

# Blogs as an effective tool to teach and popularize physics: a case study



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(Received 10 February 2009, accepted 23 March 2009)

## Abstract

Emerging technologies of information and communication have been attracting the attention of teachers and researchers in recent years. In particular web logs (blogs) represent a substantial and inexpensive medium to complement and popularize science classes to a massive and specific public. In this contribution, the case study of a stable blog dedicated to physics topics during more than two years of publication is presented. This blog has reached an excellent audience level, with an average 1,039 of clicks per day. According to a statistical study, the audience is composed of males, in their 20-30's, from Spain or Mexico, with a government school education, who are very involved in education issues as students or teachers. This type of model may be useful to encourage teachers to commence or improve other educational blogs in Internet.

**Keywords:** Undergraduate schools, Teaching methods and strategies, Computers in education, Edublogs.

## Resumen

En años recientes, las nuevas tecnologías de información y comunicación en Internet han atraído la atención de profesores e investigadores del área de educación. Particularmente los sitios llamados blogs representan un medio trascendental y económico para complementar clases y divulgar la ciencia a amplios sectores de la población. En este artículo, presentamos el caso de estudio de un blog estable y enfocado a los temas de física, el cual cuenta con más de dos años de ser publicado regularmente. Este blog ha alcanzado excelentes niveles de audiencia, con un promedio 1,039 clics por día. De acuerdo con un estudio estadístico, la audiencia promedio del blog está formada por varones entre 20 y 30 años, quienes se conectan desde España y México, provienen de escuelas del sistema público, además que están muy relacionados a los temas de educación como estudiantes o profesores. Este modelo puede ser útil para alentar a otros profesores a emprender o mejorar un blog de corte educativo.

**Palabras clave:** Divulgación de la ciencia, computadoras en la educación, blogs educativos, métodos y estrategias de TICs.

**PACS:** 01.30.Ib, 01.40.-d, 01.40.Fk, 01.40.gb, 01.50.H.

**ISSN 1870-9095**

## I. INTRODUCTION

In recent years, professional science popularisers and physics teachers have been involved with many collaborative opportunities with emerging technologies in education. In particular, they have used the many tools that the Internet has successfully introduced into the society. In the United States of America, only after television, the Internet ranks second among sources of science and technology information, and its margin over other sources is large and growing [1]. For example, e-mail, discussion forums, and chat spaces are tools very familiar to young students in physics classes [2, 3, 4]. Recent innovations (such as blogs, wikis, and RSS (Really Simple Syndication) feeds may be less familiar in the educational community, however these systems offer powerful opportunities for online collaboration for both physics professionals and learners [4, 5, 6, 7, 8, 9].

In the case of the blogs, they represent a very active, popular, and growing medium to communicate ideas via Internet. According to the survey: “*State of the Blogosphere/2008*” (from the company and web-site *Technorati.com*), there are 1.5 million new posts (annotations in the blogs) every seven days, which constitutes a vast activity in the Internet [10]. From the same document, the percentage of blogs devoted to science themes represents 22% of all blogs, and this percentage is similar to the 19% that represent the blogs with spiritual and religious information. A quick search among stable blogs reveals that for each page with the words “physics and experiment”, there are five blogs with the words “medicine and experiment”. On other hand, for each blog written in Spanish and with entries related to scientific topics, there are twenty such blogs written in English. In general, the use of the blogs

as a formal, educational and collaborative tool in physics is still a novel area, and, in particular, for the Spanish language.

In this work, we show a case study. We present the development history, the technical data, and the results of a blog written in Spanish and devoted exclusively to physics topics for more than two years. The name of this blog is the “*El Tao de la Física*”, this name in Spanish is based on the best-seller book by F. Capra: “The Tao of Physics”.

The first section of this contribution is dedicated to explaining the principal and distinctive elements of a normal blog, and to show how easy it is to publish information via blogging. In the second section the publication characteristics, formats, and communication policy of this blog are presented. The third section concerns statistical results obtained for two years of almost daily actualization of the web-site; in this section, the most significant numbers of the blog are indicated (e.g. number of clicks, importance of this blog in the Internet, etc.), a model of the typical lector of this blog (attributes of gender, nationality, social role, etc.) is also presented and discussed. Finally, the future and perspective of “*El Tao de la Física*” are discussed in the conclusions section.

