HEADS OF UNIVERSITY BIOLOGICAL SCIENCES (HUBS)
27-28 March 2006, University of Exeter

Curriculum and the Benchmark/Teaching Field Biology

All powerpoint slide shows are in the Appendices as handouts.

Richard Johnson (Exeter)
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April 27, 2006

Session 1: Novel Strategies for learning and assessment in biology

1.1. Use of PBL in a new medical school – Prof John Bligh (PMS)

John gave an interesting speech on Problem Based Learning (PBL), with the major statement that PBL was a good way to engage students. PBL usually involves a small group of students interacting with each other, with a tutor, who acts as a group facilitator rather than an expert to be consulted. In his talk John outlined the reasons why this approach should be adopted, and the roles of the students, the tutor and the teaching staff. He provided an example a schedule of a PBL session with two, two hour tutorials. In addition he added his modification on this including an extra tutorial which allowed the case to be revisited with more details unfolding. Finally adding comments of how successful PBL's are and their benefits to the students.

Q&A: How is the assessment carried out? All students sit a progress test four times a year. This is in the form of one hundred and twenty five questions randomly selected from a database of questions. These are set at the level of a Junior Doctor. A first year student would be expected to answer only 8-10% of the questions correctly, whereas a final year student would be more in the order of 60%. The important issue with this technique is not the actual marks but the progress that that student makes. This method of testing cannot stop, it must be used continuously. This method produces a lot of data upon which statistical analysis can be carried out, inlcuding comparative analysis between universities. A fundamental of this is that the students cannot "swot" up for this type of test, it is what they truly know. The point was raised of how do you know what they know with this technique when a first year student may only be getting 10 % of the questions right? The response was that it is the students trajectory from the first few tests that is important rather than their actual grades on the day.

Are students assessed by how much they contribute within PBL sessions? Prof Bligh answered that they tended to have a judgment including the possibility of a fail if they are a disruptive influence on the group, but that they don't measure confidence directly.

How labour intensive is PBL? Prof Bligh: Simple answer of yes, they are more expensive, but there have been no studies on their cost. A two week cycle will include 3x2 hour sessions for a tutor which is potentially a lot of additional work. The PMS have had to "buy in" staff to cover this. There is no doubt in his mind that this approach requires a rethink of staff deployment, and cannot be done in bits.

Galsgow's experience suggested it looked very expensive. A good tutor required a specific type of personality, with some individuals getting truly involved. Some of the tutors were ex medical student who had decided not to pursue a career in medicine; others had no experience at all. However in Medicine there not much dispute as there often is a definite answer to a problem; this is not true for the Biological sciences, so PBL would need to be run in a different way. Lecture staff were also used, some were very good, and others simply created a lot more work for themselves. One problem starts in schools, that of over assessment: CBA may encourage the student to continuously study. Repetition is a great tool, which usually results in a fact being truly learnt.

1.2. Use of Peer Assessment – Prof Ian Hughes (Leeds)

Ian's talk was on students assessing the work of their fellows. Here the key point was to explain to the students why they were doing this, and not simply to allow the lecturer more time to visit the pub. This does have many advantages, including lessening the burden on the lecturer, if the assessment is designed well. He addressed some of the negatives that could occur and the measures he had taken to minimise these (such as the integrity of the marker and lowering staff – student contact). His lecture covered many of the controls he had employed to ensure that the marking was fair and comparable to that of the staff. The main benefit of this approach is that the students seem to learn from marking themselves and subsequent work improves, unlike the case where members of staff mark their transcripts. Although he admitted that peer assessment was not suitable for essay marking, as there could be no explicit marking schedule

Q & A: The use peer review of essays in the 1st and 2nd year had been found to be a useful process, but had some doubts. There was concern about the effort required for it to be used in a summative sense, but if used in only formative way then what was the point? Ian responded, that long essays tended to differ in topics to the marking students knowledge. Therefore they could only mark the format but not the content, if there was an explicit marking schedule and only one route that an essay could be written this problem could be overcome. There is an interaction between the question and the marking schedule. This raised the point that essays at a high level (lv 3) need to be wide ranging and not prohibitively specific (Ian admitted that he didn't use peer marked essays at this level). The general consensus on this issue was that at higher levels peer marking was helpful but only in a formative manner. However the questions of how would the students understand what was expected of them when such a switch occurs.

1.3. Strategies for E assessment – Dr Dick Rayne (OLAAF)

The final talk of this session was by Dick Rayne on e assessment or more specifically Computer Based Assessment with Feedback (CBAF). This has a huge advantage: if done correctly can automate assessments and their marking. Computer based tests can also include things which paper based tests simply cannot, such as the use of animation, video, simulation and randomness. The feedback from these tests can be instant. He warns that contrary to some opinion, setting up CBAF is very expensive, in time, expertise, money and sheer mental disturbance. The effort to set up such a system must be spent wisely, including making full use of the computers strengths. He advises that anyone who is interested in such a system should seek out others with some experience before attempting it themselves.

Q & A: Are there dangers in using purely objective questions, as they miss out on the confidence of the student when answering a question?. Dick Rayne told the group about a modification, whereby answers to tests can also have a confidence rating, where a student will gain more marks for answering a question correctly and with a high confidence level but loose marks/score less if they answer incorrectly but with a high confidence.

1.4. General Discussion

Biology at Exeter used 50% multiple choice questions. These were then released onto computers the following year as a revision/exam practice tool. Student uptake of this

resource was around 80-90%. However it is very easy to make multiple choice questions and tends to be unsubtle or able to test concepts. It is much more difficult to come up with short answer questions.
Dick Rayne agreed that it is very hard to design good questions however a potential use of PCs is to use them to deliver the short answer question. This also addresses the issue of typing becoming a more predominant skill than writing.
This raised the concern that there are multiple assessment methods with less emphasis on essay writing; however final exams invariable are essay questions.
Students are less able to write critical essays, and that the standard of such is "appalling".
This delegate was disappointed by Ian's talk that essays were not able to be peer marked, and asked if he had tried to correlate staff marking to staff marking. Stating that there simply isn't a correlation between different staff's markings.
Mark Macnair warned of the dangers of double marking, where the marks would eventually regress to the mean, and that he had abolished this practice in Exeter with only a small amount of cross marking to ensure standards.
Ian Hughes had encountered the same problem with poor essay skills, they had implemented specific tutorials on essay writing and this was the tested in the end of year exams.
The statement was made that if the end of a undergrad course was an essay based exam, writing skills need to be kept.
Dick Rayne suggested that students should repeat essays, but with modifications from feedback from the assessed original and further information. He also asked the general question of how often students revisit work. The final comment on this issue was that staff marked essays but the students simply were not improving each time. The culprit may be turnaround time, with several weeks being too long, something peer marking may be able to help.

Do we over assess?

Many modules within the same course vary vastly by how much assessment is done, and this raised the issue of is more, better? At Birkbeck, (University of London) they found this was true; however this is probably due to having mature students who haven't faced exams for a long time. Multiple assessments help to overcome the fear of large exams.
If students produce work, they expect it to be marked, the goal should be to get them marked and quickly, Dick modified this slightly stating that all work should be assessed but didn't necessarily need to be marked. Also students have complained in courses which didn't provide sufficient marked assessment.
Someone noted that the discussion was moving down the line of the ease of assessment; however the issue should be the balance of assessment. This is a difficult area with modules within the same subject being very insular.
Biology is strange in some ways such as most courses being based on credits earned rather than marks. Some courses would simply prefer a pass or fail on the lower years. To avoid a student failing if they do not pass one module, up to 30 credits can be awarded. A tongue in cheek comment was made, would you want medics to pass if they failed a module such as anatomy.

Prof John Coggins finished the discussion session by contributing that the lecturer can have a great role in motivating the student, and that in medicine and science you should not be able to simply learn something for a test then forget it. He would like to see "open" computer exams where resources would be available to solve problems, as this is more realistic to the real scientific world.

2. Session 2 Development in School/University Interface

2.1. Development in school biology exams –Linda la Velle - University of Bristol
2.2. Scottish perspective- Prof John Coggins – University of Glasgow
2.3. Experience of UG Ambassador Scheme – Dr Phil Langton - University of Bristol

2.4. Revision of Biology Benchmark Led by Prof Paul Brain
Our thanks also to Mike Laugharne from the QAA for assisting us in the discussions.
A survey of members carried out by HUBS to inform the meeting was also presented as part of the documentation (Annex 1) – the summary from that suggested that the key areas for discussion were:

Ethics
Practical work

The presentation triggered discussion about these and other areas, using the wording already in the Benchmark Statement to stimulate the debate, and asking whether the current wording already covered the needs of the community. Following a straw poll of members present after the discussions, and with due regard for the views of those Institutions which returned the survey, the recommendation of HUBS as to whether the benchmark undergoes a minimal change (simple editing) or a more comprehensive modification was unanimously in favour of minimal change.

