

Delivering Real-time In-Lab Feedback for a 2nd Year Experimental Design Module

Shazia S. Chaudhry and Amanda Bamford
Faculty of Life Sciences, University of Manchester

Introduction

In the Faculty of Life Sciences (FLS), first and second year practicals are delivered as stand-alone units that are based on laboratory and experimental design skills. Providing feedback to students on experimental choices made during practical sessions or critiquing generated results can be challenging during the practical session due to the time required to observe individual students. This is particularly evident in departments with a large student cohort (approx. 550 students in FLS), leading to large practical classes.

In order to help address this issue, Personal Response Systems (PRS) were used during a new second year 'Experimental Design Module', to facilitate feedback during the practical session. The use of the Personal Response System is widely used in universities to supplement lectures, however is sparsely used to facilitate laboratory practicals.

Outline of Practical Sessions

- The practical sessions form part of an Experimental Design Module which involves a core component undertaken by all students (~550) (Phase I) and a non-core component where practicals are designed to be degree specific (~150) (Phase II).
- Phase 1 is made up of four practical sessions which are based on molecular techniques. Each practical involves a 1hr lecture followed by 5 hrs of practical work.
- Phase II involves four different units, each unit contains 3-6 practicals and follows a similar timetable to Phase I (figure 1).

Experimental Design Module			
Phase I			
PCR & Molecular Cloning			
Clone Analysis			
Protein Analysis			
Bioinformatics			
Phase II			
Molecular & Cell Biology	Physiology & Biomedical Science	Human Sciences	Organismal Biology
Signalling Pathways and Sub-Cellular Relocalisation of Protein I	Ethanol on Performance Oral Glucose Tolerance Test	Effects of Ethanol on Performance Diabetic Retinopathy	Microbiology
Signalling Pathways and Sub-Cellular Relocalisation of Protein II	Human Neurophysiology Radioimmunoassay Testosterone	Human Neurophysiology Human Neuroanatomy	Embryonic Anatomy & Physiology
Signalling Pathways and Sub-Cellular Relocalisation of Protein III	Immunoblotting and Immunohistochemistry Biostatistics	Immunoblotting and Immunohistochemistry Biostatistics	Plant Ecophysiology

Figure 1: An outline of the EDM practical sessions. EDMs place an emphasis on the design and interpretation of experiments.

Personal Response System

How do Personal Response Systems facilitate Instant Feedback?

- This system allows multiple-choice based questions to be asked during the practical session and students are able to respond via a hand-held wireless transmitter (figure 2).
- The results are aggregated using specialist computer software allowing students to view their results on projected/large screens.
- Practical sessions involved testing student understanding of the principles and reasoning behind the science and methodologies carried out in the practical session.
- This system allows student choices/class data to be visualised immediately and enables the practical co-ordinator to comment on abnormal and spurious choices/results.

Which enzyme can be used to cleave the GFP DNA?
1. EcoRI
2. BamHI
3. NdeI ✓
4. SalI
5. Don't know

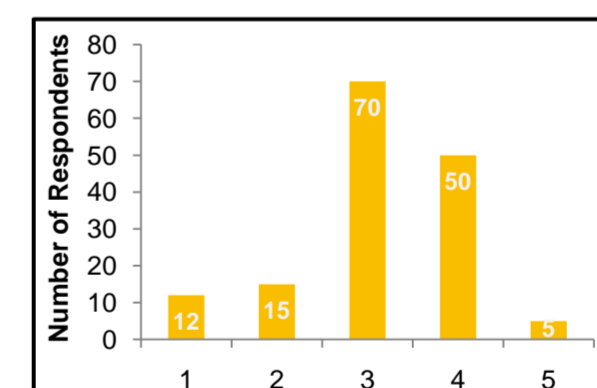


Figure 2: An example of an MCQ for use with the Personal Response System. The graph shows the number of respondents for each MCQ choice. These types of questions can be used to direct practical sessions.

Instant Feedback

- Students completed evaluation questionnaires at the end of the semester. Over 89% of students on the EDM unit felt they had developed useful skills, over 65% of students found they had enjoyed the practical involving PRS and 79% found the practical intellectually stimulating.
- Personal Response Systems can be used for any practical which involves experimental choices/class data and allows the practical co-ordinator to comment on student choices and results during the practical session.
- The PRS system enables 'real-time' discussion, guided student thinking and enhanced feedback during the practical. Student responses could also be used to drive the practical with students making strategic decisions at various points during the practical. The system has capabilities to be linked to student personal ID numbers for recording answers and so can be used for the provision of formative or summative assessment.