## II. PRINCIPAL CHARACTERISTICS OF A BLOG

Jorn Barger coined the term “weblog” in 1997 [11, 12]. In general, a blog (a shortening of weB LOG) is a site online. Blogs contain news, descriptions of events ideas, rants, announcements, brief commentaries, or other analogous materials; often the commentaries are illustrated and complemented with images and in some cases with audio and video elements. Most of these web pages are arranged in calendar format, where entries are commonly displayed in reverse-chronological order, with the most recent entries shown first. Blogs have certain basic elements of design, of which the principal components are:

1. Blog title
2. Principal column.
  - a. Post title
  - b. Date
  - c. Author
  - d. Post body
  - e. Button for the blog reader to make commentaries
3. One or many side bars with complements to the web page.

In order to illustrate the arrangement in a typical blog, Fig.1 depicts the basic structure of a one-side-bar blog. In particular and relevant to this paper, Fig. 2 presents a screenshot of the head section from “*El Tao de la Física*”. Other blogs can be accessed in order to observe a similar distribution of elements in this kind of web-site.

The underlying technology of the so-called **web 2.0 tools**, including blogs, is the XML (“extensible markup language”) which separates content from formatting, encourages use of meta-data, and enables machine processing of Internet documents [3]. This last factor is key in the ability to automatically link disparate documents of

interest to individuals or groups (social networks) in other websites, email, and different Internet systems.

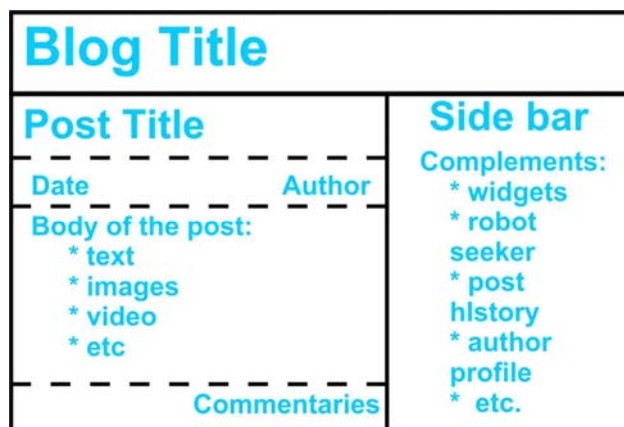


FIGURE 1. Basic vertical organization in a typical blog. There are many free templates with this basic design.



FIGURE 2. A screenshot of “*El Tao de la Física*”. Diverse services of web 2.0 are integrated easily in blogs, such as pools, RSS elements and video streaming.

However, no knowledge of HTML (or of Web authoring in general) is a prerequisite to run a blog. Typically a high-school student can create a new blog site using a tool such as *Blogger.com*, which can be used to set up a page using one of several available templates (or to create a new look). The writing interface in blogging systems is quite similar to an email interface. Thus in a few minutes a new blog, with posts and complements can be online.

In the areas of physics education and popularisation, blogs can be used in many different modes. For example:

- **Obtaining ideas for classes**; finding demos and simple experimental set-ups that can be used for students.
- **Up-dating** in education research and general physics.
- **Inspiration and support**; for instance, publishing lessons on the blog for others to start a dialog to improve class-notes.
- Most of the topics in **blogs are written in a flexible style** that can be easily shared and is attractive to students.

This feature adds flavor to the lectures, demonstrations, or discussions.

All of this type of media have an extra advantage, blogs may be used in the classroom or outside of the formal class; in both cases as a complement to traditional media (books, manuals, etc).

The simplicity of publishing, the user-friendly tools available to disperse the information in the Internet and the ease of insertion of the site into a community make blogs very popular, and also represent an immense opportunity to create a collaborative space for physics education.

### III. CHARACTERISTICS OF THE PROYECT DEVELOPED

The developement of this blog was bound by rules in order to obtain coherence between the information and the presentation of topics. For instance, there are criteria for the format of the text, illustrations in the posts, technical rules of operation, and so forth. Below we give a brief summary of some of the criteria used.