Discussion

This discussion was loosely structured around the talk by Prof Brain with most issues being raised and discussed at the time they were mentioned in the talk.

The Biology Benchmark is set by the Quality Assurance Agency (QAA), the existing benchmark undergoes a five year cycle which last started in April 2005. Bioscience is one of forty two benchmark terms. Due to the relatively small number of terms Biosciences umbrellas a large range of biological areas, for example Pharmacology is covered by the Biosciences benchmark but Pharmacy is not. The Benchmarks are not specific to curricula; this was thought best to be left to accredited bodies. Benchmark mentions more generic skills, as it was deemed more appropriate to explain skills required. The current benchmark for biosciences is a catchall statement, unlike that for chemistry which is much more specific; however that subject lends itself to more specific criteria. The current Biosciences Benchmark is to be reconsidered early in 2007. This raises the question "Are we satisfied with the Current Benchmark", if the answer to this is yes, the recommendation to go forwardto QAA is that of minimal change (which will be mainly just editing). At this point Ian Hughes commented that of a survey of 437 graduates to find out which skills they gained during their degree was applicable in their current work environment, and which were lacking. The results showed that it was

practical work and management (especially of their own career) that was of a poor level. Ian Lyne of the BBSRC added that mathematical skills were also lacking at an undergraduate level. (The papers for the discussion included a copy of an article by Prof Julia Goodfellow, CEO of the BBSRC, published in Research Fortnight in March 2006 (http://www.researchresearch.com/news.cfm?pagename=newsStory&type=default&elementID=60027) *Data rich but maths poor. Research Fortnight 253, March 8th, 2006*

If there was dissatisfaction with benchmark there could either be moderate or substantial change to the document.

At this point the general question of what benchmarks are for and what do they do, was asked. Mike Laugharne of the QAA responded that the Dearing comittee had found that it was important to secure standards of awards. This was done within the qualification framework explaining what was to be expected of the varying levels. This was an opportunity for subject communities to reflect on their own subject and the attributes of graduates in this area and therefore state what the standards were. This was also a chance to see if the subject has moved on and what that may mean. This is a major use of benchmark as a reflection point, now is the time to review it.

It was asked whether benchmark should set a definition of what should be called a biology degree/course and if benchmark had within it the powers of quality control. The view was that this occurs (or should occur) at the University level, where they should check that their own courses are compliant. Also there is the scope here of external reviews.

A major talking point was raised here, the cutting back of practical work, and was it realistic to expect that this would be redoubled after the quantity has decreased to half its level of ten years ago (especially as this was driven by greater student numbers)? Practical work is very expensive both financially and also in staff time and should the benchmark be amended to set a minimum level. There was a danger about being over prescriptive within benchmark, comparing to the fate of chemistry, which was prescriptive with the result that many departments are closing down. If biosciences went down the route of Mathematics saying what you must cover, student admissions would fall.

Returning to the issue of poor math skills, it was pointed out that all students must do some but those which are weaker tend to actively select modules which have no/little maths, hence “opting out”. Could the statement about these skills be “beefed up”?

A certain percentage of each course is practical based work; however this is not the same, nor needs to be the same throughout the differencing aspects of biology. Paul Brain noted that this is why benchmark was purposely designed to be flexible.

It was suggested that if a minimum level of practical work was inserted into the benchmark it could be used to help departments to fight for funding as this level would be obligatory. This once again could put biosciences into a similar situation as chemistry with University officials deciding that the subject simply isn’t commercially viable.

Learned societies (for example within pharmacology) can develop curriculum within the remit of the Benchmark which does specify a level of practical experience.

Mike Laugharne clarified some points; that benchmark shouldn’t be seen as something that external examiners have to chase and find, but for departments to demonstrate to them. Benchmarks can encompass curricula. They could say that only use

this technique to fulfil an essential skill which could be used for department heads to fight for funds. Most benchmarks are used to define a subject as an academic endeavour and to celebrate that subject. The aim is still to specify standards however this may not be possible with such a general statement. This discussion itself represents the major reason for benchmark, for academics to review their own subject.

Is benchmark good to describe the subject to a student, should it be?
There was comment on the earlier question of whether all biologists should have a wider understanding of other biological areas. The concern was that a little knowledge could be very dangerous, as un-rooted information can be worse than none. The response was that complete specialisation with no wider knowledge could lead to much worse (and potentially humorous/embarrassing mistakes).

Should students have bioethics training? Most already do, and the new school curriculum is more centred on this.

The discussion returned to the issue of practical work and its costs, with the danger of courses becoming not viable in some Higher Education eyes. An example of practical replacement was mentioned as a virtual microscope lab. This is a computer program which simulates a microscope (used in schools). Opinion on this was deeply divided with very little middle ground; it was either seen as good, repeatable and clean or completely unscientific, no unpredictability, basically it was a computer program not science. The question of "Do we need to specify in biology how much practical work has to be done?" was again raised.

The main focus this time was on 3rd year projects. Should students who have no desire to continue a career in science do an expensive final year project? Or a cheaper alternative e.g. literature review. Should underperforming students not be allowed to do a project. The general response to these was unease but coupled with an understanding of why these decisions may be made. However we were warned of the "slippery slope" of what happens when an institution decides to stop practicals in the second semester of the second year for the same reasons etc.

In many courses there is no opportunity until the 3rd year for students to design an experiment; they tend to simply follow pre planned practicals. Even some 3rd year projects have no planning as the emphasis is on results rather than allowing the student to learn from their own mistakes. Once again it was suggested that funding for 3rd year practicals should be included in benchmark, but it was noted that this could cause some departments to close. There are a lot of cost issues.

3. Session 3 Teaching Field Biology

3.1. Overseas Field Courses – Prof Malcolm Press – University of Sheffield

Malcolm's talk covered that large area of overseas field courses, with the unique burden and benefits such expeditions can confer. He highlighted the need for a mixed portfolio of field courses so students could have choice, with some UK based courses also included for those who didn't want or couldn't afford to go abroad. Issues such as capping of student numbers for each course, staff numbers required and local support at the site,

were also covered. At Sheffield they charge for the field courses from £50 for a UK based course in the Peak District to £1200 for a tropical jungle course in Sabah. However these costs are inclusive of travel, accommodation, full board, and also include a day excursion. The aim of such a course is to understand the science behind the field course. These certainly have added value from the student perspective but also have benefits for the institution, such as; stimulating for the staff involved, research spin offs and is a very good marketing tool to recruit students to that university and course.

Questions and comments:
Medical disclosure forms, are students forced to disclose everything? The response was that they couldn't force the students; this raised the issue that this may void the medical insurance of that student. A suggestion was to indicate that this may occur to the students as a means to ensure complete disclosure.
Does the department pay towards the students costs? No, however they do provide the scientific equipment required, and they do pay all of the staff costs.
The statement was made that it would be interesting to see the impact of enhanced fees on overseas work, with the implication that students and their families may be less inclined to pay for field work in addition to top up fees.
Is this work part of the Final year project? No, but contributes 10 credits towards the course.
How do you reconcile equal opportunities? It is a difficult issue; however you have to accept that we provide the opportunity to all. As long as you advertise well, therefore students are aware of all the opportunities, even if they are unable to participate (for any reason).
How do you deal with disabled students? I always take advice on such issues, look at the disability against the demands of the course and if they can fulfil it, also try to facilitate this. Until this goes through the courts, we don't really know, another factor this depends on is whether the course is compulsory or not.
A comment was made that by running field courses, schools were covered by legislation as tour operators. However another member corrected this stating that as long as the annual profit was less than £30,000 this didn't apply.
How do you select the students for each course? The students list their preferences and the one with the highest marks get priority, there is no preference made to ecology students who must attend a field course (but their numbers are low).
What is the staff student ratio on a tropical course? 1:8 (which seemed similar to other institutions).

Returning to the cedit issue, it was pointed out that 10 credits for 7 days work was very low, with other places awarding 20 or 30 for a similar course. Others award 10 for completing the fieldwork and an additional 10 for the write up.
Finally a question was asked about logistics of equipment. When based around a field station most of the equipment is present already. If visiting somewhere without a field station there is less experimentation and therefore less kit is required. Overall it is not a problem.

3.2. Experiential Learning – Alastair Bridge – University of Plymouth

Alastair's talk on experiential learning, learning by doing focused on the learning cycle, how experiential learning was developed and is still developing. The Learning cycles consists of four stages: Concrete Experience (doing), Reflective Observations (review or brainstorming), Abstract Conceptualisation (thinking and perhaps writing a report) and Active Experimentation (Testing ideas or planning) which feeds back into Concrete Experience. Also noting that three of the four do not have to occur in the field and this is very much not to replace fieldwork.

