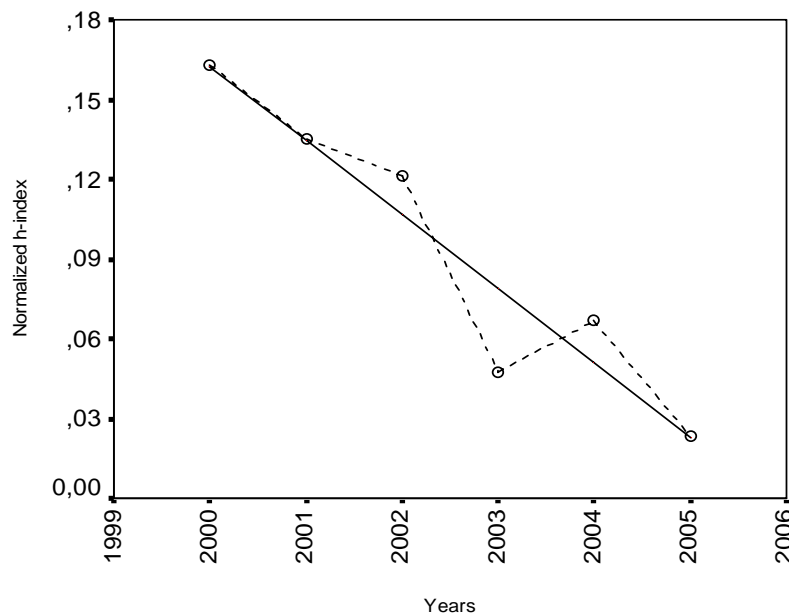
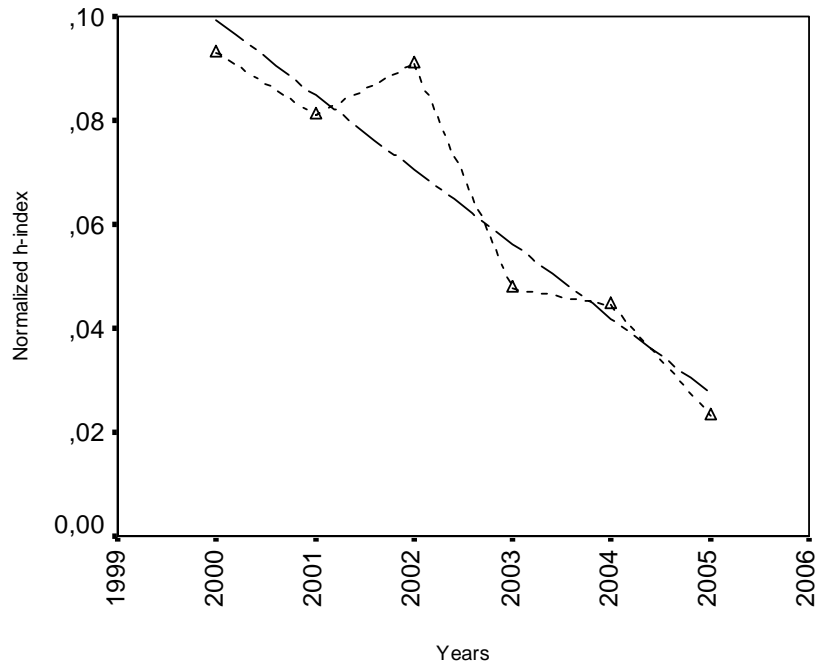Figure 2. ***Normalized h-index With Self-citation of JBE over the Period 2000-2005.***

Figure 3. *Normalized h-index Without Self-citation of JBE over the Period 2000-2005.*

As can be clearly seen from Figure 2 and 3, using the normalized *h*-index leads to a linear increase when going backward in time or decrease when going forward in time. The Pearson correlation coefficients of the regression lines of this journal are 0.951 for normalized *h*-index (continuous line in Figure 2) with self citations and 0.930 for normalized *h*-index without self-citations (dot line in Figure 3), which are *very high*, and statistically significant (1% level). It is not surprising that these two correlation coefficients are very close to each other because of the fact that the without self-citations over this period are limited by approximately 42%. Moreover, it is found out that this value is normal in another ten randomly selected journals published in the same field. In addition, the most cited seven published articles in *JBE,* over the period 2000-2005, are listed in Table 2, from Citation report (URL, 2007).

Table 2. *The Most Cited Seven Articles Published in JBE.*

As seen from Table 2, the most cited articles were mostly published in 2000. This case explains raising journal impact factor of 2001 and 2002 (see: Table 1, last column). Most of these articles are about understanding of students on biological subjects, developing concept mapping in biology and students' attitudes towards biology teaching. From these interesting results, it is concluded that a lot of published papers in this journal have been very high impact with respect to *quantity* (number of publications) and *quality* (citation rate), recently. On the other hand, as the journal is not open access, it negatively contributes to the evolution of *JBE's h*-index.

CONCLUSION

In summary, the evolution of *h*-index of *JBE* shows a positive trend during the beginning of the new century. In other words, it proves that *JBE* is improving itself both in quantity and quality since *h*-index reflects peer review, and peer review reflects research quality of a journal. Furthermore, most cited articles, published in *JBE*, are especially about understanding of students on genetic concepts. Lastly, it is recommended that if the journal is open to access, it may contribute to the improvement of JBE's *h*-index positively. Moreover when the journal publishes qualified articles or papers about different science and biological education subjects, it appeals more readers and it is highly cited by the authors.

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