Supporting students in laboratory practical work: Good practices and outcomes

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Supporting students in laboratory work

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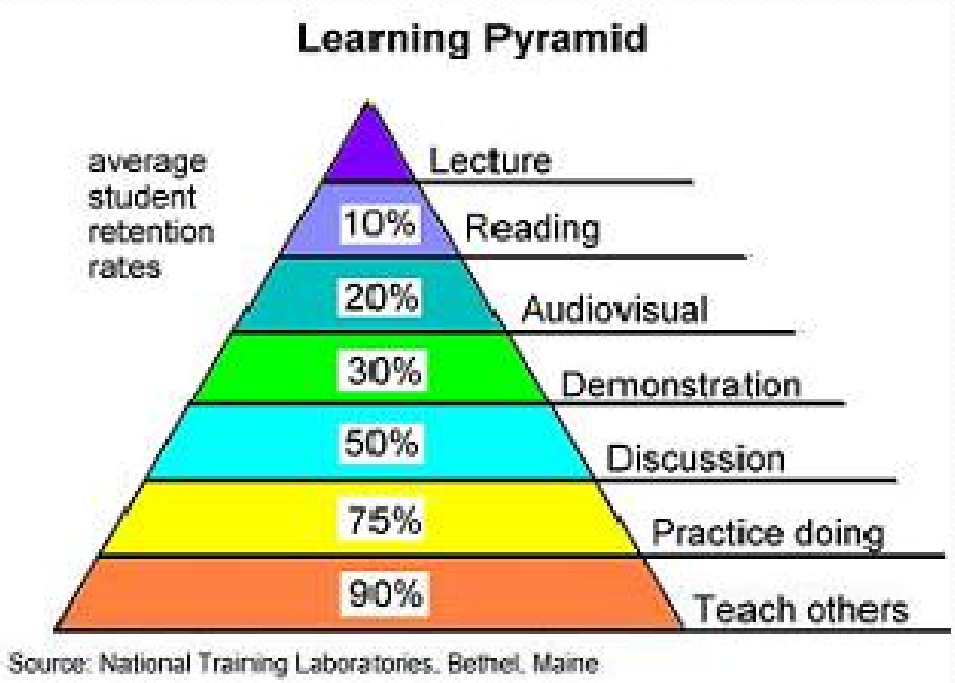
Why do laboratory practicals?



[1]

Practicals can be a very rich learning environment for students.

But are they?

Why support is needed

- Students enter the Food Quality, Safety and Nutrition degree with a range of qualifications including A-levels [Biology or Chemistry required], access courses, AVCE and HND's and some have significant family commitments or learning or other disabilities.
- The level of practical laboratory experience varies, but is usually very limited.
- There is an apparent 'fear factor' for some students in working in a laboratory. *Fear of doing something wrong: Fear of not knowing what they are doing and why.*
- As a consequence many students :

  i. do not have the experience of or knowledge about working in a laboratory environment and

  ii. are unable to fully understand a written laboratory procedure as described in a laboratory manual or handbook.

This significantly compromises the value of practical as a learning environment for these students

Our teaching philosophy is:

- To be student centred:
  - by providing a well-structured and aligned learning experience,
  - by listening to students so that we can understand what engages and motivates them to learn and
  - by building up a rapport with and knowledge of our students to help improve their learning, personal skills and employability.
- To stimulate and inspire students through a combination of traditional and innovative teaching techniques, including new technologies where appropriate.
- To provide interactive support measures which take into consideration the learning environment, the learning materials, the teaching techniques and learner needs.

Plus for first year:

- To prepare students for the later years of their degree, through introduction to key concepts such as plagiarism, referencing conventions, developing skills such as writing and becoming responsible for their own learning.

Pre-practical support

All years:

- Practical handbooks which are available on QOL. (VLE)
- Pre-practical tutorials /computer sessions .

Plus for first years:

- Pre-practical questionnaire.
- Videos of practical techniques.

Plus for second years:

- Student design of practicals

Pre-practical support

Activity	Aim	Outcome
Practical handbooks available on QOL.	To fully inform students of all practical information including Learning outcomes, where learning takes place and how they are assessed.	Students are fully aware of all aspects of the practicals related to the module.
Pre-practical tutorials /computer sessions	To allay student concerns of the practical including, reducing misunderstanding, advice on sequencing of practical, 'who does what' in student groups, time management and report requirements.	Improved effectiveness and confidence of working in the laboratory and improved quality of reports.
Pre-practical questionnaire	To prepare and focus students individually on the specific practical.	Students show clearer understanding of the practical.
Videos of practicals	To reduce the 'fear' factor for students using laboratory equipment for the first time and help students understand sequencing in a practical.	Students more confident in the laboratory, understand how equipment is used, ask fewer questions and complete practicals more quickly.

Student design of practicals

Second year students:

- Design a practical to determine the foam stability of a food.

Pre-practical tutorial:

- Brain storm ideas and agree practical methodology, COSHH, treatment of results and report structure and assessment.

In practical:

- Trial run and further class discussion on method.

Post-practical:

- Group report including reflection on the process.

Student comments

What was the best aspect of the module?

‘Explanation of practical and reports, therefore knew what was involved and expected.’

‘Explanation of practicals before practicals.’