3.3. Liability on Field Courses: Responsibilities, Risks and Rewards – Dr Stephen Morris – University of Bristol

This talk tackled the thorny issue of staff and/or university liability when away on field courses. The central theme to this was who is liable when students on a field course are "out of hours". The general expectation from students and their families (and some members of the university) is that the members of staff are responsible 24/7, however the view of the university insurance companies will undoubtedly be, if not doing an official task which the university is in control of, the university is not liable. This compounds a moral issue of if a student is injured out of hours and away from the place of residence, if the member of staff gets involved he/she assumes on behalf of the university a duty of care. The advice would be not to help, but this contradicts what most people would do as see as their moral reasonability to the student. In general leisure time is not covered but at the same time staff are expected to b responsible.

Questions and comments

Aren't staff two different people whilst away, staff during "hours" and just people who want to help out of hours? As soon as you help out of hours you assume a duty of care on behalf of your employers.

Could you get a disclaimer signed? Yes, but these are worthless as they try to modify the law of the land, which cannot be done in this way.

Is it not better to have no "out of hours"? Yes but that means that all activities must be prescribed including going to the pub, to a shop, smoking etc.

An observation was that some staff stay in separate hotels to completely avoid this issue of out of hours liability, also students are young adults so can stay independently.

However, many field sites stipulate that the staff must stay next to the students as they assume that the staff are responsible for the students at all times.

What about a disabled student, for example with epilepsy, how should the field course cover them? Asses all the activities (H&S and risk assessment) not the student (that would be discrimination), provide warnings, safety structure and responses. If these aren't done you are personally liable for criminal charges.

Shouldn't there be a National Working Party to try to solve this issue? It's not done at the moment but each university differs (and its insurance policy) so working on this at a national level may not be feasible.

3.4. UK Field Courses- Dr Andrew Pratt – Slapton Ley National Nature Reserve / Field Studies Council

This talk covered the domestic possibilities of field work, indicating some of the low land, up land and marine site that Britain (& Ireland) has available. This aspect

focused on A-level students, helping them to prepare for university. Andrew views his role (and organisations role) as a bridge between school teachers and university lecturers. Many of the participants did a project during their summer holiday, often before they had been taught ecology in the proceeding school year, which raised its own challenges. There are many reasons why schools no longer run field courses such as Time, cost, having a teacher with an interest in that area, no longer on the curriculum and H&S/risk. However there is a "Save our Biology" campaign to try to get field work back on the curriculum. Finally he believes that H&S was not a barrier to field work and that we should be more positive towards this.

Questions and comments

Field work is in decline, do you have any figures for this? No, but there has been a general decline over the last 50 years, now only 10% of schools carry out any scientific field work.

How much is a 1 week residential course? It varies greatly, especially with the time of year, however it's generally around £160-170.

A comment was made regarding the difference between geography and biology, where geography has managed to maintain field work requirement, but biology isn't. Fieldwork is set within geography's benchmark yet it is not in biology.

It was noted that Andrew was focusing on A-level and Degree level, but for new scientist we need to get "them hooked young", how old were the youngest people on his courses? Different centres vary, he concentrates on A-level but others run Key stage 2 and 3 projects some even do KS1.

Do you encounter students with disabilities? Yes, but don't have huge numbers, currently trying to get all buildings wheelchair accessible. They also run specific courses for specific groups and they do what they can. However there are a number of ecosystems which are accessible.

3.5. The Employers Perspective – Nick Jackson- Institute for Ecology and Environmental Management

The Institute for Ecology and Environmental Management (IEEM is the professional body for Ecologists and environmental managers. Nick talk centred on the skills that employers in biological areas want from graduates, the skills they lack and the changing skill requirements (driven by government policy and new technologies amongst other reasons). He wondered whether ecology and environmental management was seen as an attractive subject and recognised that there were problems with employment. These are not due to a shortage of jobs (the opposite is true) but with low starting pay relative to the skills the applicant has and the requirement of experience (which can usually only be obtained by volunteering for sometime, something which is no truly feasible after 3 years getting in debt). He identified that a major skill which is lacking is botany with the number of degrees in this subject decreasing from 90 in 1996 to 25 in 2006.

Questions and comments

The comment was made that there is difficulty attracting people to study plants but that the picture is not as bleak as he painted it. A number of courses have merged and become general biology but with plant modules included.
Asking for more detail on CPD activities, Nick responded that it was an open scheme of 20 hours a year, with 10 hours structured but the remaining unstructured for reading and writing reports. Are there any spot checks? They are hard to do but they generally do a 10% sample each year.
Professional Accreditation of Degrees, how soon might this occur? Its hard to say, and a trial would probably occur first on a masters degree. It's potentially two to three years away.
What is his vision of training networks? Currently in process of geographic sectors to get people locally together. There are learned societies which have a national pool of experts (including amateur experts) that could potentially be used.
Is accreditation required by employers? Are they pressuring to get accredited graduates? The answer that there is no pressure currently from employers, yet this could be beneficial.

3.6. General Discussion: Taxonomy

One question which has not been addressed is that of the place of taxonomy in biological programs. Clarification was asked for on what was meant by taxonomy. It was seen as the identification of species rather than the debate of whether a species is in the correct classification. It was generally felt not to be covered enough in courses, but specific training courses exist. Commonly in departments people with enthusiasm for a specific group are retiring but they are not being replaced.There is a lot of expertise out there but it is no longer within universities (or to a much lesser extent). The need is to link to where the skills are rather than trying to replicate them. There is more phylogeny but not taxonomy, people with molecular skills often lack the "natural history" component, where should this fit in? The trend is to move from taxonomy towards molecular techniques which are often more precise and repeatable, moving towards bioinformatics. The nature of taxonomy has changed.
There was a feeling that biodiversity and with it taxonomy is an essential skill for all biologists. Students should be taught at least strategic parts via the major phyla. This used to be in A-levels, but the major exam boards are no longer interested in university input, arguing that they are preparing people for life not just students for university. It would be a battle to "get back in". Universities could set entrance exams, which would drive a change in the syllabus. This could only work with oversubscribed courses; otherwise you would have no applicants any more.

The general views of the meeting will be taken up by the HUBS Executive Committee for debate externally.

4. Appendices

An introduction to problem based learning

Professor John Bligh
BSc MBChB MMEd MD FRCGP
Associate Dean Education

1. What is problem based learning?
2. Why are university teachers using PBL?
3. How does it work?
4. Is it effective?

1. What is problem based learning?

Problem based learning is a form of small group learning in which students actively, and interactively, engage with analysing a problem.

The tutor acts as a group facilitator rather than a content expert.

Not a new technique:

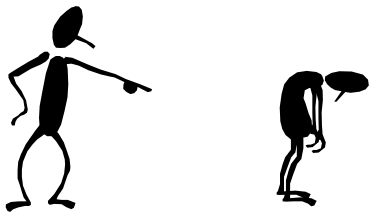
McMaster 1960s; Maastricht 1970s; Harvard 1980s; Glasgow & Liverpool 1990s

Why are university teachers using PBL?

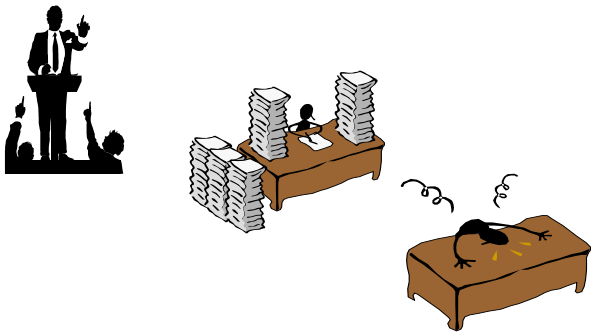
Why are university teachers using PBL?

- Volume
- Motivation
- Learning style
- Transfer of learning
- Stimulating [clinical] reasoning
- Rethinking curriculum and integration

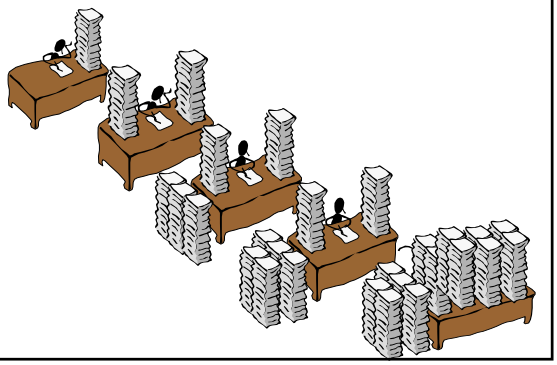
What students think about teaching…

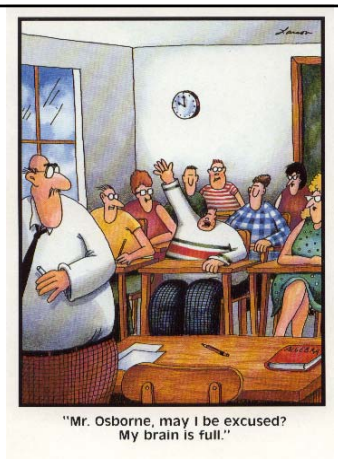


What students think…



The growth in medical knowledge





1. What is problem based learning?

Problem based learning is a form of small group learning in which students actively, and interactively, engage with analysing a problem.