#### A. Format of the text

Web pages present special features in the writing style because of the fact that web-readers are in general more impatient than traditional-paper-readers (readers of books, newspapers, etc.) [13]. To gain the attention of the readers we adhered to the following principal conventions:

- **Descriptive titles.** A title is the first piece of information exposed to the reader, for that reason this short paragraph must be very informative and explanatory about the rest of the post.
- **Short posts.** We try to inform directly about some topic with less than 1,000 words. In the case when more text is needed, we write a complementary text and create a link to the previous post, and vice versa, in this first post we create a link to the complementary post.
- **Short paragraphs.** In order to facilitate fast reading, the paragraphs have simple grammatical structure. This rule is in concordance with the structure of newspaper notes.
- **Cozy writing.** We use an informal style, avoiding very specialized jargon. However, the page is dedicated to education so that the style of writing assumes some previous knowledge.
- **Predominance on list format.** The lists allow fast organization of the text and make easy reading.
- **Multiple links per post.** Cites in a scientific paper are the equivalent of the links in a normal post. Links permit progress in the information, evidence for some ideas, and show agreement with another author.
- **Petitions and acknowledgements for participation.** This feature is to encourage the growth of a collaborative community. In the post, we ask for reader participation, and give thanks for commentaries, useful links, and additional material.

- **Use of special fonts and illustrations.** In order to emphasize the text, we stress the words with bold and italic fonts in the important parts of the text. Moreover we use illustrations to improve the presentation of ideas.
- **Use of multimedia complements.** Many videos in Internet are recorded by non-professional scientists or experts in media. However, the scientific quality, excellent visual narration, and their originality make these videos worth using in any scientific blog. Sites like YouTube have many of these didactical materials in English and other languages; our task, in the blog, is to make summaries and comments in Spanish about these videos.
- **Editorial responsibility.** Some people, not only in academia, consider that documents in Internet are ephemeral, informal, untruthful, with several mistakes (intentional or not), and a risk to learning and to the recording of formal work, such as a thesis, research paper, etc. However this perception may change when the authors have an active role in comments and criticisms and take responsibility for their work. In the blog, we take the responsibility for the contents very seriously. The sources and authors are mentioned in each post, further information online and in traditional media is indicated to contrast and corroborate the text, and we adopt an open-minded attitude to disagreements and critical messages. As in others traditional media, such as traditional research papers, the web-author also deposits his reputation in front of the audience.

Implementation of these simple rules allows an improvement in the text and more recurrent readers.

#### B. Type of information in the blog

The blog “*El tao de la física*” is a classifiable scientific blog. Thus, the current posts in the blog are about:

- Science News
- Didactical videos
- Class note-slides
- Simple experiment recommendations
- Comments about physics books
- Advice about using scientific software
- Diverse Pools
- Information about science events, contests, meetings, congresses, etc.

Keeping these kinds of topics and themes in the blog is a guarantee of identity and continuity. Therefore, we expect that the users perceive a coherent and robust online site.

#### C. Rules on technical operation

To minimize costs we use a free, standard, and popular service for blogging, *Blogger.com*. Like most blogs, this website is administrated in the posts, format text, the back-end and front-end of the page by only one administrator, with the possibility of many writers. On the other hand, some of the online complements in the blog are:

- **External statistics and pools.** Provided via the independent sites Vizu.com and Google Analytics.
- **A Google search engine inside the blog.**
- **RSS and email subscription.**
- **RSS images.** Automatically download image widgets about astronomy.

Finally, we do use neither the name nor the logo of any institution (private, or public), since this project tries to attract readers, as do other blogs, with no specific sponsorship or institutional backup presented in the blog. Also, this criterion is to avoid prejudices about the value of the information in the blog.

These criteria are needed to create a unique editorial line, format, and identity. Thus the user can identify and become accustomed to reading the blog.

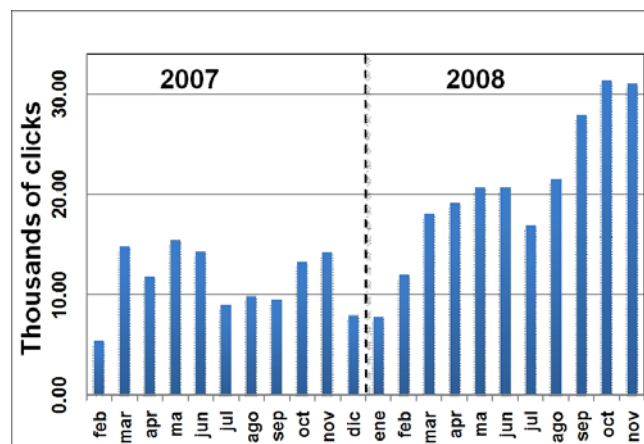
#### IV. GROWTH OF “EL TAO DE LA FÍSICA”

