

USING AN EPORTFOLIO AS AN ELECTRONIC LABORATORY NOTEBOOK IN UNDERGRADUATE

PRACTICAL CLASSES

Paper-based and electronic notebooks

For as long as Life Science research has been practiced, hard-bound paper laboratory notebooks have been the gold-standard for data collection and experimental observations. All our intellectual property (IP) and patent laws are based around accurate, timely upkeep of lab journals. Accordingly, instructing students in notebook keeping forms a central part of our practical class culture. However, nearly all the data collected in a modern research lab is electronic and the paper based notebook cannot accommodate the large data-sets and varied digital media that comprise contemporary experimental results. For this reason, adoption of electronic lab notebooks is increasing and we wished to introduce the technology to our undergraduate practical classes.

Which eNotebook to choose?

Choosing a product that would suit the 1000+ students spread across our various Biochemistry and Molecular Biology units presented a problem. eNotebooks are prohibitively expensive and do not incorporate student administration features. Instead, since ePortfolios are designed to capture and organize student created content, we decided to use PebblePad, the ePortfolio system subscribed to by our institution.

What we asked the students to do –and the impact that it had

In our implementation, students wrote up every practical session as a collection of web pages called a Webfolio. Although we encouraged some degree of creativity in the appearance of the final product, students were asked to structure their work around five major sections: pre-work, bench log, results, reflections and competencies.

Pre-work – finally students come prepared for class

The first and most dramatic impact was that, for the first time in decades, it was practical for us to set and mark pre-work. Through PebblePad, tutors and students discussed pre-work two or three days before a practical class. This meant that students were familiar with the content of the laboratory sessions, and tutors were made aware of general misconceptions well before the actual class. Indeed, it is now no longer necessary for us to have in-class pre-practical tutorials. This is a huge pedagogic improvement since these sessions were conducted in a sub-optimal environment (a noisy laboratory).

Bench log – students actually began to show some interest in the methods

Since we provide students with an extensive laboratory manual, it had become common for students, in their paper-based write-ups, to simply describe the methods used as ‘as in the lab manual’. However, PebblePad encouraged the students to describe the methods with reference to pictures and movies taken on their smart-phones. As a result, they responded with stunning creativity, producing expansive narratives rich in various kinds of media, even creating animated ‘time-lapse’ compilations of some experimental procedures.

Data – everything is kept together and accessible to the tutors

As is the case with the traditional paper notebook, students paste in graphs, tables and figures into the data section of their eNotebook. However, as in real on-line electronic journals, the electronic system allows figures to be presented as thumbnails and then expanded if desired. Most importantly, students now attach the original data files to their write-ups. So, in contrast to a paper-based notebook which can only present a static snap-shot of the data, we can check their calculations and refer to the original data in its entirety if we wish.

Reflections – students feel more free to express themselves in PebblePad

By encouraging a free-flowing narrative, we have found that the students are more likely to reflect on and to express their opinions on the techniques used and results obtained. Clearly, since training in scientific writing is one of our key aims, caution should be exercised allowing a too casual expression style to develop, but there are obvious benefits in encouraging an increased willingness to interpret data, suggest trouble-shooting strategies, design further experiments, and put forward hypotheses.

Competencies – our great vision has not been realized

One area in which we have had mixed success is in the documentation of skills. It is regrettable that recently graduated students are often unable to identify the specific proficiencies which we hope we have taught them. This is especially true for the less easy to define attributes such as critical thinking, problem solving and communication. We were hoping that, by identifying particular skills during practical classes, we could convince the students to document how they had acquired or nurtured those attributes. Sadly, this task did not resonate with the students and we will be grateful for advice from colleagues on how to make this work in future.

It wasn't all plain sailing

Of course an implementation of this magnitude and originality was not without its problems. In some units, the coordinators were reluctant to completely let go of the traditional notebooks and this caused confusion about what should go in the ePortfolio and what should be archived on paper. In other units, the coordinators were over-ambitious in using too many of the ePortfolio features. PebblePad allows the creation of several different types of asset (achievements, thoughts, plans, etc). This diversity created confusion and, indeed, student creativity was actually at its best when they were given the minimum level of guidance.

Probably the biggest problem of all was a huge escalation in the expectations and workload of the teaching staff. The on-line interaction with the students was time-consuming, continual and, often, exigent in nature. One interesting cause of tension was the loss of the pre-practical tutorial. This came as an affront to many tutors since it was not only a highly remunerated activity but it also carried perceived status (most tutors would prefer to be "the sage on the stage" rather than "the guide on the side"!). In recent iterations we have dealt with this by simply allocating more resources to the on-line engagement and ensuring that tutor remuneration reflects the importance of this activity.

Conclusion – the worth of a notebook as a professional resource

The ultimate affirmation that the move to the electronic system was worthwhile came at the end of the first Semester. In the old paper-based system, the students submit their notebooks for a general inspection at the end of the course. After checking, grading and feedback, the notebooks are retained until the students come back to collect them. A large percentage of students never do so and, eventually, the notebooks are discarded. Not only does this mean that all the student efforts and all the feedback from the tutors is wasted, but it also shows us that those students don't actually value their notebooks as a lifelong resource. Whilst it is naïve of us to imagine that the electronic system will suddenly change the students' attitude to their journals of practical work, it does tell us that in order for any notebook to be effective, the students must trust it as their resource and not just something that they complete to satisfy us. They need to depend on it in the same way as a post-graduate or real laboratory researcher worker does. It needs to represent a portfolio of their professional thoughts and abilities for life. An eNotebook is ideal for this purpose and we believe that, with PebblePad, we have a realistic way of achieving this.

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