The tutor acts as a group facilitator rather than a content expert.

A typical 'PBL' module is based on a cycle of tutorial 1 -> independent learning –> tutorial 2.

At PMS we add an additional cycle over a two week 'case', so:

Tutorial 1 –> independent learning –> tutorial 2 –> independent learning –> tutorial 3.

The PBL tutorial

Basically two types:

Tutorial 1:

Initial presentation of the problem or 'case'

The problem is one students haven't met before and cannot 'solve'

Usually a text based presentation in a study guide or single A4 sheet but can be visual via video or DVD; sometimes through actors or simulations; sometimes via plenary

Case is structured and carefully written to ensure learning objectives for block are raised

The PBL tutorial

Basically two types:

Tutorial 1:

1. Tutor presents case
2. Group read through and clarify unfamiliar terms
3. Brainstorm the case using a flipchart or whiteboard with a scribe and, often, a student chairperson from within the group
4. Use mind mapping techniques to link ideas as the brainstorm develops
5. Keep careful note of things that are not clearly understood
6. Generate a list of 'learning issues'
7. Convert the issues to objectives
8. The group may /may not evaluate their work

The PBL tutorial

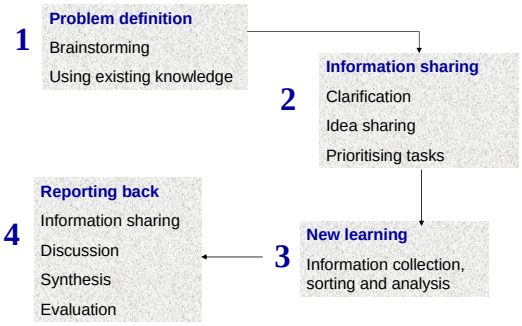
Tutorial 2:

1. Re visit the case from Tutorial 1
2. Address the outstanding issues using new knowledge learned since last tutorial
3. List any further areas of concern for further study
4. Evaluate
5. Close

OR…

1. The Case 'unfolds'
2. Clarify terms, brainstorm, mind map, learning issues etc as in Tutorial 1
3. Further independent study
4. Return for Tutorial 3, evaluate and close etc

The learning cycle in PBL



What does the tutor do?

Sets climate / atmosphere

Ensures order and fair play

Encourages

Clarifies

Keeps momentum going

Helps maintain direction and group dynamic

Facilitates but doesn't 'teach'

What does the student do?

Participates in the tutorial

Listens to others and supports their learning

Contributes their own ideas and knowledge

Is aware of what is going on in the group

Learns independently between tutorials

Compares own knowledge to others in group

Between tutorials…

Independent learning in a planned, structured and supported environment e.g.:

- Plenaries
- Workshops
- Practical sessions
- Placements
- e Learning
- Resource centres
- Library
- Self study

All of these experiences are designed by the teacher to ensure objectives are met

Students approach them with intrinsic interest because of learning need derived from tutorials

Teaching staff

Design course from objectives/outcomes

Write PBL cases or scenarios

Prepare learning and teaching activities to support student achievement of these outcomes

Supervise tutorials

Assess students

Evaluate the course

Scenario

02.00hrs

Joe Stevens is a 61 year old man admitted to the emergency department with pain in the chest and left arm. He feels nauseous, short of breath and is pale and clammy. He smokes 40 cigarettes daily, weighs 110 kgs and has a history of hypertension.

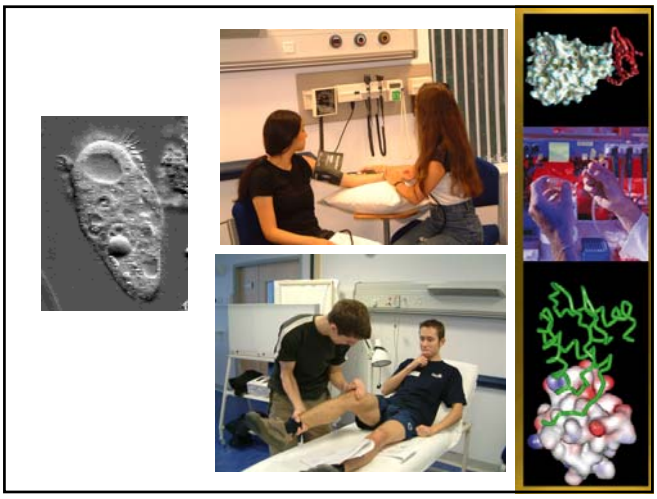
Scenario

02.00 hrs

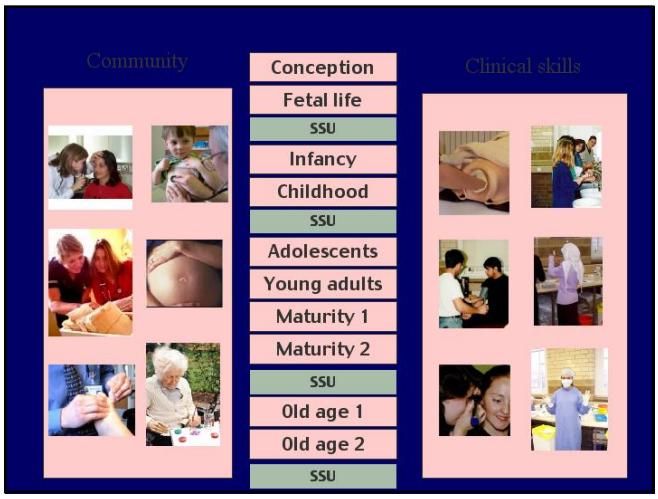
Joe Stevens is a **61** year old **man** admitted to the **emergency** department with **pain** in the **chest and left arm**. He feels **nauseous, short of breath** and is **pale and clammy**. He **smokes** 40 cigarettes daily, weighs **110 kgs** and has a history of **hypertension**.

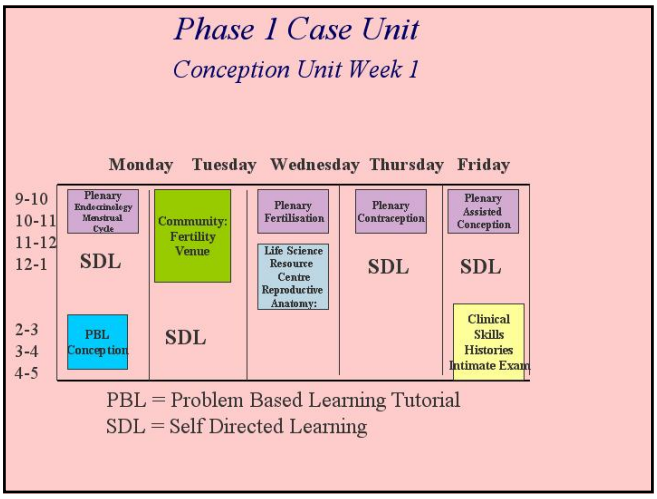
Some possible learning objectives

- Anatomy
- Physiology
- Biochemistry
- Respiratory medicine
- Cardiovascular medicine
- Pharmacology
- Health beliefs: ideas, concerns and expectations
- Social and health care support services
- Clinical medicine



How is this all organised…?





Does PBL work? Is it effective?

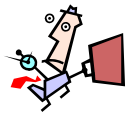
Four Cardinal Sins

Prejudices

Hunches

Opinions

Guesses



Does PBL work? Is it effective?

Harvard New Pathway / Common Pathway
- Psychosocial and well as cognitive gain

Ripkey & Swanson
->30,000 NBME candidates
-No curriculum difference

High school; tourism; post modern art; police

Small group problem based learning Summary

- Extensive literature
- Structured, facilitated learning
- Intensively supported learning environment
- Plenaries, workshops, resource centres, placements, managed learning environment, jigsaw groups all support and complement student driven learning
- Assessments suggest:
  - No difference in knowledge gain
  - Considerable gains in non cognitive attributes

Peer Assessment
What's it all about?

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The Higher Education Academy Centre for Bioscience

What is peer assessment and why do it?

Students assessing students

Because:
- you'll have to, early in a job
- it teaches you about critical appraisal
- it gives experience in critical appraisal
- if you can assess others you can assess and improve your own work – independent scientist/worker
- you get complete feedback on what you should have done
- you can compare your work and standards with others
- you understand the work better
- you learn it better

--- Research evidence ---

GOOD assessment

- Accurate and reproducible
- Appropriate methods used
- Efficient and timely
- Related to learning objectives
- Monitors student progress
- Provides staff-student contact
- ALWAYS provides high quality feedback
- Stimulates learning
- Develop self-assessment abilities
- Appeals process

Does peer assessment make the grade?

