

## The benefits of accreditation – sharing good practice in Biology Higher Education

When we first started talking about accreditation, the sense from the community was of someone judging their professional approach and decisions about learning and teaching: as University (often) Researchers, we are the experts in our area, and we carry that feeling of expertise across to our teaching. This is nothing new, and for many years now UK Universities have been moving to a more professional approach to teaching, recognising that, while some people may be ‘natural’ teachers, everybody benefits from understanding the learning process and implementing change in their approach to teaching. Accreditation is designed to support that approach – it is about supporting University departments to deliver outcomes for their students that both employers and HE teachers think are important. How those outcomes are achieved is very much the choice of the Department, and of course depends to a great extent on the student body being recruited, and the specific aims of the programs being delivered. A key aim of the RSB accreditation process is to identify the good practice and approaches that work, and share them, so that there is less need to reinvent the wheel when external pressures are brought to bear to influence our curricula. The challenge is how to share this good practice, so that others can benefit most easily. While publication in peer reviewed journals is the right approach for evidencing different approaches, this is an attempt to share the ideas and stimulate the research, which will hopefully lead to the academic papers.

For the first time this year (2017), we brought people together from across a nation – in this case Scotland - and shared the good practice identified in the accreditation visits to five Universities. The meeting focussed on two areas relevant to accreditation: approaches to research-led teaching; and laboratory skills and competencies relevant to future employment in life sciences industries. These short pieces summarise the impressive work that has been going on in these areas in Scotland. First, from Edinburgh Napier’s School of Applied Sciences, the importance of laboratory skills to the Scottish economy has led to significant changes in the way employability is integrated into the curriculum.

### Lifelong Employability: Ten Years of Teamwork for Employability at Edinburgh Napier University

*Dr Claire Garden SFHEA MRSB, Head of Life Sciences*

The Life Sciences Sector is a key growth area for the Scottish economy where many jobs are with small and medium-sized enterprises who demand well rounded, confident graduates. At Edinburgh Napier University we have recently updated the curriculum for our undergraduate biology degrees, gaining Royal Society of Biology degree accreditation. Our employability focus, including on laboratory skills, was highlighted as good practice. As an ambitious, modern university, we are proud of our professional emphasis and are keen to share and learn from others. We would like to share with you our continuing journey over the last decade embedding employability skills into our biology degrees.

The Cambridge Business English Dictionary defines employability as “the skills and abilities that allow you to be employed”, which is how we tend to think about employability in Higher Education – we work hard to equip students with the skills they need to get a job when they leave us.

Interestingly, though, it goes on to state: “There will no longer be jobs for life but employability for life”. Our journey over the past decade catalogues our response to this shift in thinking and has led us to develop some key principles around the approach we take to education for employability. For example, in order to take a lifelong approach the student must be an active participant, and continue

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the work once they leave us. This means that the teaching and evaluation of employability skills must be both explicit and student-centred. Five years ago this led us to develop the student-owned Skills Passport in partnership with employers. This work has been widely disseminated and is the subject of ongoing research, indeed we are beginning to see its adoption by other universities as we monitor its impact. We have also embedded unique, contextualised 'Confident Futures' and academic skills workshops on topics from time management to effective communication into our biology modules for a number of years now alongside successful employer networking events.

Opportunities for Edinburgh Napier Life Sciences students to engage with employers and the world of work continue to grow with the introduction of volunteering, work shadowing and employer e:mentoring. Alongside careers coaching these initiatives are beginning to bear fruit, leading to collaborative projects linked to student's degrees, and employment opportunities for some. The combined impact of all these projects is that students are better able to confidently articulate their experience to stand out in the recruitment process. In this way we are equipping our graduates to enter a volatile job market where the majority of the jobs available to them by the end of their working lives have yet to be invented.

