

Creativity in the Biosciences

Parents, new to the job, will be all too aware that young children ask lots of questions and challenge well established ideas. During those early years a child's curiosity and enthusiasm are often matched by impressive displays of creativity. Disappointingly, as we grow older, we tend to lose the curiosity of our childhood years and some would argue the creativity that may be associated with curiosity and challenging assumptions is suppressed by aspects of our secondary and tertiary educational systems. In HE, bioscience students are rarely given the opportunity to be truly creative until they embark on a major research project towards the end of their degree programme. This is a great pity and it would seem that for many of our students we scarcely scratch the surface of their true creative potential. How can we encourage our students to retain or recapture their curiosity, challenge assumptions and be creative?

Students cannot realistically be expected to be creative in the biosciences until they have acquired a comprehensive, subject-specific knowledge base. They will build this essential foundation over the first two years of a typical degree programme when they will be expected to absorb an enormous amount of information. During this time it is important to emphasise that some of the major advances in the biosciences occurred because researchers were curious about unusual and unexpected results. Similarly, students need to know that the information we impart during lectures is not necessarily written on tablets of stone, it is healthy to be sceptical and challenging, and often we are only one step ahead of them in terms of our knowledge and understanding! These themes are pursued at the website Creativity in the Biosciences (www.fbs.leeds.ac.uk/creativity) which also describes a range of techniques that may be used to promote creativity in students working alone or in groups.

The techniques that may be used to foster creative approaches to problem solving range from the identification of analogies, including those identified through bioinspiration, to brainstorming with mindmapping to a number of procedures that depend on the creation of a forced

relationship between the problem and a random word or piece of information. These approaches can be used from the very beginning of degree studies when students can be expected to think about creative solutions to general problems like novel applications for new technologies or improved methods for communication of science to the general public. As students become more confident and build their bioscience knowledge base, detailed subject-specific problems can be considered at Level 3 and beyond. Students should also be encouraged to 'incubate' their problems and, as they mull over potential solutions, to consult widely, perhaps seeking the views of friends and colleagues who may be studying other disciplines. This will allow them to obtain novel perspectives on the problems they are trying to solve and may help them to make unexpected connections between apparently unrelated phenomena. The identification of new perspectives and connections can lead to creative solutions to the most challenging of problems.

Creativity is a notoriously difficult concept to define and measure. It is perhaps not surprising, therefore, that the terms 'creativity' and 'innovation' do not feature in the skills section of the QAA's subject benchmark statement for Biosciences (www.qaa.ac.uk/academicinfrastructure/benchmark/statements/Biosciences07.asp). The statement outlines a wide range of skills that students should acquire by studying biosciences and focuses on the development of the essential critical and analytical skills that enable students to converge on the correct solution to a problem. However, the divergent thought processes that underlie the identification of alternative, imaginative and creative solutions to problems are not addressed. Psychologists tell us creativity involves the effective combination of divergent and convergent thought. It may therefore be appropriate for future benchmark statements to address the issue of the promotion of divergent thinking and creative skills in bioscientists. I'd be very interested to hear your views.

David J. AdamsDirector of the Centre for Bioscience
d.j.adams@leeds.ac.uk

Contents

- 1 **Creativity in the Biosciences**
David J. Adams
- 2 **Bioscience Horizons: The National Undergraduate Research Journal**
Julian Park
- 3 **Creating a Bank of Plant-Based Research Projects for Final Year Students**
Jo Smith and Julie Hawkins
- 4 **Turning Students into Bioscientists: Teaching the Scientific Method**
Martin Luck and Carol Wagstaff
- 5 **Is There Value in Reflecting?**
Morven Shearer
- 6 **National Teaching Fellows**
Andrew Booth, Tim Cable, Stephen McHanwell and Liz Warr
- 8 **No Cost Technologies to Support Teaching and Learning**
Simon Ball
- 9 **m-Learning and Mobile 2.0**
Terry McAndrew
- 10 **Engaging Employers**
Stephen Gomez
- 11 **The Industrial Placement Year: a Student Perspective**
Lucy Williams
- 12 **News from the Centre**
Centre for Bioscience



2 | Bioscience Horizons: The National Undergraduate Research Journal

A year ago we wrote in the Bulletin concerning the proposed Bioscience Horizons journal (Bulletin 21). This is now reality, with the first issue having gone live on 25th March 2008, containing papers from 10 undergraduate projects completed in the academic year 2006/07 (see www.biohorizons.oxfordjournals.org). Bioscience Horizons aims to provide a forum for the brightest undergraduates in the UK and Ireland to publish their research and for supervisors and institutions to highlight the quality of their learning and teaching activities. Published twice a year, it includes papers – following a rigorous peer-review process – covering a wide range of research in the biological sciences. Bioscience Horizons is published by Oxford Journals in conjunction with Oxford University Press' Higher Education department, and has been supported by a grant from the University of Leeds.

In this first year the Journal attracted 37 undergraduate papers from 24 universities. Biological science departments were asked to nominate two high quality pieces of work to go forward to the journal. Students were asked by their departments to submit an abstract of their work, via the department. It is important to note the Journal only accepts approved nominations from departments and not submissions directly from students. Abstracts were reviewed by the editorial board and the majority of the students submitting were then asked to complete full papers of up to 5000 words. The paper could take the form of a research report or a review. Completed manuscripts were sent to independent referees who were both knowledgeable about the subject matter, but also familiar with standards relating to high quality undergraduate research work. Papers were either accepted as they were, with corrections (minor or major) or in some cases rejected because they did not meet the scientific or editorial requirements of the Journal. Two electronic issues have been published in Spring 2008 containing 10 and 12 papers respectively. The range of material accepted is considerable and includes research papers and reviews such as:

- Gene expression of *Pseudomonas aeruginosa* and MRSA within catheter-associated urinary tract infection bio-film mould;
- An investigation to determine the variation in marsh orchid (*Dactylorhiza*) populations at Moses Gate Country Park, Bolton;
- Is the clinical use of stem cells a realistic possibility for myocardial regeneration?; and
- The production of a dynamic website for exploring biofortification of wheat with selenium.