- Accurate and reproducible ✓
- Appropriate methods used ✓
- Efficient and timely ✓
- Related to learning objectives ✓
- Monitors student progress ✓
- Provides staff-student contact ?
- ALWAYS provides high quality feedback ✓
- Stimulates learning ✓
- Develop self-assessment abilities ✓
- Appeals process ✓

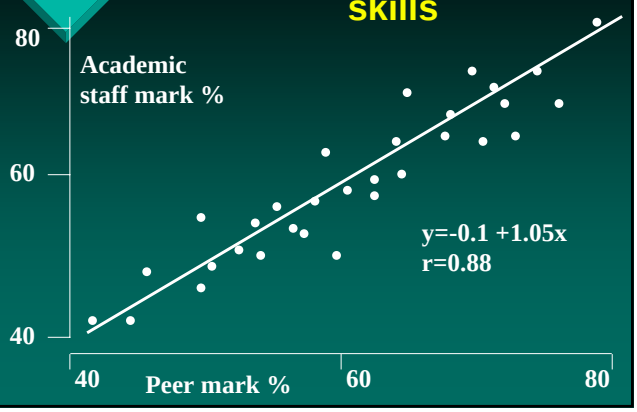
+ integrity issue

What have we peer-assessed?

- Verbal communication
- Poster presentations
- Information retrieval and formatting
- Laboratory reports
- Data interpretation exercises
- Long essays (**)

Saves staff time, improves student learning, creates ability to assess self and others

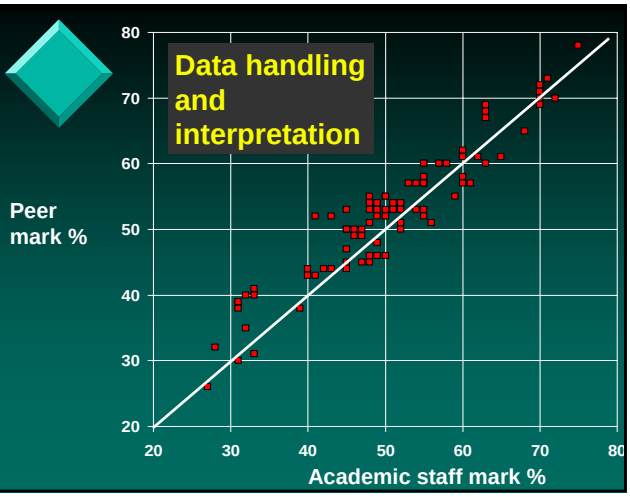
Verbal presentation skills



Verbal presentation skills

n=44	MARKING ACADEMIC	PEER
Global mean	63.2±7.8	60.2±6.1
Commonality:		
Top quartile	11	10
mean±s.e.	77.2±4.8	74.1±5.6
Bottom quartile	11	9
mean±s.e.	48.2±3.5	44.1±3.9

Data handling and interpretation



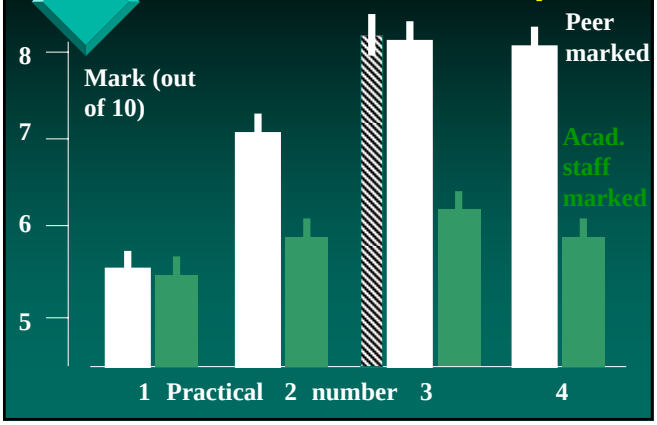
Why use peer assessment of lab write-ups?

- saves staff time and effort (200 every 14 days)
- all get all the information
- provides full explanation
- requires better understanding
- develops critical evaluation
- see others' mistakes and standards
- exposes bias/fairness/integrity issues

How is it done?

- explain purpose
- instructions on format; additional questions
- hand-in deadline (penalty)
- all in LT (350) (penalty) - distribute at random
- explicit marking schedule distributed
- prepared explanations + OHP
- total marks and sign (10% checked)
- reproducible
- appeals procedure

Practical write-ups



What are the problems?

- introduction and initiation
- keep silence during marking!
- some students don't like it (hard work, its your job, some are unfair)
- marking schedules get passed on
- cheating?
- scheduling; all same prac; time between prac and marking session; standard answer /data

Peer poster assessment

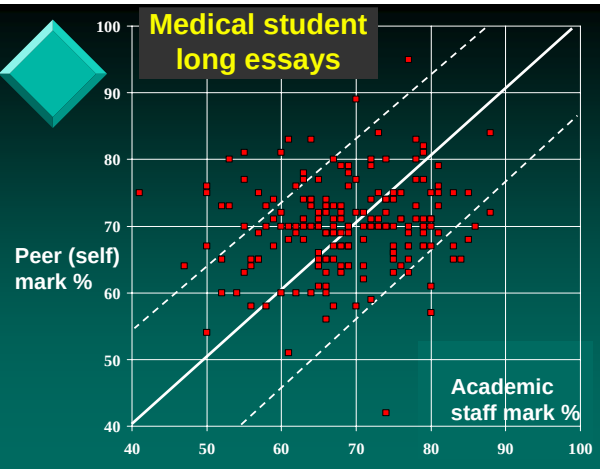
	Group A n=4	Group B n=4	Group C n=4
first poster	staff 56±4	peer 55±4 →	peer 59±3
second poster	staff 67±4	staff 83±4	staff 78±5
	staff only	P assess + P assessed	P assessed

NOTE: peer process took significantly longer; small numbers; groups not isolated; 6 weeks between posters; rest of course ongoing; self selection of groups; new method effect

Peer assessment of long essays

- Medical students
- 3000 - 4000 words
- Proforma for staff and students (properly referenced, critical approach, evidence based; good presentation)
- Staff mark 70.2±2.1%
- Student mark 72.6±2.2%
- NSD; P>0.7

Medical student long essays



Take home messages

PEER ASSESSMENT

- is good assessment
- can improve student learning
- equips students for the real world
- can save staff time
- may well work for you??

Strategies for e-Assessment

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Exeter

- "all light household and electrical goods contain a number of vital components and at least one exeter"
  - Adams and Lloyd (1990) *The Deeper Meaning of Liff*

OLAAF Project Aims

- establish strategies for effective incorporation of CBAF* in the assessment regime
  - *CBAF as a formative tool*
- produce useful examples/resources for CBAF authors

- *Computer-Based Assessment with Feedback

An unsurprising finding...?

- CBAF is EXPENSIVE!
  - time
  - expertise
  - sweat/pain
  - ultimately...money!

Surprising advice...?

- Don't do it!
- But if you can't resist... *spend your effort wisely*...

Ask hard questions...

- *Does CBAF give a real advantage?*
  - Are we leveraging the strengths of the computer?
    - *animations, sound, randomised variables, multiple realisations of same problem*
    - *rapid feedback, 24 x 7 remote access*
  - Other gains? (saving marking, etc.)
    - *Might only be realised for large student numbers*

"On the side" doesn't work...

- ***Make sure students use it and take it seriously!***
  - Motivating the unmotivated and/or phobic–how?
    - *"Reward" with a mark for "formative" work?*
- ***Make it central to the assessment regime***
  - Consistent with "11 conditions under which assessment promotes learning"?

Strategic Use of CBAF

- "Spending the effort wisely" could mean...
  - filling distinct "support gaps"
    - Maths
    - Chemistry
  - explicit linking to other forms of assessment
  - use CBAF to set the pace

How to start?

- Beg, borrow, steal...
  - use publishers' materials
  - hunt down established users
  - HE Academy
- Don't overdo it...
  - small can be beautiful
  - don't overuse one tool

CBA in Year 1 Biology

- Molecular Cell Biology
- 1st year, obligatory module, covering:
  - DNA replication
  - transcription, translation
  - simple genetics
  - key techniques and strategies in molecular biology

Pedagogical problem...

- Typical Birkbeck student is returning to education, so they soon must...
  - develop habit of regular study
  - learn to study effectively
  - build a foundation for further study
    - Knowledge
    - Skills
    - Confidence

Toward a solution?

- Frequent assessment to provide timely and structured learning support
  - to encourage regular study
  - timely diagnosis of learning deficits should promote effective study patterns
  - feedback should build students' confidence and strengthen foundational knowledge

Why computer-based?

