

# making the case

## Using the ePortfolio PebblePad as an electronic laboratory notebook

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### **Theme(s)**

**Learning:** Reflection, Graduate Attributes, Employability

**Teaching/Professional practice:** Continuing Professional Development

### **The background context**

Hard-bound paper notebooks are the gold standard for the recording of experimental data and laboratory observations. In all university practical classes throughout the world, students are trained in the practice of notebook keeping through varying degrees of instruction, regular feedback and formal assessment.

However, the modern laboratory collects electronic data – e.g., digital images and movies, spreadsheets, spectra, DNA sequences, gene expression data-sets, etc. – none of which lend themselves to archiving in a paper notebook. Such ‘raw’ student data usually gets stored on in-class computers and is easily lost or, at best, becomes disconnected from the students’ notes and reflections.

Paper lab-books are easily lost or damaged and, in post-graduate research, ownership, security and sharing information within a paper notebook creates problems.

Electronic lab notebooks are therefore increasingly prevalent in modern research labs, especially in the Industry Sector where establishment of intellectual property and audit trails are paramount. As well as allowing inclusion of any type of electronic file, eNotebooks provide security, back-up, and full searchability. In addition, eNotebooks facilitate the sharing and integration of related research resources like recipes, literature, templates, OH&S protocols, etc., within the whole institute. Lab-leaders can keep track of their team’s work, even when overseas, and can view both the raw and processed data.

### **Why PebblePad?**

- PebblePad is a fraction of the price of commercial electronic lab notebooks.
- It is easy and fun for the students to use, engenders engagement and creativity through integration of rich media, and naturally promotes a reflective approach, especially with use of achievement assets which can be continually updated as progress is made.
- Gateways enable us to administer submission and assessment involving large numbers of practical sessions, students and tutors. It is hoped that these will also lead to increased accuracy, efficiency and accountability of tutors in providing marks to students and course coordinators.

### **The purpose**

We wanted to better prepare our students for the future research workplace environment. However, commercial eNotebook systems are VERY expensive (\$1-2K per person per year) so various alternative options had to be explored. Crucially we wanted the student experience to be more than just file management and cataloging, placing more emphasis on feedback and reflection and engendering a culture of engagement, creativity and fun.

### **The approach**

After briefly experimenting with Content Management Systems, open source eportfolio, and social networking software, we came to realise that PebblePad would do both the student side

(creation, linking, submission) and academic side (assessment, feedback) parts of the job.

In mid-2011 we began by recruiting student volunteers to create webfolios that mimicked write-ups from existing practical class experiments. Initially we were tied to the traditional structure of Aim, Methods, Results, and Conclusions – but soon the power of PebblePad to foster creativity and reflection came out. Students started to use photos and natural expressions to record what they did and observed at the bench, they linked their results to the original data-files (eg, XL spreadsheets and computer outputs) and they used rich media to record their improving technical skills. We started to see the potential for incorporating pre- and even post-session questions to make the students better prepared for classes and to foster increased communication between tutors and students. Just as importantly, the students have produced product of a quality that will endure as foundations for professional accreditation and evidence of attainment.

### **The result**

We are currently fully deploying PebblePad as an electronic lab notebook in four separate units of study in the general area of molecular biology and biochemistry. If the experiment is a success, every Unit will use the system. Each has an enrolment of 150-250 students and we are conducting one formal research study to directly evaluate the outcomes across a wide range of criteria.

Even without that data, we have all appreciated the opportunity to reflect on what we are actually getting students to do in our practical classes. We have all had an opportunity to discuss (and sometimes justify!) the way we approach things with our colleagues, something which, shockingly, did not always occur before. Already, we are convinced that PebblePad will assist several aspects of class delivery and student engagement. But we also see an opportunity for augmenting the training and reflection processes of our tutor team.

In the past, it has been difficult for tutors to mark paper-based lab books in real time as, to do so, the journals have to be collected in. Since this creates a situation in which students no longer have access to their work, it is usual for notebooks to not be collected until the end of a unit, which then means that there is no ongoing feedback. With PebblePad, tutors can easily access the eNotebooks between classes, providing formative feedback when it is most needed.

### **The impact**

Even before full deployment in Semester 1 2012, the best evidence that the eNotebooks are already a success is the ease of translation to a real research environment. Modern research in molecular biology and biochemistry involves significant collaboration, often between researchers in different locations (sometimes in different countries!). To genuinely collaborate and facilitate quick access to raw data for all project members is sometimes challenging and relies on both the fast transfer of large amounts of electronic information and the organisation and discipline of all the researchers involved, particularly those generating the raw data. PebblePad enables the researcher, often a student, to post their results with reflection for all team members to access quickly and comment before the next experiment is planned.

Already PebblePad is being used to document and enrich genuine postgraduate and undergraduate research projects. Additionally, interest in what we are doing is exceptionally high across the Faculty of Science and beyond. The fact that this is happening in an environment where choice of a high-end commercial eNotebook is bogged down by indecisions, is doubly satisfying.

### **Lessons learnt**

The most important lesson is to respect and embrace the individual personality that specific course coordinators bring to their Units of Study. Each of us has some aspect of our course that we cherish and do not wish to lose in a 'one size fits all' solution. Therefore when implementing PebblePad across several units of study, it is important to capture and enhance the unique flavours inherent to the individual units. For example, in one Unit we are emphasising how PebblePad can be used to make students acknowledge and be proactive about reflecting upon and using the feedback they receive. In another, the vision was to integrate the laboratory notes into the webfolios so that the students could customise the background material and so that the context would stay permanently bound to the data and reflections.

Another lesson is to keep the Science at the forefront of the exercise. PebblePad provides such a stimulating environment that it would be easy for students to focus on producing 'pretty' product unless properly guided. In this respect PebblePad is no different to PowerPoint which, in the early days, was over-used by students (and some academics!) with respect to animations and colour schemes but which, with education and example, has proven to be an effective communication tool. Indeed, already we see an opportunity for us to educate students into correct figure and legend writing by mimicking the format of on-line journals in the presentation of completed scientific studies.

### **In brief – making the case for PebblePad**

Reflection, Graduate Attributes, Employability and Continuing Professional Development are all addressed by the fact that PebblePad allows students to track their progress with laboratory skill acquisition, and be engaged by producing a quality journal that fosters observation and creativity.