##### A. The principal numbers of the blog

There are many parameters which can be used to measure the success of a blog. Some are very subjective like the perception of personal communications, and either the feeling of making friends or of making contacts for an eventual need or crisis. However there are objective indicators to quantify the development of a web site. These are the parameters, the figures, and charts that may represent signs of progress. These are the principal parameters in consideration of the blog:

- **Number of visits and clicks.** Figure 3 shows the growth of page views in the blog. A total of **373,107** page views have been achieved in more than two years; the average per day is **1,039**. In the days of December-January and the period around July the clicks are reduced, because there are many students and teachers off-line in these holiday seasons of winter and summer, respectively. However, in general, we observe a clear growth in the number of the clicks and visitors in the blog. From the figure it can be seen that the number of visitors has nearly doubled in one year. We consider these figures very satisfactory in the conditions explained above. However, there are many potential readers, who do not know of this blog of physics. We expect in November 2009 an increase of the average number of page views to 2,000 per day, or 60,000 clicks per month.
- **Number of subscriptions via email.** We had **490 email readers**, in December 2008. These subscriptions represent the base of frequent visits and clicks in the blog. In the next year we expect to duplicate the number of email readers.
- **Impact factor.** There are many organizations and specialized tools devoted to measuring the importance of a blog in the Internet. These systems give information on the impact of the web-site in the virtual community. Some of these tools are similar to the impact factor of specialized science publications, because these instruments base their scales on the number of cites by

other authors. For example, **In PageRank we were 5/10, May-June 2008**, this tool uses a logarithmic scale and an algorithm to calculate the relevance of a page web, the number is based on the number of external links of other web-sites, number of visits, among other factors. As a reference, the principal webpage of the UNAM, *Universidad Nacional Autónoma de México*, (<http://unam.mx/>) has a PageRank 8/10. Additionally, the organization Wikio (<http://www.wikio.es>) also takes into consideration the number of references on other web pages, but Wikio uses a different algorithm to PageRank; besides, in Wikio, the blogs are divided by language and principal matter in the posts. **In the index Spanish and science of Wikio, we were 21/100 over other blogs**, August 2008. Finally, *Technorati.com* have a focused and constant observation on the development of blogs on Internet, this site offers a rank based on the actualization of the posts, the number of comments per post, the links and the importance of external pages which cite the studied blog. **In Technorati, the blog has a rank below 165,145 other blogs**, February 2008. In short, the impact factor in a blog notably increases with collaborative cites from other web-writers; also, the number of visits is a fairly unimportant component of impact factor in a blog.



**FIGURE 3** Number of visits in the last two years. Although in the holiday seasons (about July and around December) the clicks come down considerably, the general trend is an annual audience doubling.

We considered it imperative to know the objective and the external parameters of the significance of the blog in Internet and in educational communities. However, we need more communication with teachers and schools, which could use this blog as a complement in their physics or science classes. In this way we will count with a social impact factor.

##### B. The activity in social networks

There are many kinds of social networks in Internet. Most of them strongly encourage the sharing of information and contents in Internet, such as videos, photos, documents, links to web pages, etc. As far we know, there are two principal



social networks that direct and collaborate in the promotion of the blog with 70% of new visits. These are:

- **Hispanicencia.com:** this site is dedicated to science blogs written in Spanish. The titles and a paragraph are presented in a chronologic list that is automatically actualized when a post is published. Its high grade of specialization is a source of visitors interested in science and educational posts.
- **Meneame.net:** this is a more complex social network and its organization is more sophisticated than *Hispanicencia.com*. This site presents well defined sections and strict rules to publish and promote links. For example, in a system of votes, one pre-registered user recommends posts, then the rest of the community vote to encourage other users to visit and vote for this post. An increase in votes, is an increase in the space and time to visualize the post. In particular, a very well accepted post would have 200 votes, this represents around 5,000 new unique-visits in a week.