The Journal requires papers to be solely authored by the student undertaking the research, with an acknowledgement to the supervisor(s), rather than jointly authored. It is clear in the majority of cases that supervisors have supported the student in the preparation of the paper but the Journal editorial board stresses that the substantive work should be undertaken by the student. Nominated students have clearly put in a great deal of effort to produce papers to the Journal

specification and we have had positive responses from the students involved about the opportunity to publish; "I've just had an email confirming that my paper has been accepted, subject to some minor revisions, for publication in Bioscience Horizons! I am absolutely thrilled!"



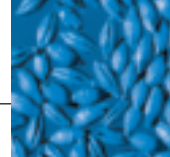
Figure 1:
Bioscience Horizons, www.biohorizons.oxfordjournals.org

We are reliant on the bioscience community to judge the quality of these contributions, their usefulness to teaching and learning and their research value within our disciplines. As well as publishing excellent science, we hope the Journal will provide a useful resource to students and staff, illustrating how high quality research can be undertaken as part of undergraduate final year projects. The editorial board is delighted by the quality of the articles in this year's pilot volume and believes it has provided a useful resource to our community. Our intention is to review the process we have been through in the last 18 months as well as considering feedback from readers of the first issues.

We will continue the Journal in the current year, asking for submissions from amongst projects submitted in the academic year 2007/8. We will be writing to Heads of Departments in May with details of how to participate in 2008. If you would like to be added to the mailing list, email biohorizons@leeds.ac.uk. We strongly encourage those who participated last year to consider nominating students again, and for those who did not participate to consider doing so.

Julian Park
University of Reading
j.r.park@reading.ac.uk

Journal Editorial Board
Celia Knight (University of Leeds) – Chair
Julian Park (University of Reading)
Martin Luck (University of Nottingham)
Alison Fletcher (University of Chester)
Jac Potter (Trinity College, Dublin)
Jonathan Crowe (Oxford University Press)



Creating a Bank of Plant-Based Research Projects for Final Year Students | 3

Final year research projects allow undergraduates to develop a wide range of skills, from experimental design and problem solving to time management and effective communication (Ryder, 2004). Dissertations often form a significant part of a finalist's degree result, and a positive experience can encourage graduates to pursue research careers. Nonetheless, the provision of projects can be a challenge: unsuitable or poorly thought through research can waste significant resources in both expensive consumables and technician support time.

An initiative from the Centre for Excellence in Teaching and Learning in Applied Undergraduate Research Skills (CETL-AURS; www.reading.ac.uk/cetl-aurs/CETL-AURSProjects/CETL-AURS_Projects.asp) at the University of Reading is aiming to resolve these problems by developing a bank of plant-based projects for students within the School of Biological Sciences. Plants interact with human and other animal systems in many ways, for example nutritionally, pharmaceutically and physiologically, but plant-based project topics were under-utilised outside the plant sciences themselves. The University's plant collections, both living, in the 5 hectare botanical Harris Garden, and dead, in the 250,000 dried specimens in the herbarium, provide excellent potential resources for final year projects, and this is something we wanted to promote.

A project template (<ftp://www.bioscience.heacademy.ac.uk/newsletters/smithhawkins.pdf>) was designed that detailed the academic supervisor, the research hypothesis, the methodology, as well as the resources required, and the names of postdoctoral and postgraduate advisors and sources of technical advice. All this ensured projects were clearly defined and well-supported logistically. Discussions with academic and technical staff across the schools and departments of Biological Sciences, Chemistry, Food Biosciences, Pharmacy and Agriculture have led to the development of a bank of 50 project descriptions. It is intended that these project descriptions will be used year after year with appropriate modifications, for example by selecting different plant species in successive years. This will maximise the time staff and students can focus on the detail of the project, and allow students and staff to accumulate enough data to support a publication. By using the full range of the available plant resources, the aim is to spread the responsibility of supervision more evenly among staff and relieve some of the pressure from the busiest research laboratories, thus ensuring a positive experience for the student.

Many of the research designs involve collaborations between plant scientists and researchers from other disciplines (Table 1). For example, one project aims to test the antimicrobial effectiveness of plant material in the search for novel compounds to control antibiotic-resistant pathogenic bacteria. Another investigates the effect of plant-derived oestrogenic compounds (phytoestrogens) on breast cancer cells, while another researches the link between the traits of flowering plants and the behaviour of their pollinators.

Table 1: Examples of research projects

Applied Ecology
Use of plant extracts as insecticides or inducers of plant resistance
Phytoremediation of heavy metals
Behavioural Ecology
Plant traits and the effectiveness of insect pollinators
The biochemistry of plant pollination: petal pigments and pollinators
Biomedical
Anti-cancer effects of herbal plants
Phylogenetic analysis of the distribution of secondary metabolites in plants in the search for novel sources of medicines
Conservation
Ex-situ conservation: developing the seed bank facility within a herbarium
The invasive potential of exotic plant species: competition for pollination services with native species
Environmental Education
Developing a medicinal plant trail for the public within an amenity garden
Developing web-based resources from herbarium collections
Microbiology
Plant impacts on bacterial growth and bacterial impacts on plant health
Influence of plant compounds on bacterial growth and gene expression
Quality Assurance
Authentication of medicinal plants in trade using DNA bar-coding
Quality control of spices from ethnic shops and mainstream supermarkets

With student numbers within the life sciences increasing, it is anticipated this CETL-AURS initiative can help sustain and develop the quality of the research experience enjoyed by our undergraduates. The initiative also helps life science students experience some plant science when numbers recruited for traditional plant-based degrees of botany and horticulture remain relatively low.