The success of these initiatives is down to the importance we place on putting key employability-focused professional and academic staff at the heart of the programme team, and developing relationships with external stakeholders. Much of this work was developed with the help of £2.7m Scottish Funding Council Graduate Employability Project from 2013-15, and we continue to employ teaching associates with industrial experience to teach on our degrees.

*The other area of very strong focus has been the development of research-led teaching approaches, especially in relation to the capstone, Honours project, where departments often find themselves struggling to make sure all students get that research-led approach. It used to be assumed that only laboratory-based projects would satisfy that, but this is clearly not true – the research project can take place in many settings, and can be used to develop and assess a wide range of skills, as demonstrated by the School of Biological Sciences at the University of Aberdeen, and the Strathclyde Institute of Pharmacy and Biomedical Sciences at the University of Strathclyde.*

### **Research-led teaching and project provision at the University of Aberdeen.**

*Professor Michelle Pinard, Director of Teaching*

*Dr Martin Barker,*

In the School of Biological Sciences (SBS) at the University of Aberdeen, we embed projects, investigations and research-led teaching throughout our curriculum. Our teaching is research informed, research based, research led, and research orientated. Our students are exposed to enquiry-based learning from the outset. In our Stage 2 Accreditation Report (December 2014) examples of our good practice included three areas in particular, in which we have had some notable achievements, outlined below.

1. "Flexible approach to providing project titles for students, encouraging engagement between students and the research interests of staff"  
Every year we provide a list of possible honours/capstone projects for students entering the fourth year. Since each academic is asked to submit at least four titles, there are usually many more titles than students so there is flexibility in choice. Students are also encouraged to 'negotiate' a research direction, in response to their own research passion, or using their own external contacts. Another part of the flexibility is in the timing and location of honours

projects. Students can conduct their projects overseas during the summer and the entire first semester of the 4th year.

2. “Some good examples of non-laboratory projects, for example accessing national databases”

So-called desk studies have become an important and much valued part of the range of our class teaching and also as projects that we offer to Honours students. These can be quite challenging because they often involve large datasets but they are also authentic and enjoyable because they involve collaboration with outside agencies. For example, our students work on datasets associated with bird or butterfly monitoring, and with phenological events. These datasets allow students to test hypotheses related to the effects of climate change or shifts in land use. The national databases are often a product of citizen science, which our students are able to evaluate.

Another advantage of using national databases is that they allow ask students to ask ‘big’ questions, which might not be practical or affordable. Some of these projects have resulted in peer-reviewed publications.

3. “Progressive approach to development of skills in statistics”

Quantitative skills are embedded in much of our teaching. Wherever possible, we get the students to work with real, biological data. We train our students to deal with ‘messy’ data. Staff who teach experimental design and statistics regularly meet, to ensure that our teaching is consistent, integrated and progressive. We believe that this ‘joined-up’ teaching is an important way of instilling confidence and autonomy among our students.

We recognise that among our students there is a vast range of aptitudes and attitudes to statistics, so we use differentiated teaching materials and hands-on computer workshops to allow lots of individualised learning.

#### Future directions

Within SBS, we continue to build a ‘skills matrix’ as part of our effort to coordinate training for each student and are currently strengthening the integration and progression of our writing curriculum and field skills.

### Using projects to develop career skills in students at the University of Strathclyde

*Dr Catherine Lawrence*

The research projects offered for 4th year undergraduate Biomolecular Science students at the University of Strathclyde were designed to take into account their different career aspirations. Students select from 6 types of projects: laboratory, in vivo, data analysis, critical analysis, enterprise, or education. This capstone experience allows students to demonstrate their skills and competencies and independent learning in a research setting. Irrespective of the project, students use and extend their abilities in information retrieval, statistical analysis and critical analysis of primary research data to put their project findings into the context of published data.

**Laboratory projects** – are aimed at students considering a career in research in either academia, the life science sector or the NHS. These are offered in disciplines that match the student’s curriculum - biochemistry, immunology, microbiology or pharmacology. Some include a clinical aspect to accommodate students on our IBMS accredited programme.

