

LABORATORY PRACTICALS STRATEGY TO ENHANCE STUDENT LEARNING

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Aims

The aim of this project was to improve student learning by moving away from prescriptive teacher-led practical activities to a more student-centred approach ('why am I doing this' instead of a 'follow-the-recipe' practicals). This was done by developing a complete package to support a large laboratory practical in the biosciences (~180 students). It included

- Developing an interactive e-resource to support the practical
- Use of Moodle to allow students to share information and collate/interpret data
- Peer assessment of lab reports in large classes.

Method

1. Development of an online tutorial to support the practical:

Online tutorial includes

- website outlining theory based on an observation (see image) and experimental challenge
- Flash animation of the practical (designed by Simon Bos - Gavitywell and Ashley Loynton – Final year student). The animation was interactive and also included calculations
- Formative quiz which students had to complete before being allowed to do the practical.



If anyone would like to access the tutorial, email me at bssmvh@bath.ac.uk

2. Use of Moodle

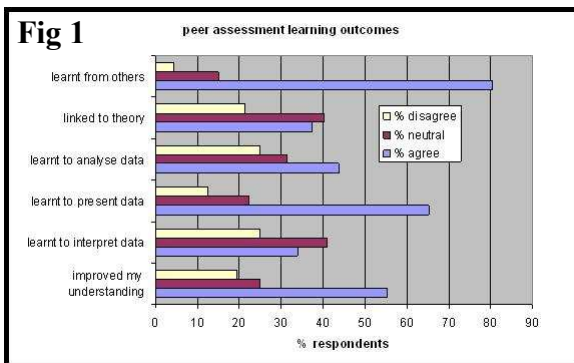
E-resource and discussion forums set up on Moodle to enable students to upload their data for sharing and statistical evaluation (a learning outcome).

3. Peer assessment of lab project reports

Peer assessment of all anonymised reports done in an hour lecture slot, using explicit marking criteria. Benefits and guidelines (peer assessment) explained to students at the start. Attendance at the peer assessment session was compulsory. Students could appeal to me if they were dissatisfied with their mark. Reports also **blind double-marked** by postgraduate demonstrators using identical marking criteria (**controls**)

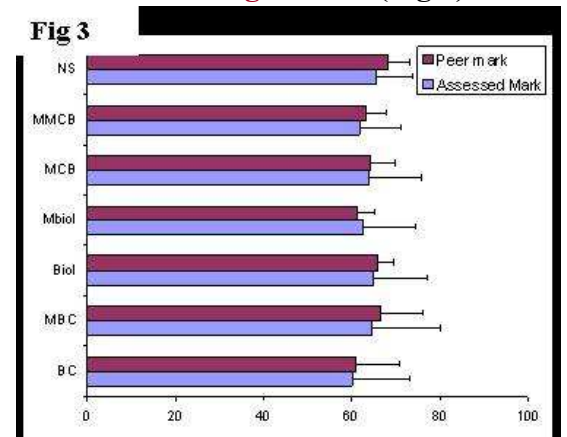
Evaluation

Student feedback Response rate was 89%. All respondents supported the use of the online resource. Most appreciated the usefulness of the resource in understanding and preparing for the practical (Fig 1)



	LIKES	DISLIKES
Prepractical support (E-resource)	<ul style="list-style-type: none">• When I entered the practical, I knew exactly what I was doing and why. It was good• Pre-practical animation was very useful to understand the concepts of the practical• Helped me prepare• Moodle fantastic, really good support and very good tutorial• Could enter the practical with all the necessary knowledge, learnt at own pace, could research areas where necessary	<ul style="list-style-type: none">• Online quiz was pointless
Peer assessment	<ul style="list-style-type: none">• Learnt how to write a better report• Learnt from others mistakes & how to improve• Helpful to compare• Helped me see what you get marked for• Showed things I missed out• Know what to expect	<ul style="list-style-type: none">• Do not like the idea of someone else criticising my work, prefer it to be marked by those trained to mark objectively• Difficult to give judgement properly• Found marking difficult

Peer mark was remarkably similar to the staff mark, based on blind marking using identical marking criteria (Fig 3)



Learning on Moodle Extracts from discussion forums

Have you got the TRR values for the result that you've attached? Shouldn't we use cpm% instead of cpm to plot the graph and draw the conclusion? As what I think is that it will eliminate the different individual errors when comparing the results of mutant and wild-type results at the end.