Reference

Ryder, J. (2004) What can students learn from final year research projects? *Bioscience Education E-journal*, volume 4. Available at www.bioscience.heacademy.ac.uk/journal/vol4/beej-4-2.htm (accessed 18 March 2008)

Jo Smith and Julie Hawkins*

University of Reading
joanne.smith@reading.ac.uk
j.a.hawkins@reading.ac.uk
 *Corresponding author



4 | Turning Students into Bioscientists: Teaching the Scientific Method

How important is the scientific method to becoming a bioscientist? How can we get students to engage with it during their studies? We would like to start a debate about including the scientific method (SM) in bioscience education and what that means in practice.

All scientists should appreciate how and why science works, but there is no consensus about how to deal with this in bioscience courses. In training the next generation of bioscience professionals, we naturally give our students the core knowledge they need and also try to lead them towards a deep understanding of the subject. Research is also an essential part of the undergraduate experience, but is there something missing?

Like all science students, bioscientists are heirs to a long history of discovery and intellectual development in their specialist areas. Science has been an extraordinarily successful human endeavour – some would call it a defining feature of modern humanity – and we should expect our students to understand why this is so. What is it about the process of science that makes it so productive? With what justification do we continue to exploit the methods that science gives us? What defines scientific reliability and how do we decide what and whom to trust? On what basis may we, as professionals, expect the rest of society to listen to what we tell them about the biological world?

Questions like these are the natural province of courses on the philosophy of science. The debate for us is the extent to which they should be covered in specialist bioscience courses and whether gaining an understanding of the SM is part of becoming a bioscientist. One view is that students should pick things up as they go along: they should assimilate the process of science by example, by engaging with the culture of the university and by doing their own research. Alternatively, one could imagine a formal didactic approach with compulsory modules on the philosophy of science and students not permitted to graduate unless they can prove competence in the subject.

Well, bioscience teachers enjoy diversity (biology is the science of variation) and neither extreme seems likely. Thus we need to ask how much should be expected and what form it should take. Any teaching of the SM will probably have to be integrated into existing courses, either those covering 'research methods' or more specialist modules within the discipline. There can be few students who don't at some time receive guidance on how to design a reliable experiment or test a hypothesis. We also require students to know the importance of controls and how to apply statistical tests to data. These are components of the SM, even if not presented that way. As students gather their own data in practical classes and projects, there may be opportunities to discuss such weighty matters as the nature of evidence, the difference between accuracy and precision and the need for independent replicates. Practical investigations can be designed with that in mind.

A more formal approach might look at the characteristics of successful science (predictive accuracy, coherence, consistency, unifying power, fertility, simplicity), discuss the principle of testability and the problem of induction, and evaluate the concept of paradigms. These can be approached from an abstract viewpoint, or looked at historically alongside a hagiography of influential thinkers. This sounds intellectually satisfying, but it is unclear where adequate space will be found in a crowded timetable. As course designers, we currently decide for ourselves how to incorporate the SM in our teaching. If the extent to which concepts are acquired through practice or explicitly taught varies, students must be graduating with different levels of experience, confidence and expertise.

There is also an important debate about the relevance of the SM to students whose careers may take them away from science. Should all graduates be equipped with a secure conceptual framework with which they can evaluate new discoveries and assess the consequences of advancing knowledge? How does it help, as a member of a science-dominated society and in the context of a wider world view, to understand how science works?

Perhaps there are already some instructional and experiential models which are known to work? Perhaps there are colleagues who have worked out how to make an effective connection, in the mind of the student, between the theory of science and its practice? We would be interested to hear from anyone who has experience in this area. Please contact either of us with your thoughts or suggestions.

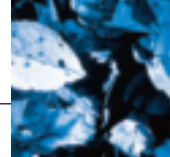
Martin Luck
University of Nottingham
martin.luck@nottingham.ac.uk

Carol Wagstaff
University of Reading
c.wagstaff@reading.ac.uk

Themed Issue



We are planning for the Spring 2009 edition of the Bulletin to be themed around practicals and fieldwork. If you would like to submit an article on either of these topics then please email an expression of interest to Steve Maw (s.j.maw@leeds.ac.uk) by 18 July. We look forward to hearing from you.



Is There Value in Reflecting?

| 5

A student sidled up to me at the end of the seminar and asked, in hushed conspiratorial tones, "...you know the reflective essay thing... when you say 'reflective'... and that it's supposed to be what I've been thinking... do you mean... waffle? Is that right?"

Far from being waffle, Dewey (1933, cited in Grant *et al.*, 2006) defined reflection as "a purposeful form of thought" and Betts (2004) recognised 5 levels of reflective practice: reporting, responding, relating, reasoning and reconstructing. These definitions suggest a structure and process to successful reflection.

I recently introduced a reflective assignment to final year scientists in a bioethics module. The students had been asked to write an extended essay on a contemporary ethical dilemma. The reflective assignment was included in parallel to allow them to understand the progression of their ideas throughout the semester and hence learn from the interplay of the different components which had contributed to the finished work. The framework used for this exercise was a learning log (adapted from MacFarlane, 2001). Students were encouraged to keep a diary and were given the following guidelines:

- First entry: Where do you stand? Summarise your opinions and attitudes on your chosen topic. Why do you have those opinions? What influences have been important?
- Subsequent entries: Evaluate the theories. As you start to read around the topic, which papers or ethical arguments 'resonate' with you? Which do you strongly disagree with? Which are the most challenging? Why?
- Final entry: After finishing the log look back over all the entries and reflect on the very first entry. Do you still hold the same opinions and attitudes? Has your thinking developed? What have you learnt? What was the most influential paper you read, or conversation you had, in terms of helping you to clarify your ideas?

