

«The periodic table of videos»: an excellent bridge between university research and the high school chemistry classroom

«The periodic table of videos»: un excel·lent pont entre la recerca universitària i la docència a secundària

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abstract

Teachers and professors know that excitement within the class and school lab is a key factor for promoting vocations. With this article we want to show an interesting project developed from the University of Nottingham that has this objective. «The periodic table of videos» (PTOV) has become an excellent bridge between university research and the high school chemistry classroom. This proposal aims to increase scientific vocations in students and give a better view of chemistry and scientific culture in society.

keywords

Education, videos, periodic table.

resum

Els professors saben que la motivació a classe i al laboratori és un factor clau per a la promoció de les vocacions científiques. Amb aquest article volem mostrar un interessant projecte desenvolupat a la Universitat de Nottingham amb aquest objectiu. «The periodic table of videos» (PTOV) s'ha convertit en un excel·lent pont entre la recerca universitària i l'aula de química a secundària. Aquesta proposta té com a objectiu fomentar vocacions científiques, així com millorar la visió de la química i incrementar la cultura científica en la societat.

paraules clau

Educació, vídeos, taula periòdica.

It is known that society often takes a negative view of chemistry and perceives the scientific research conducted in universities as something distant. Over the last decade, in our country, we have noticed a steady decrease in the number of students enrolled in the degree of Chemistry in universities. One of the reasons for that is that the number of students choosing

the scientific itinerary in high schools has also progressively decreased. This trend was not specific for our countries, but also for other regions of Europe. How could we combat this lack of interest? Teachers and professors know that excitement in the class and school lab is a key factor for promoting vocations, so several new actions were promoted, from the use of recreational chemistry

resources in the class to the creation of blogs and the addition of videos about interesting and amazing aspects of chemistry. These proposals aim to increase scientific vocations in students and give a better view of chemistry and scientific culture in society. Thanks to them, we can see a glimmer of hope in reversing that downward trend. One of these interesting projects is «The perio-

dic table of videos» (PTOV) [1]. From the University of Nottingham, this project, developed by the video journalist Brady Haran and Prof. Martyn Poliakoff and colleagues, has become an excellent bridge between university research and the high school chemistry classroom.

Background

«I wanted to show what real scientists are like and how they work». With this sentence found on his Test Tube web page [2], the BBC-trained video journalist Brady Haran presented this project to the public. Test Tube started in September 2007, when Haran was appointed filmmaker-in-residence for Nottingham Science City, and it now consists of more than four hundred videos covering topics in chemistry, physics, astronomy and mathematics, to name but a few.

Test Tube became the cradle of several independent projects such as Sixty Symbols [3], Numberphile [4] or Deep Sky Videos [5] and, obviously, PTOV.

PTOV began in June 2008. The project was devised by Brady Haran and features chemists from the University of Nottingham led by Prof. Martyn Poliakoff, *The Professor*. Of course, the other stars of the project are the elements and the major protagonist is chemistry.

The school and high school students that have the privilege of visiting the School of Chemistry at the University of Nottingham can watch amazing chemical demonstrations performed live by Dr. Pete Licence, Dr. Samantha Tang or Prof. Poliakoff or other colleagues. Since it is not possible to meet all audiences in person, the enthusiasm of these researchers for science has been captured on film with the production of PTOV. This is a series

of short online videos for each of the elements in the periodic table (fig. 1). The runaway success of these, and overwhelming demand from viewers across the world, has resulted in the production of other additional video series that respond to current science news stories, tie in to seasonal events and include molecules of general interest.

In addition to one hundred and twenty videos about the elements themselves, some of which have been updated with newer

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Figure 1. The PTOV homepage with the current nine regular presenters. Clicking on each element opens a link to the video about it.

versions, special ones were produced to reflect chemistry in the news: the helium leak at the Large Hadron Collider, the award of Nobel prizes or the Deepwater Horizon oil spill disaster. A few have been more light-hearted, such as «Pumpkins at Halloween» or «Which element for Christmas?». In 2010, with funding from the Engineering and Physical Sciences Research Council (EPSRC) in the United Kingdom, the team began uploading videos about molecules under the title «Molecular videos». They have also made «road trip» films to destinations such as Ytterby (where the first rare earths were discovered), Darmstadt (birthplace of some of the superheavy elements), Brazil, Australia (one

video was even filmed on Sydney's Bondi beach!) and to the United States, Ethiopia and India to meet young chemists. Maybe the greatest adventure was the journey to Everest basecamp, where Brady climbed with a kettle and a thermometer. The aim of the trek was to demonstrate that the boiling point of water became lower as the team climbed higher, and the result was one of the most beautiful videos of the entire project.