- Saves teacher time in marking!
- Remote access, 24 x 7, etc.
- Opportunity for targeted revision and for self-testing
- Dynamic question styles: can't do this on paper!
  - randomised variables
  - animations
  - simulations

Keys to Effectiveness

- Attention to test design
  - short, highly structured tests, targeted to key learning objectives
  - target *understanding* rather than recall of loads of facts
- Test deployment tactics
  - *summative* mode first, to focus students' attention
  - same test in *formative* mode afterward, to permit revision and self-testing
  - structure of the final CBA

Keys to Effectiveness

- Repeated items on final test
  - 7 questions (of 19) were near-identical to questions from the 3 in-term CBAs
    - None were pure recall items (can't easily memorise)
    - 3 items were actually identical
    - 4 same concept, but a different instance or different item design
  - ***This is a motivator and proves the importance of the CBA--get's 'em hooked!***

Molecular Cell Biology Week-by Week, 2006

Week	Session	Summative CBA (notes)
1, 2	Lecture	
3	TEST	TRIADS: 13 items, 35 min
4,5	Lecture	
6	TEST	TRIADS: 13 items, 40 min
7	Lecture	
8	Lab	(DNA electrophoresis)
9, 10	Problem Solving Sessions	(CaseIT! simulation)
11	TEST	TRIADS: 11 items, 45 min
12	Practical Test	CaseIT!: paper/computer-based
13	TEST (Final Exam)	TRIADS: 19 items, 70 min

CBA Modes

- Summative
  - initially delivered during timed, in-class sessions
- Formative
  - "re-runs" of originally summative tests
  - one version of each test gives feedback *on submission of each answer*
  - a second version gives feedback (score only) *after completing the test*

TRIADS Tests

- Demonstration

Did students improve their scores on repeat items?

- **On the whole, yes**...
  - **Good: for all 7 of these items, there were impressive improvements**
  - **Not so good: for all 7 items, there were some 'backsliders'**
  - **Best example:**
    - 46 of 58 people improved
    - average score, 1st instance = 16 (yikes!)
    - average score, 2nd instance = 77 (good going!)
    - only 6 went down; 6 stayed the same at 100%

Other Analyses of *MCB* CBA

- **Effectiveness in assisting students whose 1st language is not English**
- **Effectiveness of the assessment regime**
  - **with OU-Sheffield FAST Project**

Assessment for Learning

- **11 conditions under which assessment promotes learning**
  (Gibbs *et al.* and FAST project)
- **Qualities of the assessment regime**
- **Qualities of the feedback provided**
- **What students do with the feedback**

11 Conditions

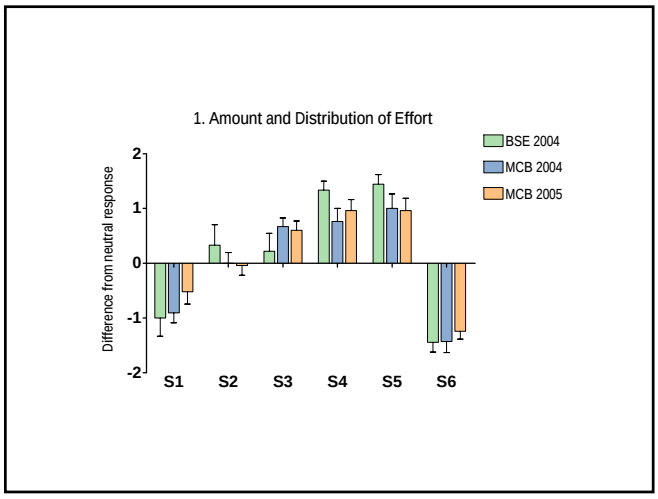
- **Qualities of the assessment regime**
  - Assessed tasks capture sufficient student time and effort
  - These tasks distribute student effort evenly across topics & weeks
  - These tasks engage students in productive learning activity
  - Assessment communicates clear and high expectations to students

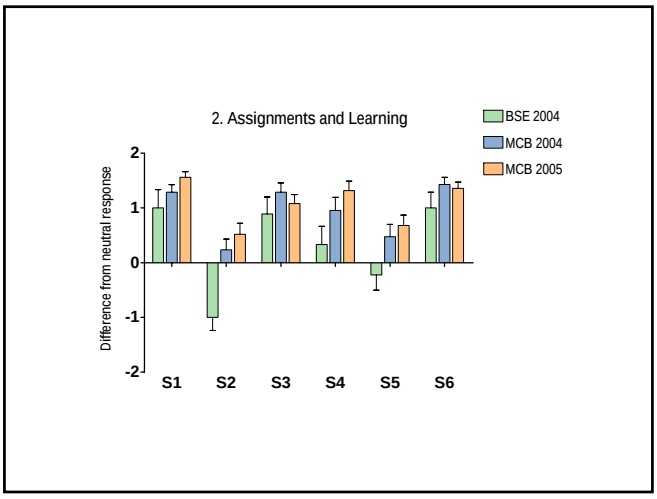
11 Conditions

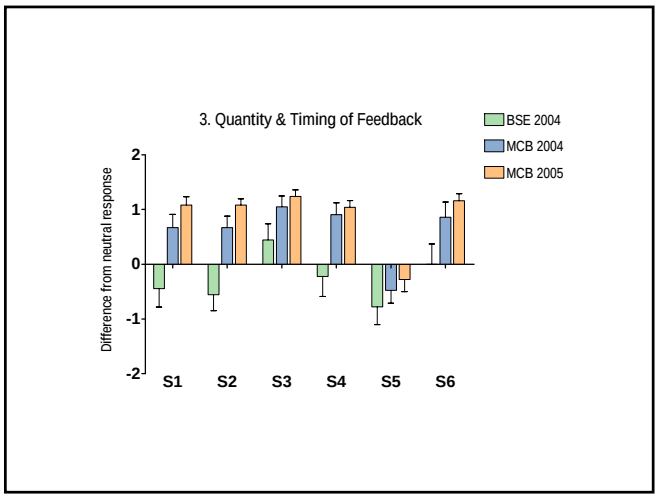
- **Qualities of the feedback provided**
  - Sufficient feedback is provided, often enough & in enough detail
  - The feedback is provided quickly enough to be useful to students
  - Feedback focuses on learning rather than on marks or students
  - Feedback is linked to the purpose of the assignment and to criteria
  - Feedback is understandable to students, given their sophistication

11 Conditions

- **What students do with the feedback**
  - Feedback is received by students and attended to
  - Feedback is acted upon by students to improve their work or their learning


1. Amount and Distribution of Effort
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
-2
S1
S2
S3
S4
S5
S6


2. Assignments and Learning
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
-2
S1
S2
S3
S4
S5
S6


3. Quantity & Timing of Feedback
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
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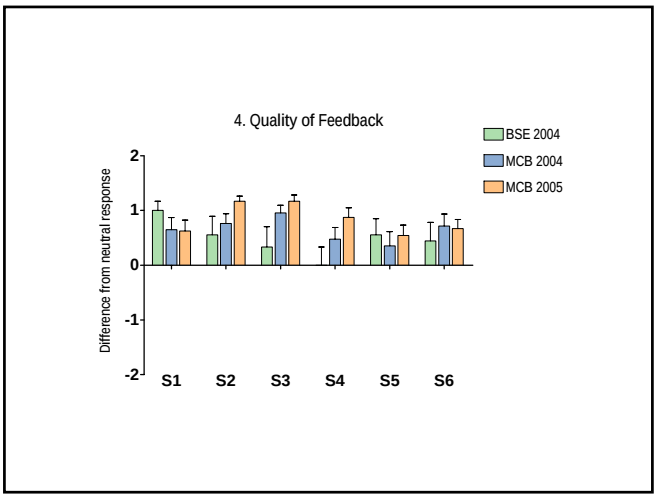
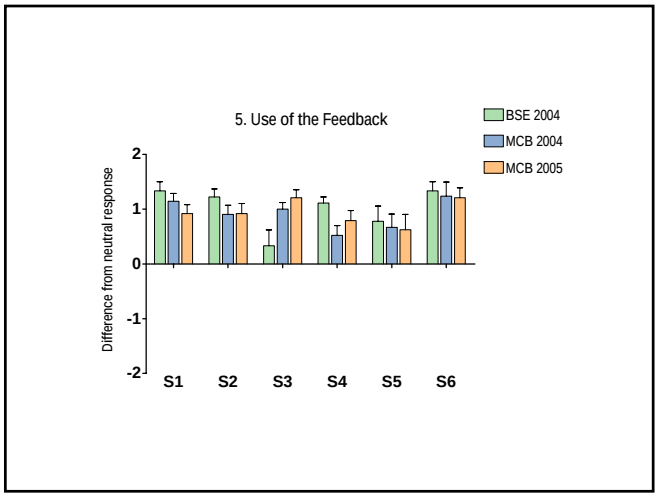
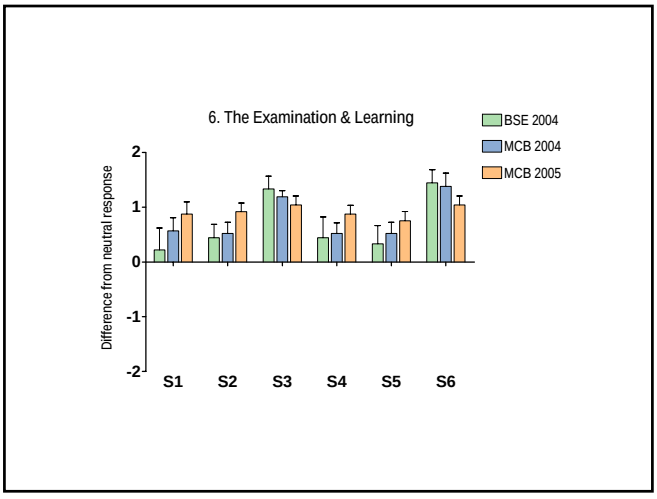
S1
S2
S3
S4
S5
S6


4. Quality of Feedback
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
-2
S1
S2
S3
S4
S5
S6


5. Use of the Feedback
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
-2
S1
S2
S3
S4
S5
S6


6. The Examination & Learning
BSE 2004
MCB 2004
MCB 2005
Difference from neutral response
2
1
0
-1
-2
S1
S2
S3
S4
S5
S6

Simulations

- **CaseIT!**
  - simulates molecular biology techniques
  - used in MCB
  - part of a "computer-assisted assessment"
- **NeuroLab**
  - simulates neurophysiology experiments
  - used in Physiology of Excitable Cells

Coming soon...

