Putting the moving image to work in biochemistry education

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There is tangible evidence of the growing importance of visual media in science education. While large amounts of material on the video-sharing service YouTube would not be considered educational in a positive sense, there are many hours of quality scientific information available for viewing. These can be called upon for both formal and informal learning. We have also witnessed the rise of 'TED talk', short presentations by engaging speakers which often tackle cutting-edge developments in bioscience. This year also saw the awarding of an Institute for Scientific Information (ISI) impact factor to JoVE, the Journal of Visualised Experiments. I want to suggest in this article that there is an additional resource that we are not yet exploiting to its proper potential, namely, broadcast media.

Promoting engagement

When I've discussed my enthusiasm for using television footage in university bioscience teaching, some colleagues can barely conceal their view that I have suggested forming a pact with the devil. At a recent conference one of the delegates said what I'm sure some of the others were thinking – television science is 'dumbed-down' science. Now of course to some extent he is absolutely right; a large percentage of science on television is watered down or plain wrong. However, a sizeable amount of TV science content is accurate and, as I hope to illustrate in a moment, even the science that is wrong can be valuable for teaching. I've come to realize that one of the reasons for scepticism about the merits of using broadcast media in teaching is a belief that the only motivation for doing so would be to convey factual content to students. This is a caricature of Open University broadcasts circa 1975 in which the prime motivation was to replace lectures for students whose life commitments meant they were unable to attend a full-time, campus-based course. Although content can be important, as we will see below, I would argue instead that the primary motivation for showing TV clips is to promote **engagement**. Limitations in the application of broadcast material to biochemistry teaching may therefore stem from a lack of creativity, coupled with uncertainty about what might be available (and how to get it). Let's deal with these issues in turn

Considering creativity

To begin with, consider the importance of creativity. If the suggestion had been made that we should be routinely replacing our lectures with hours of students sitting passively watching a screen, then I would share scepticism regarding the value of this approach. However, use of a carefully chosen clip can introduce a new dynamic to a lecture or tutorial. Short extracts can be employed in a variety of ways.

As hinted above, the most obvious use of a clip would be to illustrate some **factual point**. Rather than describe the processes involved in preimplantation genetic diagnosis, for example, I can include a two-minute clip from Robert Winston's series *A Child Against All Odds*, which shows the procedure. Similarly, a short section on the role of cilia in determining the layout of body organs, from *Countdown to Life: the Extraordinary Making of You,* might help enrich a lecture on the diverse roles of microtubules.

Alternatively, a clip might be used as a **scene-setter** at the beginning of a session. I have used a couple of short sections from the James Bond film *Die Another Day*, in which the proprietor of a secretive Cuban clinic explains that gene therapy involves "introduction of new DNA from healthy donors; orphans, runaways, people that won't be missed". In this way he is able to transform North Korean Colonel Tan-Sun Moon into British aristocrat Sir Gustav Graves.

Of course this is abject nonsense – gene therapy is something entirely different. But that is exactly the point. This ridiculous storyline serves as a humorous introduction to a lecture when we look in more detail at what gene therapy actual involves and the difficulties that have hampered the introduction of far less ambitious changes to the human genome.

Making use of news footage, the rather more tragic case of Eloise Parry, might be used to bring human interest to a lecture on mitochondrial uncoupling. This young woman bought 'DNP' (2,4-dinitrophenol) online as an aid to slimming. She took several pills in quick succession which triggered a fatal metabolic response. Alternatively, a lecture on muscle

biochemistry might benefit from inclusion of news reports about an improved technique for determining the concentration of troponin in the blood of a patient with a suspected heart attack. Or maybe a lecture on the antibiotic mode of action would be enhanced by reflection on the O'Neill report on antimicrobial stewardship and development.

Thirdly, a clip might be used as a **discussion starter**. For several years I have run a workshop on experimental design for first year undergraduates, in which I have used a section from the populist science series *Brainiac: Science Abuse*. In the clip, presenter Richard Hammond supervises an experiment which he concludes 'proves' that you can smell fear. Of course the method shown does nothing of the sort (even if we put to one side philosophical debates about the notion of proof).