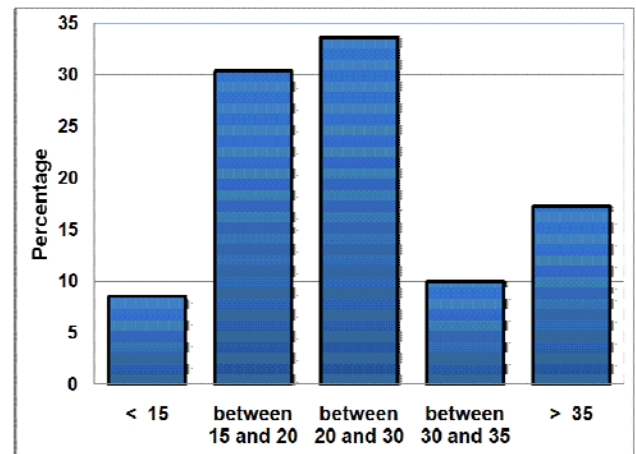
There are no well-established rules to obtain more visits from social networks. Nevertheless, posts about fashion, popular topics, or sensational news, even in science areas, are the most popular posts in these types of online sites. For instance, the news regarding the opening of the LHC (Large Hadron Collider) was a high-ranked science- technology post in 2008.

## V. MODEL OF VISTERS IN THE BLOG

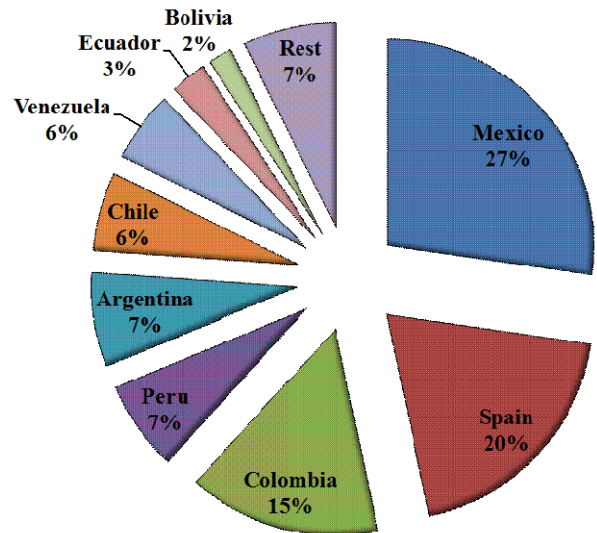
Based on direct surveys of the readers of the blog (with more than 150 participations), and statistics from *Google Analytics*, *Motango.com*, and *Sitemeter.com*; we have a first model of the normal visit to the blog “*El Tao de la Física*”. The typical reader to the blog is:

- **Male.** According to our survey, the visitors are composed of 75% male and 25% female. In contrast, according to *Technorati.com*, the writers of blogs present a distribution of 66% male and 34% female [10]. We do not have a simple answer to this behavior. In effect, the style in writing may be more attractive to male readers, because the blog-writer is also male, however, we consider that science topics are of interest to both male and female readers. Perhaps female readers were not interested in the posts or in participating in this particular survey. We need more information to make claims about the gender trends in this blog.
- **Between 20 and 30 years old.** As the reader can see in Fig. 4, our visits are in the so-called university age, corresponding to a young sector of population. This particular figure is in agreement with different reports on the use of blogs [10].
- **From Spain or Mexico.** According to many studies and reports, Spain is the country with the highest number of internet users and the most dynamic country in social networks in the Spanish language [14, 15]. On the other hand, Mexico is the blog-author’s residence country, and Mexico presents a large part of internet activity in Latin-America. For these reasons, it is no surprise to see the

massive presence of both these countries in the blog, see Fig 5.



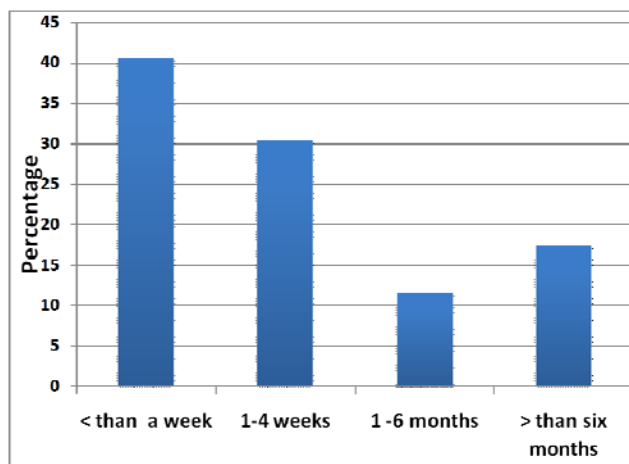
**FIGURE 4.** Statistical distribution of ages in the visits. Most of the users are between 20 and 30 years of age.