- **Classroom "Personal Response System"**

Developments in School Biology Exams

Developments in School Biology Exams

- Background
- new GCSE subject criteria (2006)
- Recent developments in A-level
- Proposed changes to AS and A2 subject criteria (2008)
- Some 'case studies'

Concerns?

- Outdatedness of much school biology
- Students unenthused
- Inadequate dealing with social and ethical issues
- Mediocre careers advice
- Students' weakness in chemistry, physics and maths
- Fall in applications for biomed sci

Biosciences Federation Working Party

- Educationalists, Bio Sc academics, SLC, ASE, Pharma Cos, UGs + AL students, VC.
- Reported Nov 2005.
- 12 Key recommendations
- http://www.bsf.ac.uk/responses/enthusing.pdf
- Responses to: info@bsf.ac.uk

BSF Recommendations

"….action needs to be taken in the next five years with regard to the skills and knowledge that are learnt from primary school to university, and how these are taught and assessed."

Prof Michael Reiss, Chair

Changes to the Curriculum

- 14-19 Opportunity and Excellence (DfES, 2002)
- New KS4 Programme of Study for Science from 2006 (DfES)
- New GCSE Science criteria (QCA)
- New GCE AS and A-level biology criteria (QCA)

GCSE Science Criteria – the main changes

- Less emphasis on knowing and understanding a body of scientific facts – substantive content.
- A greater emphasis on knowledge, skills and understanding of *how science works* both in the world at large and in the lab – procedural (syntactic) content.

GCSE Science Criteria (2006)

http://www.qca.org.uk/downloads/11881_gcse_science_criteria_apr05.pdf

- How Science Works:
  - Data, evidence, theories and explanations
  - Practical and enquiry skills
  - Communications skills
  - Applications and implications of science
- "… skills, knowledge and understanding outlined above, *entirely in the context* of:"
  - Organisms and health
  - Chemical and material behaviour
  - Energy, electricity and radiations
  - Environment, Earth and universe.

GCSE Additional Science Criteria (2006)

- HSW +
- Biology:
  - Cells and growth
  - Energy flow and element cycles
- + C and P topics
- Science + Additional Science = GCSE double award (x2 GCSE)
- Sc + Add Sc + further topics = B, C, P as Single subjects (x3 GCSE)

Changes in Assessment

- Significant reduction in the current emphasis on assessing pupils' ability to recall discrete and specific components of their knowledge (about 40%);
- Significant increase in the emphasis on assessing pupils' ability to use their understanding of the major 'explanatory stories' of science and the competencies likely to be required of students in adult life (such as the abilty to comprehend media reports, or to argue a rational case based on data) (about 60%).

GCE Science Assessment Objectives

AO1: Knowledge and Understanding of Science and how science works, (20-40%)
- How sc evidence is collected and its relationship with sc explanations and theories
- How sc knowledge and ideas change over time and how these are validated

AO2: Application of skills, knowledge and understanding, (30-55%)
- How decisions about sc and tech are made, including ethical issues
- Evaluate impact of sc developments or processes on individuals, communities and environment

AO3: Practical,enquiry and data handlings skills, (20-40%)

This means that 60% (at least) is NOT K&U

Why the emphasis on "How Science Works"?

- To generate more enthusiasm for science
- To make science more interesting and relevant to more students
- To make science more accessible to more students
- To encourage more students to follow science-based courses after 16

the Present .....and .... the New

Students should be taught that…

drugs change the chemical processes in people's bodies so that they become dependent or addicted to them and suffer withdrawal symptoms without them.

Candidates should use their skills, knowledge and understanding of how science works:

to evaluate the different types of drugs and why some people use illegal drugs for recreation;

to evaluate claims made about the effect of cannabis on health and the link between cannabis and addiction to hard drugs...

AQA Section 10: HSW – the Procedural Content

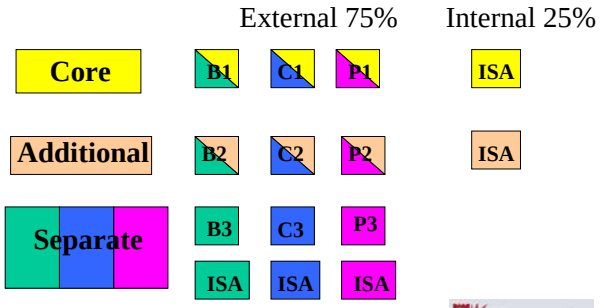
10.1 The thinking behind the doing
10.2 Fundamental ideas
10.3 Observation as a stimulus to investigation
10.4 Designing an investigation
10.5 Making measurements
10.6 Presenting data
10.7 Using data to draw conclusions
10.8 Societal aspects of scientific evidence
10.9 Limitations of scientific evidence

What is possible? The AQA Sciences Suite

- GCSE Science (A or B)
- GCSE Additional Science
- GCSE Additional Applied Science
- GCSE Applied Science (Double Award)
- GCSE Biology
- GCSE Chemistry
- GCSE Physics
- Entry level

  Enables centres to offer a range of flexible progression routes from KS3 through KS4 to further studies

Science Units

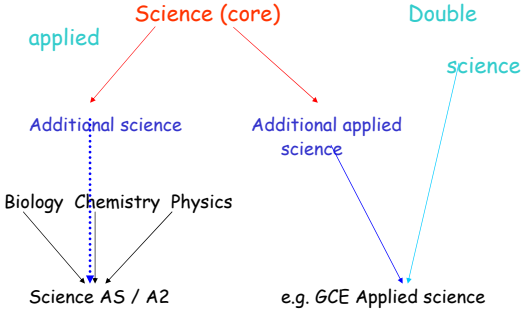


GCSE 'core' science

- Reduced content with an emphasis on 'science for scientific literacy'
- Three content units + internal assessment
  - B1 Biology
  - C1 Chemistry
  - P1 Physics

  The course will allow progression to AS Science for Public Understanding.

What is possible?



Changes to content of Specifications

- Many topics have been removed from 'Double Science' (Science + Additional) to allow more time for teaching 'How Science Works'.
- Some of these topics have been moved into Separate Sciences.
- To accommodate these topics, several topics have been removed from Separate Sciences.
- There are a limited number of new topics, mainly due to changes to the National Curriculum.

What has gone from 'Double Science' (Science + Additional)?

Biology B1 and B2

- Human Biology
  - Eye
  - Digestive system (except enzymes)
  - Ventilation
  - Anaerobic respiration → B3
  - Blood system → B3 (but content reduced)
  - Kidney → B3
- Exchange surfaces and active transport → B3
- Plant hormones
- Transport in plants → B3
- Eutrophication
- Nitrogen cycle

What has gone from Additional Content in Separate Sciences

- Biology
  - Moving and feeding
  - Controlling disease (except kidney)
  - Blood grouping
- Chemistry
  - Alcohols and Carboxylic acids
  - Industrial
- Physics
  - Electronics
  - Momentum → P2

New topics

- Biology
  - B1
    - Diet including obesity, cholesterol
    - Testing and using of drugs
    - Infection control
    - Indicator species
  - B2
    - Enzymes (from Chemistry)
    - Stem cells
  - B3
    - Biogenesis

TWENTY FIRST CENTURY science

Beyond 2001 2002 2003

- Developed by Nuffield and York University
- Influenced by Beyond 2000 Report
- Trialled by schools in England and Wales since 2003
- Single, Double and Triple Awards
- Approved as preparation for further study, by Institutes of Biology and Physics, Royal Society of Chemistry

"The model we propose offers all students the chance to develop the scientific literacy that they need to play a full part in a modern democratic society where science and technology play a key role in shaping our lives - as active and informed citizens. In addition, for some students - perhaps a minority - we are producing courses which provide the first stages of their training as a scientist, or for a career that involves science."

What choices are on offer?