**In vivo projects** - are aimed at students considering further academic study - PhD - or work in a sector that involves animal studies. Students also study ethical issues involved in animal research and specific research techniques used in neuroscience, cardiovascular, immunology, and cancer. These students complete the Home Office personal license course. The data produced by students during their projects has contributed to grant applications, conference presentations and publications (see below).

Other projects cater for students who have an interest in scientific data rather than laboratory careers interested in careers which use their transferable skills - finance, project management, management consultancy, marketing, sales, scientific writing.

**Data Analysis projects** - use data generated by researchers. Students have to understand the methods, interpret and analyse the data and propose a hypothesis to explain the results obtained in the context of published studies.

**Critical Analysis projects** - students address a hypothesis and use systemic analysis and review to analyse scientific literature. Students demonstrate an understanding of the techniques used to obtain the data

**Enterprise projects** - aimed at students who want to follow a career in Knowledge Exchange, a key area for the University of Strathclyde. These projects involve collaborations with multinational companies, the NHS, local SMEs and university spinout companies. Students undertake scientific market research and/or competitor analysis, which can be worth £15-20k to the company involved. Students develop teamwork and interpersonal skills, important attributes for their future careers. Many Enterprise students are now employed in the Life Sciences Industry or business facilitator houses.

**Education projects** - aimed at students who wish to follow a career in secondary education. Students develop materials that can be used to deliver the Higher/Advanced Higher Biology curriculum and determine the impact on the learning. Students also develop a laboratory suitable for use in schools taking into account the learning outcomes and restrictions. These projects encourage contact and dialogue with schools so students get a clear understanding of what a career in teaching involves.

Our degree programme produces innovative, collaborative, ambitious, meticulous scientists and produces graduates who will succeed because they are...

- capable – applying leading-edge knowledge in a professional manner
- enquiring – identify and pursue critical questions
- creative – interpret data and come up with novel solutions
- enterprising – create and recognize opportunities
- ethical – identifying risks and taking responsibility
- global in outlook – think internationally and recognize the value of diversity
- practically minded – have laboratory based skills to use in the workplace.

#### **Publications including contribution from student projects.**

Gow M, Mirembe D, Longwe Z, Pickard BS. 2013. A gene trap mutagenesis screen for genes underlying cellular response to the mood stabilizer lithium. *J Cell Mol Med.* 17:657-63.

Candelaresi M, Gumiero A, Adamczyk K, Robb K, Bellota-Antón C, Sangal V, Munnoch J, Greetham GM, Towrie M, Hoskisson PA, Parker AW, Tucker NP, Walsh MA, Hunt NT. 2013. A

structural and dynamic investigation of the inhibition of catalase by nitric oxide. *Org Biomol Chem.* 11:7778-88.

Morrow GB, Nicholas RA, Kennedy C. 2014. UTP is not a biased agonist at human P2Y(11) receptors. *Purinergic Signal.* 10:581-5.

Mahmoud RY, Li W, Eldomany RA, Emara M, Yu J. 2017. The Shigella ProU system is required for osmotic tolerance and virulence. *Virulence.* 8:362-374.

Brozio S, Manson C, Gourevitch E, Burns TJ, Greener MS, Downie JR, Hoskisson PA. 2017. Development and application of an eDNA method to detect the critically endangered Trinidad golden tree frog (*Phytotriades auratus*) in Bromeliad Phytotelmata. *PLoS One.* 12:e0170619.

### Conference

Grant A. and Efthimiou G. (2017). Mutants versus cations: variable effects on biofilm formation by *Pseudomonas aeruginosa* PA14. Microbiology Society Annual Conference, Edinburgh, UK.

*These examples from Scotland are just the beginning of a sharing of good practice. Hopefully, they will give you ideas which you will want to develop in your own University. There are many more such innovations going on across the UK, and we will be bringing people together later in the year to share those more widely.*

David Coates