A reflective essay, based on these notes, was then written to describe the development of their thoughts and also discuss aspects of general learning (time management and organisation). Students were marked according to their ability to be contemplative, analytical and self-critical.

The exercise described above could be thought of as a 'cheat' as scientists were asked to reflect while taking a humanities-type module which arguably lends itself to reflection a little more readily than, say, molecular biology. However reflective practice can be valuably embedded in bioscience itself. Campbell and Lom (2006) describe a method they use to encourage reflection and develop mentoring relationships during undergraduate research projects. Again, they use questions to structure their students' reflections and the students respond via weekly emails. The responses (covering issues such as time management, knowledge acquisition and frustrations) can be used constructively by both parties.

Reflective Practice Within the Bioscience Curriculum

Normally an assignment is set and several weeks later the finished product arrives on your desk, how a student got from A to B is unknown. Why they picked the topic, influential articles, difficult aspects, challenges, important discussions with peers, and the ways in which they have grown as learners are a mystery. Some could argue all these things are irrelevant but, if used constructively, that need not be so - they can in fact be insightful and extremely useful to both parties.

All that said, we do not want students to produce dense fact-based diaries describing minutiae, or contrived pieces of self-analysis, filled with clichéd phrases. For reflection to be of value it must be a natural, relevant, structured, critical process and, as Dewey said, purposeful. There are in fact a whole range of different approaches which can be used and adapted depending on the desired purpose. With reflective practice being introduced into a wide variety of professional development courses (as well as in PDPs) it is only a matter of time before its inclusion in the bioscience curriculum at undergraduate level. The challenge to those involved in teaching bioscience is to explore novel ways of introducing reflective principles into coursework to produce outcomes that are valuable, intellectually robust and encourage learning and growth.

References

- Betts, J. (2004) Theology, therapy or picket line? What's the 'good' of reflective practice in management education? *Reflective Practice* **5**, 239-251
- Campbell, A.M. and Lom, B. (2006) A simple e-mail mechanism to enhance reflection, independence, and communication in young researchers. *CBE-Life Sciences Education* **5**, 318-322
- Dewey, J. (1933) *How we think*. Boston: Heath, in Grant, A., Kinnersley, P., Metcalf, E., Pill, R. and Houston, H. (2006) Students' views of reflective learning techniques: an efficacy study at a UK medical school. *Medical Education* **40**, 379-388
- Macfarlane, B. (2001) Developing reflective students: evaluating the benefits of learning logs within a business ethics programme. *Teaching Business Ethics* **5**, 375-387

Morven Shearer
University of St Andrews
mcs6@st-andrews.ac.uk

6 | National Teaching Fellows

The National Teaching Fellowship Scheme aims to raise the profile of teaching and learning in higher education. There are two separate strands to the scheme: individual awards and projects.

The aim of individual awards is to recognise and celebrate individuals who make a significant impact on the student learning experience. In 2007, four bioscientists were awarded Fellowships, here they describe the activities and experiences which led to their Fellowship and how it has impacted on their teaching.



Andrew Booth

In 2006, the NTFS scheme changed. It was split into two strands, individual and project awards. The individual awards are accompanied by what is effect a prize of £10,000. Although administered by the Fellow's institution, the Fellow has complete control over how the award is spent, within reason. There is no longer any obligation to carry out a project, though if the Fellow is keen to contribute to a project this can be achieved by applying via the project awards strand for funding of up to £200,000 per project.

I was lucky enough to be nominated for an individual award. The nomination cited my previous work on the development of VLEs, on computer-based simulations of practical procedures in the biomolecular sciences and my work in developing countries. I was very flattered to receive this fellowship and I intend to use the award for travel and to fund small research projects I currently have under way, such as an examination of the security of student information contained within VLEs, something about which I am becoming increasingly concerned.

Has the Fellowship changed my life? Well, probably not, but everyone likes to receive acknowledgement. Working within a research-led university, this doesn't come very often to those of us primarily working on teaching-based activities. Still, many of my colleagues seemed genuinely pleased I have become the second person in my faculty to be awarded an NTF. The photograph of the award ceremony (Bill Rammell on the left and Prof. Rick Trainor, chair of the advisory panel that selected the fellows on the right) was put on the plasma

screens in the faculty, prompting comments that I had never before been seen in a DJ and bow tie!

You have to be nominated by your institution, but if you get the chance – go for it. You'll join a growing group of like-minded individuals who act as a self-support group and off whom you can bounce ideas, and the award dinner is highly recommended!

Andrew Booth

University of Leeds

a.g.booth@leeds.ac.uk

Tim Cable

As Director of the School of Sport and Exercise Sciences at Liverpool John Moores University, I am responsible for the management of a dynamic research and teaching environment. The School is renowned for its excellence in teaching (QAA Subject Review score, 24) and internationally rated research (RAE 5**) and has been recently designated as a Centre of Excellence for Teaching and Learning (CETL) to promote Leadership and Entrepreneurship amongst the student body.

I am a strong advocate of the University's Postgraduate Certificate in Learning and Teaching programme and have established review mechanisms to provide encouragement for staff to enhance their teaching performance. As CETL activity is embedded within the School, staff engage with pedagogical processes and are supported by CETL sabbaticals to enhance the student experience.

My research interests include exercise, ageing and the cardiovascular system, environment and performance and muscle strength in post-menopausal women. In addition, I lead a team that administers and evaluates community-based physical activity programmes for weight-management and improved health and have used this research to directly inform and develop the curriculum. I have also developed a range of approaches to facilitate enquiry-based learning, including field trips to collect physiological data at high altitude that students use in completing coursework.

In bringing research and teaching together in my own professional practice, I believe my input has been important to the development of the University's strategic initiative for research-informed teaching that spans all faculties. Most recently, the embedded model of employability I developed through CETL funding within the School has been adopted by the University and from September 2007 all LJMU programmes included an integrated curriculum model of work-related learning that has a focus on promoting students' self-efficacy and their understanding of the learning process.