PTOV has become one of the most interesting projects about public engagement of chemistry that we can find nowadays on the web. It is a very useful tool for high school teachers and the videos are used in classrooms all over the world.

A 2.0 periodic table

This is a 2.0 project and not only in the sense of «using social networks» [6, 7, 8, 9], but also for the physical feedback established between the researchers and the viewers of the videos.

The feedback from pupils, teachers, parents and even Nobel Prize winners has been extremely positive and many students have contacted the team to tell them how inspirational and helpful the videos are to their studies. As of April 2014, the number of sub-

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scribers to the PTOV YouTube channel has reached > 413,000 and the videos have been viewed over 57.5 million times. The impact of the PTOV project is discussed in an article published in *Nature Chemistry* [10]. In order to make the videos as accessible as possible, the team have worked with transcriptors to produce accurate subtitles in English for it. The videos have also been translated into Portuguese and the translation into other languages, like Spanish, is an exciting project for the future.

In an article published by the team in *Science* [11], «the impact of PTOV is best judged qualitatively from the many thousands of comments and unsolicited e-mails received from viewers». These messages come from students excited by the chemistry they have seen in the videos or from teachers who use them in their classes.

A loyal fan base for PTOV is noticeable. The Professor's eccentric hairstyle and endless selection of chemistry-themed neckties are some of the icons of this project, and the viewers watch the videos with much more sympathy than a conventional chemistry class. Viewers feel they are watching a «true record» of life in the Chemistry Department. The presenters are real scientists who are often caught off guard, forced to answer unexpected questions from the interviewer. Their hesi-

tations and occasional admissions of ignorance reinforce the bond with the viewers. The videos look professional because they are produced with broadcast-quality equipment used by Brady, yet they deliberately retain an amateur flavour and raw appearance (fig. 2).

Now and future after five hundred videos

In November 2013, the PTOV group celebrated the success of five years' worth of chemistry on



Figure 2. Brady Haran recording at the GSI (Gesellschaft fuer Schwerionenforschung), Darmstadt, Germany, where hassium was first synthesized.



Figure 3. Prof. Martyn Poliakoff in one of the videos of the project.

YouTube with its special five hundredth video.

The celebratory five hundredth video is a round-up some of the series' very best moments since its launch in 2008. It features impressive explosions, some of Prof. Poliakoff's classic lines, and lots and lots of bars of gold.

One of the big reasons for the videos' success is Prof. Poliakoff, as celebrated in the five hundredth video. However, at the start of the project, Brady had no idea how popular *The Professor* would prove. «Off camera, *The Professor* is very humble and almost shy. He doesn't strike you as a clichéd "internet star". But in hindsight, it is that humility, combined with great knowledge, which makes him so popular. People can spot a fake, and they know Prof. Poliakoff is the genuine article», says Brady.

In addition to the Poliakoff effect, Brady believes that it is chemistry itself that is the key to the videos' popularity. He said: «I think that even after five hundred videos, the scientists are still excited to be sharing their love of chemistry. I also think the videos try to be very honest and show what life's like in a real lab. You don't see that unvarnished depiction of science too often on TV or in videos. We've also been lucky: with so many people making so many videos, you need a little bit of luck on YouTube».

Reaching the five hundredth video doesn't signal the end. More videos continue to be uploaded, and there will always be new discoveries and new stories about chemistry. Despite having achieved the initial aim of making a video about each element in the periodic table and even having reached the five hundred mark, PTOV is a living project.

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Prof. Martyn Poliakoff, CBE

Is a Research Professor of Chemistry at Faculty of Science at the University of Nottingham and a pioneer in the field of green chemistry, working on gaining insights into fundamental chemistry and also on developing environmentally acceptable processes. He was elected a Fellow of the Academia Europaea and Associate Fellow of TWAS, the World Academy of Science. He is Foreign Secretary and Vice-President of the Royal Society and he was a Council Member of the IChemE (2009-2013). martyn.poliakoff@nottingham.ac.uk.



Brady Haran

Is an Australian independent filmmaker and video journalist who is known for his educational videos and documentary films produced for BBC News and for his YouTube channels. He's passionate about science. In 2012 he was the producer, editor and interviewer behind 12 YouTube channels such as PTOV. Haran's PTOV, with Professor Sir Martyn Poliakoff, received the Royal Society of Chemistry Nyholm Prize for Education in 2013. <http://www.brady.haran.com>.



Dr. Samantha Tang

As Public Awareness Scientist, she occupies an unusual position in UK Science Communication. Her remit is to enthuse and excite schoolchildren and the public about science and to energise all members of the University's School of Chemistry to participate in the communication of science. Her involvement in the PTOV project is focused on performing experiments that illustrate scientific principles. samantha.tang@nottingham.ac.uk.



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