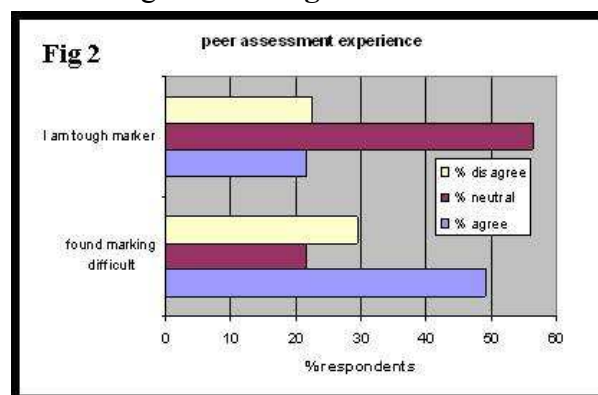
hey just wondering in terms of the wild type as its UV insensitive should the results for both A and B be basically the same as the UV irradiation wouldn't make a difference??? Am i just being really thick??

Thats a really good point yeah. I havent (stupidly) got round to thinking about this properly yet. I really have my work cut out over the weekend... So I suppose that means our results do actually make a bit more sense than I thought. Yay!

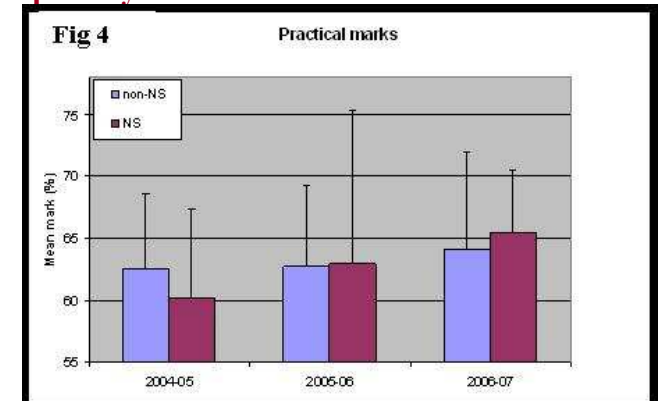
Can I ask if I am right in thinking it is irrelevant to average the raw data sets from Exp 1 without first converting the 'cpm counts' to '% incorporated' using the average of three TRR counts specific for that group's data? In my eyes, this will produce comparable data that we can analyse with a bit of stats.

Most students trust peer marking if given explicit guidelines and answers.

Only 3 students preferred to be marked by staff. However, majority of the students found peer marking difficult Fig 2.



An overall increase in practical marks was seen in all cohorts in the past 2 years (Fig 4), especially for Natural Science students



Benefits for students

- **Encourages deeper learning.** Students had a better understanding of the rationale behind the practical and they were much more confident and independent.
- **Detailed and timely student feedback.** Students learnt from mistakes made by others and improved their understanding on processing and analysing data. The overall quality of student feedback tended to be highly detailed, clear and constructive. However, there is still scope for improvement in some areas
- **Improved learning outcomes.** The quality of the data and the written report were of a higher standard compared to previous years resulting in better marks
- **Develops objective assessment skills.**

Benefits for staff

- **Efficient teaching practice.** E-resource resulted in less time spent in introducing the practical, leaving more time for support during benchwork.
- **Reduced assessment workloads.** The amount of time spent marking lab reports was minimal (mainly for any moderation requests by some students)

Lessons learnt and some tips

E-Resource (Pre-practical tutorial)

- Having a clear plan and storyboard in place for the online tutorial material is vital.
- Using a professional web designer was very cost effective in the long run. The resource was produced on time, professional quality and needs little maintenance
- Consultation and feedback from the e-learning team was invaluable, especially in complying with SENDA guidelines.

Peer assessment

- Important to schedule a brief session explaining the benefits of peer assessment and rules of the exercise
- Using clear guidelines and explicit marking criteria (perhaps with a model report or using an exemplar from the previous year)
- The logistics of registering, marking and handing back of anonymised reports needs to be well thought out.
- I encouraged students to give detailed feedback in a separate proforma with minimal annotations on the script.
- Ensure the room size is adequate. (it was difficult to conduct peer assessment quietly in a packed classroom with students squeezed next to each other)
- Formative or summative per marking? Still variable, depends on the year and cohort of students.