Tim Cable

Liverpool John Moores University

t.cable@ljmu



Stephen McHanwell

Though I started my professional career as a physiologist and neuroscientist I have, for the last 26 years been teaching anatomy to medical, dental, speech sciences and science students at both under and postgraduate level. Currently, I am based in the Dental School at Newcastle where I am Director of the first 2 years of the Bachelor of Dental Surgery course. I have had the privilege of working with some of the most committed groups of students one could hope to meet and so I have been very pleased to receive this prestigious award recognising my work as a university teacher.



Within Newcastle University I have contributed to developing the teaching and learning agenda by developing a project to collect student feedback at programme level and by contributing to designing and implementing our institutional student survey.

I have taken up mentoring and leadership roles institutionally, nationally and internationally supporting both junior and more senior colleagues. I played a key role in shaping and supporting Newcastle University's Certificate in Advanced Studies in Academic Practice, a training programme undertaken by all new staff. I have made contributions to teaching Anatomy through co-authoring the publication of Basic Medical Science for Speech and Language Therapy Students, widely adopted as the leading UK textbook in its field and am currently preparing a 2nd edition. I have also contributed edited chapters to the 40th edition of Gray's Anatomy.

I have been Education Officer of the Anatomical Society of Great Britain and Ireland for the last 9 years and am currently its Assistant Secretary. I helped to establish, and now act as Secretary General to, the Trans European Pedagogic Anatomy Research Group of the European Federation of Experimental Morphologists. I am about to take up a Visiting Professorship at Complutense University in Madrid where, amongst other ventures, I will be working on a project developing a new digital atlas of anatomy for under and postgraduate teaching.

My current interests lie within developing clinically-relevant anatomy teaching programmes to encourage more effective student learning, developing pedagogies that will help students to become more authentic and autonomous learners, and effective methods to gather student feedback.

Stephen McHanwell
Newcastle University
Stephen.Mchanwell@ncl.ac.uk

Liz Warr

On reflection, the combination of a first degree in Agricultural Science at a traditional research-led institution (Oxford University) and a Certificate of Education at a technical teachers College (Wolverhampton) was ideal preparation for my lecturing career in Vocational HE at Writtle College that has now spanned three decades! From my first period of teaching practice at Berkshire Agricultural College, I have relished the challenge of teaching principles to students on vocational programmes. I try to inspire learners by explaining "how things work" and "why things happen" and attempt to evaluate "learning difficulty" and use simple analogies to explain problem areas. My goal is to develop the minds of learners, and introduce a spirit of inquiry and the ability to question commercial practice.



In developing Equine Studies as an academic discipline I believe an innovative approach to curriculum design, delivery and assessment has inspired many learners. For example, a computer-aided design module meant Writtle students were designing Show Jumping Courses on computers when International Course-builders were using rulers and graph paper! Bringing in professionals to assess students and incorporating the best designs into local and national competitions, inspired students to produce work of impressive quality, representing a high level of independent learning and an early example of employer engagement.

I have designed curricula for maximum flexibility and accessibility and my pedagogic approaches aim to celebrate diversity. I place a high emphasis on formative assessment and provision of constructive feedback. Building on the ethos of creativity and innovation I have tried to instil in my own teaching, I have instigated a Teaching and Learning fund at Writtle from which staff can bid for money to undertake innovative projects and / or obtain new technologies to support learning.

Equine Studies has emerged as a respected academic discipline that has brought large numbers of non-traditional learners into HE, enabling them to achieve a high standard and to progress successfully to further study or employment. I believe its success lies in the balance between the development of generic intellectual and cognitive skills expected in today's graduates and the vocational competence expected by employers.

The love of the subject is undoubtedly vital, as students are intrinsically motivated to learn, which is critically important. Looking back I see this as the most crucial factor in my success as an educator – I love teaching!

Liz Warr
Writtle College
liz.warr@writtle.ac.uk



8 | No Cost Technologies to Support Teaching and Learning

This article looks at some of the free technologies available which can support learners with a variety of needs and requirements. Some may be viewed as 'assistive' in the sense that their primary intended function is to provide a specific solution to issues related to a particular impairment. However, many of these tools can be used by a very wide audience and be a quick way of introducing variety into teaching and learning.

The creation of interactive and informative content can increase learner engagement. With the tools described below this can be done easily, cheaply and they could equally be used by learners to create content. Further information on the technologies described in this article (including animations of their application) is available from the JISC TechDis Service (www.techdis.ac.uk/getfreesoftware). It is important to note some of these tools can be used to create audio or visual rich content and as such the specific needs of learner groups should be considered in order to ensure solving one set of barriers does not create another.

- **Reading Assistance Software.** Read assist software comes in a variety of guises, but they all share a means of making text more accessible. Some help users with poor reading skills while others aid those with poor vision, although many learners find them beneficial. NaturalReader (www.naturalreaders.com) will read aloud text in a variety of packages e.g. Microsoft Word, Internet Explorer, Adobe PDF and emails. DSpeech (dimio.altervista.org/eng/) has similar functionality to NaturalReader, but can also convert selected text into either mp3 or wav format. With the mp3 conversion, an audio file of a document can easily be created and made available.
- **Screen Capture Software.** Camstudio (www.camstudio.org) will record any activity occurring on a computer screen and synchronise accompanying audio (either via a microphone or directly from the computer). Camstudio can enable quick and easy production of resources without expensive software and can output as avi or swf format.
- **Sound Recording and Manipulation Software.** Audacity (audacity.sourceforge.net) is an audio editor and recorder which can record live, and edit saved, audio. Audacity can save any imported audio as an mp3 file; ideal for producing audio files of resources and materials. Audacity can also be downloaded as a portable application and loaded on to a USB memory stick, removing the need for the software to be downloaded onto a computer; ideal if staff or students do not have administration rights to their computers.
- **Visualisation Software.** Wink (www.debugmode.com/wink) is a tool for creating interactive learning resources. It enables users to capture screenshots, add explanation boxes, buttons, audio content and titles. These screenshots can then be joined together to produce a 'movie'. Each screen can have a number of text and audio descriptions added to the image, creating a multilayered learning object.

