Projects marrying advanced technical skills and scientific controversy

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Background and rationale

This case study highlights a traditional lab project and describes an example of one of the topics for projects undertaken by our Biology or Microbiology BSc students as part of a double module (40 credits) research project in their 3rd (final) year.

The learning outcomes are:

- practical skills in the designated project area;
- time management skills;
- ability to collate and write up complex datasets for publication;
- ability to access, survey and synthesise data from primary and secondary literature sources; and
- independent project management skills.

I initially designed this project to complement my 3rd year module entitled 'Communities, Agriculture and Biotechnology', which is itself an experimental exam-free module that has proved very popular with students. The idea was to marry some advanced lab techniques (ELISA and detection of tiny levels of 'contaminants' in foods) with an important contemporary scientific controversy that also had social and economic implications (GM crops).

How to do it

The activity itself is relatively straightforward, but a detailed description would be too lengthy to include here – see the Methods section of Partridge and Murphy (2004).

Advice on using this approach

The two major factors are cost and identifying the right food samples. Other key factors are: ensuring student competence in the protein extraction techniques; identifying appropriate controls; and assay design to maximise sample numbers for each run – the kit only allows for 2 or 3 runs so we tend to do dry runs first so we don't waste valuable kit materials during the initial skill-acquisition phase of the project.

Troubleshooting

This is a lab-based study also involving some fieldwork in collecting samples with some interesting social implications. Students have sometimes had problems in accessing enough samples for a statistically meaningful project. Ideally we need several dozen soy-containing food samples including similar products sourced from different suppliers or retailers. At the beginning students sometimes find it difficult to distinguish between different types of soy product, some of which are not amenable to ELISA analysis. They also take a while to understand the full implications of the food labelling information that is normally the primary source of product information. This is an interesting phenomenon in itself because if food labels cannot readily be understood by 3rd year undergraduates, it is even less likely that they will be accessible to much of the general public.

Does it work?

This project is popular among students and its main drawback is probably the cost, which at £500 per kit limits it to a few people each year (the cost/student of £200-300 is not high for a final year project) and the dependency on the availability of a plate reader (which are standard in most molecular biology research labs). On the other hand, it can generate publishable data and in the past we have produced a high impact peer reviewed article (Partridge and Murphy, 2004) from such projects where both students went on to take higher degrees. Feedback from reflective essays about the module has been very favourable. Students felt they were working on a cutting edge area of biology that had direct social implications, especially regarding topics such as food labelling, GM foods, consumer awareness, organic foods, and 'health' foods.

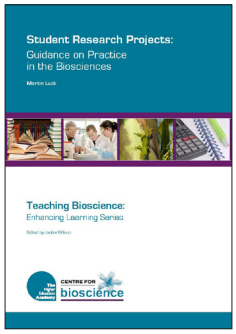
Further developments

We will be running the project again in 2008-09 and I hope we will be able to collate the data either for a peer reviewed publication or as a correspondence item in a journal. We are also considering extending the activity as part of our schools outreach work and possibly involving year 11-13 pupils in sample collection, results analysis and discussion of the results and their implications.

Accompanying materials

Partridge, M. and Murphy, D.J. (2004) Detection of genetically modified soya in a range of organic and health food products. Implications for the accurate labelling of foodstuffs derived from potential GM crops. *British Food Journal*. **106**, 166-180

Additional materials



This case study accompanies the Teaching Bioscience: Enhancing Learning guide entitled *Student Research Projects: Guidance on Practice in the Biosciences*, written by Martin Luck and published by the Centre for Bioscience. The associated website (www.bioscience.heacademy.ac.uk/resources/TeachingGuides/) contains a downloadable version of this case study

Case Study published October 2008

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