**FIGURE 5.** Statistical distribution of visits per country. The presence of visits from Mexico and Spain is more significant than the rest of Latin-America.

- **Was educated in a public school.** Via the survey, we know that most of the users attended **government-run school: 75%**, and the rest attended a **private school: 25%**. This is a very general result, because the visits came from many countries, where the educational systems are quite different. It is necessary to perform more studies to obtain the distribution for country and the visitors use of internet as a function of the educational system.
- **Uses the blog to investigate on his own.** According to a survey, the users arrive at the blog for **schoolwork: 23%**, **self-study: 37%**, **entertainment: 39.1%**. We interpret that most of the users read the blog as a complement to their education; however few of these visits use the blog as a direct source to do homework.

- **Has a high opinion of the importance of physics classes.** For the question: “Do you believe physics can improve our life?”. The results are: 85.3%-Yes, 9.7-No, 5%-Do not know. Moreover, the blog-users considered that physics was the most difficult class in school (40%) (follow by mathematics 22.3%). On the other hand, their favorite class in school was also Physics (46.5%) over other classes (the second place was mathematics 25%). These numbers represent the importance of physics for the visits in the educational context.
- **Thinks that the physics is primordially experimental.** The results from the survey show that the visitor considers physics as an experimental science 75.8% and as a theoretical science 24.2%. We take this figure as a good reflection of our blog, since we have the goal of fomenting experimental activity.
- **Is very involved in experimental experiences.** We formulated a survey in order to know how often our users perform an experiment. The results are shown in Fig. 6. Most of our users claim to have made an experiment during the previous week. Based on this result we suspect that the visitors are students or teachers. However, to obtain a more accurate conclusion we need to include an explicit question about the principal activity of the blog-users.



**FIGURE 6.** Statistical distribution of experimental activities of the visits. Under the question: “My last experiment was done ...” the answer “... less than a week ago” presents the highest frequency. This result claim that the readers are very active in performing experiments, and very probably physics experiments.

All these surveys are useful to outline some characteristics of the visits in the blog. This allows us to build a general model of the kind of people that utilize the blog to obtain information and maybe have some pleasure. However, the surveys are like photographs of moments; they only describe the general state in that singular instant, not all the time. The profile of the users may change with time, and we need to include more variety in the questions and certain very specific questions in the surveys.

## VI. CONCLUSIONS

Based on the data presented here, blogs represent an easy way to publish information to complement a science class. Moreover, blogs can be a channel to popularize science in mass terms. Blogs represent a huge opportunity to endorse the collaborative model of education. However, it is important to have a previous, well-designed scheme of the kind of the blog that can be run. This scheme must contain the time that can be dedicated to writing posts and administrating the blog. When the blog obtains a stable status, in order to improve the site it is necessary to formulate an exhaustive study about the trends of the users and the user's personality in the blog.

We consider the “*El Tao de la Física*” to be in a stable condition. The blog has more than two years of publication. This is about 800 entries, more than 300,000 clicks, and more than 400 subscriptions via email. Also, the scheme of work in the blog permits a clear editorial line and a well-defined identity in Internet, which the users recognize without difficulty. However, it is necessary to promote the blog in other media in order to obtain more users, and have a better position among the science blogs in the Internet.

In the blog, it is possible to create many surveys and use many web statistics so that we can have a prior model of the users. Thus, the average user on our blog is a male, 20-30 years of age, he accesses the blog from Spain or Mexico, uses the blog to investigate on his own during his free time, was educated in a government-run school, he thinks that physics is in essence experimental, and is fond of experimental experiences. Although this model represents a general scope of our visits; the model is not complete. Surveys about gender, activities, profession, and others aspects are needed to have a total and clear picture of the kind of users, and their activities in the blog.

With this contribution, we hope to encourage other enthusiastic science popularizes and teachers to start a science blog, because this is an excellent way to share and complement class notes, observations, and ideas, with a mass audience.

## ACKNOWLEDGEMENTS

The authors wish to thank to Dr. Neil Bruce for English revision of the manuscript. This work was supported partially by D. F. government, project “Creación joven” project No. SC-465.

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