- **Online Discussion Tool.** Gabbly (www.gabbly.com) is an instant messaging application that can be used in conjunction with any website. For example if a user enters the URL www.gabbly.com/www.techdis.ac.uk a chat pane will appear over the TechDis homepage, while still enabling navigation through the site; all users who enter this URL will be added to the same chat pane. This can be a quick and easy way to involve learners in evaluating a specific website as everyone can add comments into the chat pane without having to use a proprietary system such as MSN Messenger or Yahoo Messenger, which would require administration rights to download.
- **Accessible Learning Object Tool.** Xerte is a tool for creating accessible learning objects. Originally developed at the University of Nottingham, TechDis have worked with the developers to create a template which makes it easy to construct accessible learning objects with just a few images, sound clips or video files. These can be published as HTML files or packaged for a VLE. If you are interested in trying it out, download and install Xerte from www.nottingham.ac.uk/xerte and click on the 'templates' link to download the 'techdis.xtp' template. A getting started guide can be found at www.techdis.ac.uk/getXerte. We would be very interested in building two Xerte user groups – one for developers who want to build further templates and one for academics building and sharing learning objects. If you are interested please contact helpdesk@techdis.ac.uk

The tools described in this article are just a small selection of the many freely available tools and technologies which could be used to support innovative content creation, planning, discussion and collaboration. They also highlight some of the easiest ways of creating material in non-conventional ways and broadening the range of learners who can access it.

TechDis supports the education sector in achieving greater accessibility and inclusion by stimulating innovation and providing expert advice and guidance on disability and technology. TechDis is a JISC-funded advisory service. For more information go to www.techdis.ac.uk.

Simon Ball
JISC TechDis Service
simon@techdis.ac.uk

TechDis

m-Learning and Mobile 2.0

Nearly every new mobile phone now comes with as much memory as a desktop pc, a camera which captures audio and video, a screen capable of rendering high colour images and a communications backbone which allows it to share content with both nearby and more distant devices. Unless of course, you are an academic. It would appear many university staff have 'hand-me-ups'; the mobile their offspring would no longer be seen dead with – given to a parent who believes "a mobile phone only needs to make calls". Well, does it? What else can we do with the phones students already own?

An iPhone may be 'the coolest device on the planet' but is probably far too expensive to be making inroads into the student pocket for quite a while yet and the delay providing tools for 3rd party developers hasn't helped. The long established competition has plenty up its sleeve and the existing mobile devices, especially phones, can do quite a lot. Students also appear to be wedded to their mobiles. Many use them as their principal calculator, an mp3 player and a password storage device; panic ensues when it is lost. It is this close-coupling that could be exploited to great advantage.

Outside the lecture theatre we have an opportunity to use two-way SMS (texting) to replace the functionality of the 'clicker'. The Centre currently has projects evaluating these and one has been coupling SMS with podcasts to make lecture podcasts interactive based on Tribal CTAD's SMS Quiz author (www.m-learning.org/).

Within most student mobiles lies a powerful programming environment based on Java (J2ME, www.java.com/en/mobile/education.jsp). While trying the 'Who wants to be a millionaire' game for some personal formative assessment (I'll stick to the day job) it was obvious to me that these could be running formative MCQs. After presenting on this at the CAA conference last year I was contacted by a developer with a solution. It takes standard format questions from a questionmark database (no MCQ re-writes needed) into a database which can be downloaded with an application for playing them back 'offline'. Students use the questions for revision without incurring a charge once the download is completed. New questions can be retrieved by synchronising with the master database occasionally for minimal charges and it works on almost any mobile. Contact me if you are interested in trying it out.

Pastoral care can be supported with SMS text using JANET's 'jan.net txt' messaging service (www.pageonejanettxt.com). This simple application enables groups of students to be contacted quickly at low cost, e.g. "You've missed another practical – care to SMS your response?"

The mobile's camera can be used to capture assessment output and post it online for discussion as still images or video – YouTube and its alternatives provide the service. For example, school teachers and pupils have used mobile phones to capture video clips on field trips using OOKL (www.oocl.org.uk). On return to the classroom they can aggregate these to share the experience once again and extend their learning. These pupils will have high expectations of HE if their school experience has been so technologically rich.

Developments for mobile devices are being undertaken on many different platforms with Microsoft, Adobe, and Google keen to establish their mobile presence. Competition is fierce but the swiftness of the blogger is helping to keep tabs on developments (see Carnival of the Mobilists, www.mobili.st).

Social software has been the definitive notable of the Web 2.0 'evolution' and has made the web itself a platform but extending this to mobile devices needs to be more than the web in a 2 inch browser. One of the popular applications here is 'Twitter' (twitter.com) microblogging for rapid updates of current activity through social network applications: 'communities of practice' can work in step more easily at greater distances, or an audience can give feedback during a presentation which can be reviewed immediately afterwards.

A key issue with mobile learning is likely to be the cost of transaction. Students already burdened with course fees will resist having to pay to undertake learning activities on their own mobile. However Bluetooth is available on most mobile devices and has great potential in constrained environments. Automatic registration and sharing of content has a ready, cost free, network for delivery. Delegates at the mLearn 2008 conference (mlearn2008.org) will be able to re-experience their paths through the exhibitions by automatic follow-up material generated by their Bluetooth trail.

The important point is to share the experience quickly. Bulletins are frequent but your blogs would be ideal; add them to our reference group blogroll at www.bioscience.heacademy.ac.uk/network/elrefgrp.aspx.