Student comments on designing their own experiment:

‘This is the first practical I have really felt involved in’

‘I now understand more about designing an experiment and would be willing to do this again’

‘It was important to find out about COSHH and risk’

‘We should have been set some reading before the tutorial so that we would have had more ideas’

Support during the practical

Activity	Aim	Outcome
Active student/demonstrator/staff engagement in practicals	To establish a rapport between the staff and students and encourage students to ask questions.	The practical sessions are clearly seen as a learning event for students, not a test to see if they can follow the instructions in the manual. Students become more confident in the laboratory and the 'fear factor' is decreased.

Student comment on staff interaction:

‘I was able to ask questions about anything I was unsure of.’

‘Very approachable, and always helps you if you ask.’

‘Felt any problems encountered could be addressed and explained.’

‘He was interested in what he taught and cared if we understood or not.’

‘She always explained how to do things and explained the purpose.’

‘ Dr King clearly indicates the relevance of the practicals to the lectures’.

‘We known what we are doing in your practicals’

Student comments on practicals:

‘The labs were very interesting and encouraged my interest in the subject.’

‘The best part of the module was the practical classes.’

‘Practical classes enjoyable and interesting.’

‘Practicals interesting.’

‘I really enjoyed the content of this module. I found practicals relevant and interesting. Made me confident that I am on the right course.’

Post-practical support

- All report submitted via QOL.[VLE]
- Referencing support.
- Part practical report submission.
- Assessment criteria are consistent for self-assessment, peer-assessment and examiner assessment.
- Self assessment of practical reports based on the assessment criteria which must be included with each practical report.
- 24 hour feedback on practicals
- Peer marking of practical reports.
- Self marking of practical reports

Post-practical support

Activity	Aim	Outcome
All reports submitted via QOL	To promote assignment submission.	Negligible non-substantiated non-submissions, negligible late submissions, no 'lost' assignments.
Referencing support [Referencing tutorial, Turnit in; 24 hours feedback re referencing and re-submission within 48 hours.]	To promote correct referencing. Turnit in used as training tool for students. To indicate importance of referencing.	Both accuracy and extent of referencing has improved. 100% of students referencing correctly.
Part practical report submission	To enable students to understand the requirements for the Introduction, Aim, Methods, Results, Discussion, Conclusions sections.	Full reports have less errors of structure.
24 hour general feedback on practical reports [3 positive and 3 areas for improvement]	To indicate the importance of practical reports and encourage students.	Improved feedback scores on module evaluation questionnaires.

Post-practical support: Assessment

Activity	Aim	Outcome
Self assessment on all practical reports	To increase student understanding of assessment criteria and deceases the difference between examiner and student expectations on marks awarded.	Student assessment of own work indicates students are realistic about their achievement. Whilst most are 'generous' in their self assessment , they are not awarding themselves first class marks.
Peer marking of all practical reports	To increase student understanding of assessment criteria and their translation to marks awarded.	Student understanding of reports and engagement in discussion with staff to further understanding has increased . Far fewer complaints from students regarding marks awarded in assessments.
Self marking of practical reports	Requested by students to further increase their understanding of where they are losing marks /not meeting the assessment criteria in practical reports.	Students fully engaged with report writing and assessment criteria.

Student questionnaire response to practical support

[% of students 'strongly agreeing' or 'agreeing' with the statement]

% of students who responded. Activity helped me to understand:	Pre lab tutorial	Pre lab questionnaire	Active demonstrators	Videos	Report writing sequencing	Rapid feedback	Self- assessment	Peer assessment	Referencing and plagiarism
How to do the practical in the laboratory	100	29	91	100	38	17	20	29	24
How to write up practical reports	77	28	54	48	78	58	57	84	73
The theory behind the practical	73	48	72	70	43	58	44	48	42
How the practical reports were assessed	57	17	32	24	81	83	68	73	46
Gave me more confidence working in the laboratory	84	23	94	97	35	35	21	21	24
Total [max 500]	391	145	342	340	274	252	210	254	208
Number of areas supported [max 5]	5	1	4	4	3	3	3	3	3

5 point Liekert scale: strongly agree; agree; neither agree or disagree; disagree; strongly disagree .
Red = 68% or greater; Blue = 42 to 58%; Black = <39%. n = 33-38.

What were the most satisfactory aspects of the module?

‘ Feedback helped to motivate me’

‘Comments on assignments helpful’

‘Reports returned promptly and feedback constructive’

‘Best aspect was peer marking of reports’

‘I liked the peer assessment - allowed me to understand in more detail the marks I lost and the grade I deserved.’

Student achievement

Practical marks for Food molecules and macromolecules; 2006-7 to 2009-10

	2006-7	2007-8	2008-9	2009-10
Mean %	56	56	57	63
Classification	Number [%]	Number [%]	Number [%]	Number [%]
1st	1 [2]	0	3 [7]	14 [40]
2i	12 [26]	10 [37]	20 [44]	14 [40]
2ii	19 [41]	10 [37]	16 [35]	4 [11]
3rd	11 [24]	7 [26]	3 [7]	3 [9]
Fail	3 [7]	0	3 [7]	0
n	43	27	45	35
1st and 2i n [%]	**13 [28]**	**10 [37]**	**23 [51]**	**28 [80]**

Outcomes

- Improved student achievement in assessment, indicates increased learning.
- Improved student engagement with practicals and report writing.
- Improved confidence of students in the laboratory.
- Students engage with feedback:
  - Reactions during peer-marking and self marking.
  - Class discussions.
  - After class/personal tutor groups.
  - Value feedback by requesting it.
- Positive student comment in module evaluation questionnaires on all aspects of practical sessions including feedback.

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