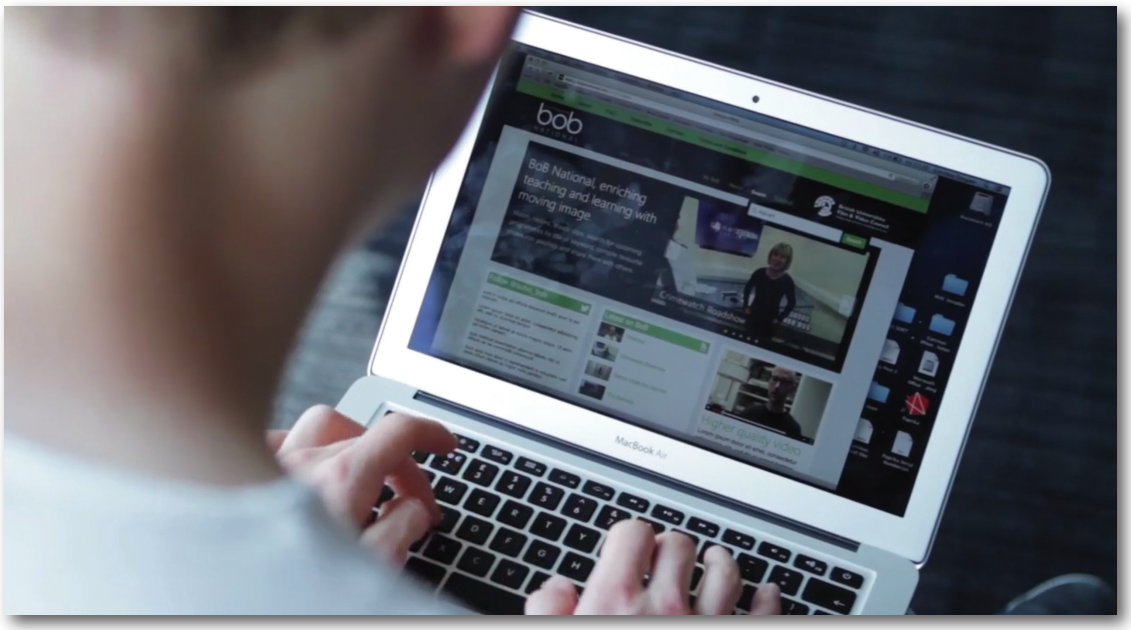
Once again, however, the poor quality of the science is exactly the point. Students are asked to watch the clip and keep an eye out for aspects of the experiment that are good, and those features that are less good. These observations are then collated, before the students are set the task of working with their neighbours to design a better study posing the same question.

This would have been a valuable exercise in its own right. I was, however, fortunate that at around the same time I found this clip, there was also a well-designed study published in *PLoS* One which reported that the smell of anxiety could trigger empathy in others[1]. Details of this teaching activity are available elsewhere[2].

Time management

There will be occasions when the content of a programme is sufficiently strong to warrant watching it in its entirety. Examples that are worthy of this attention include *The Battle to Beat Polio*, any episode of the series *Pain, Pus and Poison* and *The Chemistry of Life*. The latter is the second episode of Adam Rutherford's trilogy on *The Cell*. This 60 minute documentary provides a beautiful walk through of the experiments that identified DNA as the molecule of inheritance. I have, in the past, committed a full session to watching this programme with first year students – providing them with a structured sheet to aid in their note taking.

As we discussed above, however, this may not be the most appropriate use of valuable face-to-face time. In addition, there are practical difficulties in watching a full hour's documentary in a lecture slot which is, in reality, only 50 minutes duration. Only a few years ago, there was no genuine alternative; if your class was more than a handful of students and you felt it was worthwhile them all seeing something then you had to commit the necessary time. This is no longer the case. The rise of authorized archives of streamed TV (such as *Box of Broadcasts*, *Planet e-Stream* and *ClickView*), and on-demand services, make it possible to prescribe watching a programme as a homework task in advance of a tutorial or lecture. In this way, watching broadcast



media might be a component of a 'flipped classroom' model of teaching.

Tools such as *Box of Broadcasts*, a UK-based archive for education containing nearly 2 million TV and radio programmes, solves the issue of access. It also raises the potential to offer recommended 'viewing lists' alongside 'reading lists' for a module, as well as opening up the possibility of setting authentic assessment tasks, such as critiquing the accuracy of science content in documentaries or news coverage.

Knowledge is everything

The second limitation we identified previously was a lack of awareness of what broadcast material might be available. It is quite possible that a section of a programme would be pertinent to a basic concept about which you are teaching, but how are you to use it if you don't know it exists?

In the UK we are blessed with a number of valuable tools to help track down relevant broadcasts. In addition to the websites of broadcasters themselves, and search facilities within the archives, there is also the *Television and Radio Index for Learning and Teaching* (www.trilt.ac.uk). Trilt includes a significant amount of metadata relating to programmes. Even this, however, will not necessarily provide nuanced guidance for ways in which they could be used within the context of university teaching of biochemistry.

This is where a new service *Biology on the Box* (www.biologyonthebox.wordpress.com) comes into its own. Posts in a variety of styles highlight TV (and to a lesser extent radio) material of relevance to undergraduate bioscience. Some items merely raise awareness of the existence of digital copies of programmes, others include reviews, structured activities and/or tried-and-tested classroom applications. Recommendations are provided by both academics and students. If you would like to consider developing the use of broadcast media in your own teaching, you could do worse than start with a look around this site. ■

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