Finally, you may like to know that there is a new use for that tiny camera in your mobile. Many phones now have a 2-D reader already installed which can decode a square dot pattern into a simple text, number, SMS or hyperlink. Just load the application and photograph the 2-D barcode – it will take your phone's web browser directly to the page. Ideal for handouts and posters, it saves the reader from thumbing an unfeasibly long URL into a phone keypad and it works from various distances and angles. Visit reader.kaywa.com to add a reader to your phone and try the example below.



Upgrade your old mobile now and prepare to be amazed!

Terry McAndrew
Centre for Bioscience
t.j.mcandrew@leeds.ac.uk



10 | Engaging Employers

As the Placement Tutor for science students at the University of the West of England (UWE, Bristol), I come across employers in a wide range of activities, from persuading them to offer a one-year paid placement, to visiting students in the workplace. Like academics, employers are very free with their opinion of and advice on the state of education of students. In my dealings with employers I have been at the receiving end of both solicited and unsolicited comments on how 'I' (I take that to be the HE Sector) should better prepare students for the world of work. Rather than remaining anecdotes, I wish I could have captured their comments and shared these insights more directly with colleagues and students.

Like all universities UWE has been considering ways of enhancing the employability prospects of its students. I lead the Employer Engagement Group (EEG), part of the university-wide Employability Group. The EEG was tasked with finding ways in which we can access employer expertise and advice for the benefit of our students. The standard way of doing this is to invite employers to the university to give presentations. These enable students to meet the employer directly as well as allowing the employer a chance to get to know the university.

The EEG met to think creatively about solutions other than traditional employer presentations. One idea was a web-based video pod delivery system, somewhat like YouTube, with short videos of employers talking about their likes and dislikes on a range of work related topics, such as CVs, application forms and interview performance. With two colleagues, David Lush and Karen Croke, I started working on this bespoke system called the Employer Engagement Resource (EER). The EER is accessible on the Internet though it is password controlled and can be accessed only by UWE students and staff (therefore, unfortunately we cannot let you have access). The controlled nature of the resource has been important when negotiating with video employers. The majority said that they did not want their videos to be openly available on the Internet. In addition to controlled access, the videos are not available for download and can only be viewed on the site.

In the initial trial, a select number of employers were contacted with an explanation of the purpose of the EER followed by a request for them to take part. In all cases, they were more than happy to assist. We found most employers are happy to help with anything so long as it does not take too much time. The employers were sent a selection of questions beforehand and we recorded them using a domestic digital video camcorder and tripod. The interviews were digitised and separated into short segments which were uploaded into the EER and tagged with keywords so that they could be searched for.

An important feature of the EER is that any staff or students can upload videos into the resource. This means that the content of the EER is not determined by a small number of individuals and is a true Web 2.0 application with a community building capacity for peer-to-peer networks. The content is moderated before it appears on the site and anything not pertaining to employer engagement is deleted.



Figure 1: Videos can be viewed within a playlist or individually. The user can add videos to a private playlist, rate the video and provide comments. The system tracks the number of views, provides a description and suggests related videos.

The login nature of the site with UWE passwords means that any uploaded content can be traced back if necessary to the originator. Students and staff can comment (again this is moderated) and rate videos and these functions provide feedback loops to the person who has produced the video.

The EER, at the time of writing this article, is a new resource and we will be evaluating it over the academic year. We feel that this way of accessing employers' advice on demand offers a number of important advantages and empowers our students at their point of need.

A video guide to the main features of the site can be viewed at: science.uwe.ac.uk/medialibrary/sgomez/eer.wmv. The EER has numerous features, if you would like to know more, please contact me.

Stephen Gomez
University of the West of England (UWE)
Stephen.Gomez@uwe.ac.uk

Case Study Call

We currently have an open call for case studies, alongside calls for case studies in a number of specific areas, including linking teaching and research, final year project work / student research and employer engagement. If you've got an example of practice you would like to share have a look at our case study call and get in touch to find out about completing and submitting your case study. www.bioscience.heacademy.ac.uk/funding/cs/

The Industrial Placement Year: a Student Perspective

From 2006 to 2007 I undertook an industrial work placement in the Drug Metabolism and Pharmacokinetic (DMPK) department at GlaxoSmithKline and am now back at the University of Leeds studying for the final year of my BSc in Pharmacology.

I decided to do a placement for several reasons. The main one for me was the chance to see if I would enjoy pharmaceutical research as a career. Money was also an important factor; although I did not choose to do a placement for this reason, I did decide to stay in the UK rather than do a placement overseas where they are unpaid. The only other factor that contributed was that I was thoroughly enjoying my time at university and saw a year out as a way to prolong the student life a little longer!

The application process was daunting at times, especially the interviews. I had my first experience of an HR interview for which I was totally unprepared, fortunately I had taken a gap year and done many activities outside university so had experiences to draw upon but I think I would have done much better had I known to expect those sorts of questions. However it was a good learning point and I have already found the experience useful in job interviews since. Before my second interview I was able to speak with a Leeds student who had just returned from placement at the same company. Knowing what to expect put me at ease and meant I was able to ask lots of questions it did not occur to me to ask at my first interview.

I decided not to accept the first placement offer I received, which turned out to be the right decision. Before this experience I had thought that interviews were only about selling yourself and not about deciding if the job would be right for you.

The placement itself was slow to start; I had to complete a host of health and safety, radiation and GLP courses before I could get stuck in. Once I did it was a steep learning curve but the staff were fantastic, everyone was always ready to help or answer questions. I learnt a huge range of different techniques, initially I was conducting small parts of studies but by the end I was competent and confident enough to undertake whole studies, reporting back with completed data. While undertaking my research project I became the expert for a particular assay and was able to teach it to new staff as well as help more senior staff analyse unusual results. I also gained a lot of transferable skills in terms of basic lab skills and juggling all my work so everything was always completed on time. It was great being completely autonomous by the end of the placement; having the independence and responsibility to organise my own work and make valued contributions was a real step up from university.

The university assessment for the placement consisted of a 6000 word lab report in the same format as the final year dissertation. It was marked pass or fail which took the pressure off and allowed me to concentrate on getting the most out of my placement. The project was given to me by one of the researchers in my team and was research that

the company actually wanted doing so I was giving regular presentations to my team and the relevant research group. I really enjoyed presenting my results to people who were genuinely interested in what I had found and having an opinion that mattered rather than being 'just' a student.

Adjusting back into university was the most challenging aspect of the placement. By the end of the placement my opinion was not only respected but often, especially with regard to the assay I was researching for my project, actively sought after. I was also trusted with responsibility and to organise my work myself. Back at university it was difficult to accept having no independence or responsibility, having to submit my work as I go along this year because I am not trusted to organise myself has definitely felt like a backwards step in life and of course having to adjust to having no money again has also been a rather painful experience!

Even though I have decided not to go into pharmaceuticals, I am glad I did the placement. Not only did I have a lot of fun and make some good friends but I also got first hand experience of things that are relevant to any career; independence, team work, office politics etc., I got a unique insight into what I want from a job that I would not have had otherwise. Overall I would definitely recommend doing a placement to anyone else.

Lucy Williams

University of Leeds
bms4lmrw@leeds.ac.uk

Lucy has also written a case study of her experience as a work placement student; www.bioscience.heacademy.ac.uk/ftp/events/workpl181207/casestudy.pdf

Bioscience Education e-Journal – 11th Edition

Volume 11 of Bioscience Education e-journal will be published at the end of June, with a range of papers including: Students' Responses to Academic Feedback Provided via mp3 Audio Files, Stephen Merry and Paul Orsmond; and Student learning networks on Residential Field Courses: Does Size Matter?, Mark Langan, Rod Cullen and David Shuker. All articles are available to read and download from www.bioscience.heacademy.ac.uk/journal/vol11/

Interested in submitting an article for publication? Details on how to submit and instructions for authors are available from www.bioscience.heacademy.ac.uk/journal/



12 | News from the Centre

A round-up of some of the recent news and activities from the Centre

Recent Events

Transition issues for Bioscientists / Scientists. Tony Cook from the STAR Project shared his thoughts on the issues affecting transition to HE and how both institutions and individuals might improve the experience for students; "A really useful overview of the issues with lots of thought provoking ideas for good practice".

Developing the next generation of research scientists. This invitation only forum brought together teaching staff from a variety of bioscience disciplines to discuss 1st year practicals; "Very stimulating meeting".

Preventing and Designing out Plagiarism. Jude Carroll led a lively workshop looking at how assessment could be changed to help design out plagiarism; "Excellent chance to discuss with colleagues".

Couldn't make it to an event? Read the event report from the day. Event reports bring together a summary of the day, presentations, and related resources and information, www.bioscience.heacademy.ac.uk/events/reports



Figure 1: Discussions and workshops at Centre events. Top; Developing the next generation of research scientists. Centre; Transition issues for Bioscientists / Scientists. Bottom; Preventing and Designing out Plagiarism.

Short Guides

The Centre has recently developed four short guides on specific areas of learning and teaching. The guides are intended as informal, accessible introductions to topics, which complement the information and material available on our website. The guides produced so far are: Transition to higher education; Preventing and designing out plagiarism; Inclusive learning and teaching; and Advice on starting your bioscience course, a guide for students.

The guides are freely available to download from the Centre website (www.bioscience.heacademy.ac.uk/resources/shortguides.aspx) and we would be interested in any comments and thoughts for future short guides.



Figure 2: The Transition short guide.

Departmental Teaching Grants Awarded

We are delighted to announce the recipients of the 3rd round of Departmental Teaching Enhancement Scheme grants. We received 31 initial expressions of interest, of which 4 were asked to submit a full bid; all 4 of these projects have been awarded funding.

Congratulations to:

- Alan Cann; Personal Learning Environments, Personal Development Planning and Lifelong Learning.
- Karen Gresty; Enhancing Final Year Projects: A Stakeholder Perspective.
- Stephen Merry; The Role of Data in the Development of Scientific Knowledge.

Information about the projects will be available soon from our website www.bioscience.heacademy.ac.uk/funding/

Student Essay Competition

Congratulations to Sue Dixon, a second year Biochemistry student from the University of Southampton, winner of the 2008 student essay competition. This year students responded to the question "What makes a good bioscience lecturer?". Thank you to everyone who publicised the competition to their students, the competition is now in its 4th year and we received 36 entries – the highest number ever. The winning, runner-up and shortlisted essays are available from our website www.bioscience.heacademy.ac.uk/funding/essay/essay08.aspx

ImageBank

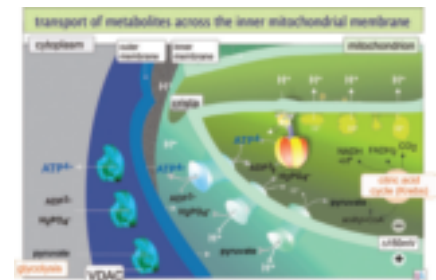


Figure 3: Diagram from the Ijsbrand Kramer collection, available from ImageBank.

There are now over 6,000 images in ImageBank, including an exciting new collection from Ijsbrand Kramer. Can you help us to reach our target of 10,000 images? We are putting together a new 'Research Collection' of images taken as part of current research for use in teaching, and would welcome contributions to this, please contact ImageBank on imagebank@leeds.ac.uk

Interested in finding out more about any of these news items? Questions or issues about learning and teaching you'd like to discuss with us? We'd be delighted to hear from you!

Centre for Bioscience
heabioscience@leeds.ac.uk