Science Plus

and/or

GCSE Science

Science Plus and GCSE Additional Applied Science

GCSE Science and GCSE Additional Applied Science or GCSE Additional Science

---

Separate Sciences

GCSE Science

- Making sense of science in our everyday lives
- Coursework is worth 33.3% of marks:
  - case study
  - practical data analysis

Science Plus

- Supports students' developing science skills
- Very relevant to science in everyday life
- Build up marks during the course
- Can lead to GCSE Science

GCSE Additional Science

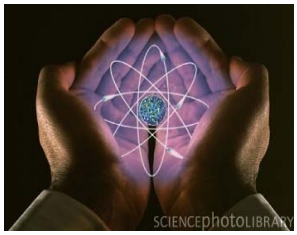
- Concentrates on knowledge and skills needed to prepare for further study
- Coursework is an investigation worth 33.3% of marks

GCSE Additional Applied Science

- Three larger modules from:
  - Ap1 Life care
  - Ap2 Agriculture and food
  - Ap3 Scientific detection
  - Ap4 Harnessing chemicals
  - Ap5 Communications
  - Ap6 Materials and performance
- Science related to the work-place
- practical, problem-solving approach
- 50% of marks from coursework

Separate Sciences

- Extending knowledge and understanding
- For those with a very keen interest in science
- Leads to three GCSE Awards
  - GCSE Biology
  - GCSE Chemistry
  - GCSE Physics
- Coursework worth 33.3% of marks



From TWENTY FIRST CENTURY science, what happens post-16?

TWENTY FIRST CENTURY science Course	What science courses can you study post-16?
Science Plus or GCSE Science	GCSE Additional Applied Science
GCSE Science + Additional Science	Well-prepared for AS Biology, Chemistry, or Physics
GCSE Science + Additional Applied Science	Well-prepared for AS Applied Science, wide range of vocational courses, SPU, etc
Separate Sciences	Well-prepared for AS Biology, Chemistry, or Physics

Life study: Biology A Level in the 21st Century

www.wellcome.ac.uk/education/lifestudy

- 'Life Study' set out to understand current views about biology A level.
- commissioned by the Wellcome Trust
- carried out by the Centre for Education and Industry at the University of Warwick, and published in 2004.
- 10 key recommendations, including
  - contemporariness,
  - review of 'core', coursework and assessment
  - involvement of HE
  - dialogue between schools and HE – progression, dissemination of good practice, relationship between research biology and curriculum
  - investment in CPD
  - improvement of teaching and learning strategies

- From Nuffield + York
- Pilots from 2002
- Full start 2005
- Edexel

"SNAB is about turning A-level students into mature and effective biologists"

Context-led approach

Teaching and Learning Strategies:

Reading and writing + practical work, debate, discussion, research, role play, independent learning

Skills:

Data analysis, critical evaluation of info, communication, collaborative work, ICT

Ethical Debate

http://www.advancedbiology.org

SNAB

AS Topics

- Lifestyle Health and Risk
- Genes and Health
- Voice of the Genome
- Plants and Climate Change

A2 Topics

- On the Wild Side
- Infection, Immunity and Forensics
- Run for Your Life
- Grey Matter

AS Science for Public Understanding

- AQA (www.aqa.org.uk)
- Designed for scientists and non-scientists
- Built around three modules:
  - Issues in Life Sciences:
    - Health and disease, genetics, selection and evolution
  - Issues in Physical Sciences:
    - Uses of energy resources, effects of radiation, where we are in the universe.
  - Coursework:
    - A study of a topical scientific issues + a critical account of scientific reading

Draft Subject Criteria for AS and A-level Biology

- Consultation document at:
  http://www.qca.org.uk/16182.html
- New specifications available 2007 for teaching 2008 – first UGs 2010
- Essential Skills:
  - Nature of Science
  - Collecting Data
  - Considering and Presenting Evidence
- Reactions to content?

Camilla

Strengths, Weaknesses, Offer?

A sporty girl, has applied for biomedical science

Subject	Grade
x3 GCSE	BAA* (PCB)
AL Chemistry	B
AL PE	B
AL Psychology	A
AS Biology	A

Charles

Strengths, Weaknesses, Offer?

Abiding interest in conservation

Subject	Grade
X2 GCSE	BB
AL Biology	C
AL Chemistry	C
AL Geography	C
AS SPU	B

William

Strengths, Weaknesses, Offer?

Realised he wanted to do biology half way through Y12, but too late to change

Subject	Grade
x2 GCSE (C21st)	A*A*
AL PE	A
AL Physics	C
AL Geography	B
AS Philosophy	C

Harriet

Strengths, Weaknesses, Offer?

Acknowledges that Art is her strength, but SNAB course fired up her interest in Biology

Subject	Grade
x2 GCSE	AA
AL Biology (SNAB)	B
AL D&T (RM)	B
AL Art	A
AS Chemistry	D

University of BRISTOL

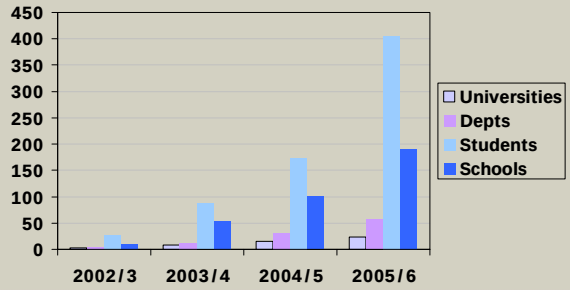
undergraduate ambassadors scheme

UAS scheme & final year projects

- Dr. Phil Langton
  - Senior Lecturer in Physiology
  - phil.langton@bris.ac.uk
- 2004_5
  First year of scheme in Bristol

inspiring education and communication

GROWTH OF UAS



inspiring education and communication

AIMS OF UAS

- Attract more graduates into subject specific teaching
- Giving support to teachers
- Supplying young, enthusiastic role models for pupils
- Providing undergraduates with an intellectual challenge which helps them to develop key transferable skills
- Encouraging a new generation of scientists, technologists, engineers and mathematicians

The UAS is flexible

UAS Project in Physiology

- University of Bristol
- Physiological Science B.Sc. (Hons)
- ~50 students in third (final) year
  - About 15 from Medicine
- Final year = single 120 credit point unit
- Dept of ~25 academic staff

[our] Final year projects

- 26% of final year mark attributed to project (120/~4 = 30 credit point unit/module)
  - 5% review essay, 3% supervisor's report, 18% dissertation and poster (Note: students work in pairs)
    - Initial reading = 2 days per week x 5 weeks = 10 days
    - Exp. work = 2 days per week x 8 weeks = 16 days
    - Dissertation = 4 days per week x 2 weeks = 8 days
- Alternatives to lab-based projects needed.....
  - Increased student numbers
  - Changing career aspirations of B.Sc students
  - Research techniques more involved (support & cost issue)
  - Staff more pressured

Issues [for us] going into UAS

- Academic parity and rigor
- **Requirement** - UAS projects must involve high level physiology & students must generate & analyse data
- Assessment methods constrained
  - i.e. same assessments as lab-based projects
    - Review essay, dissertation (& supervisors report), poster
- Joint supervision worries
  - Tough balance - academic support without increasing the burden on teachers?

UAS – Outline approach

- Hypothesis
  - UAS-based projects **ARE** suitable for final year projects
- Methods
  - 3 schools each with a pair of students
  - Each pair of students has dept and school supervisor
- Results
  - All schools very happy with outcome
  - Students very positive about benefits of UAS-based project
  - Very creditable research work undertaken
- Conclusions
  - UAS scheme **IS** suitable, but success is not automatic!

Quotes and testimonials

- Four of the six UAS projects graded as 1st class
  - Three of six UAS students received 1st class degrees
  - All schools signed up for next year
- *'The lesson [given by UAS students] was the best, most interesting school lesson I've ever had'.* Quote from St Mary Redcliffe pupil.
- Pair of intercalating medical students, working in Cotham School, have been commissioned by the British Medical Journal to write an article on their experience of a UAS project.
- *' The ability to explain complex concepts pitched at the recipient's level of knowledge represents a fundamental aspect of being a good doctor, a skill clearly demanded in the classroom. For us the opportunity to teach has transformed the often dreaded research project into a highly rewarding and relevant experience which should stand us in good stead for returning to the wards next year'.* Quote from a UAS student.

Things we got right [04-05]

- Pre-scheme info (selling)
  - Canvassed interest
  - Full info in project handbook
- Selection process
  - Included teacher
  - Video taped interviews
- Teacher's training*
  - 0.5 day – led to shared understanding
- Student's training
  - Crucial & could be better
- Estimate of staff effort required

Room for improvement

- Current emphasis on high level physiology
  - Led to focus on A-level work
- General anxiety
  - Students – data!!!
  - Staff - equivalence
- Student's training
  - Could have been more focussed

Reflection & Conclusions

- Dept [staff] gains:
  - Number and variety of projects
  - Popular with intercalators
  - Better links with schools
- Student gains:
  - UAS can match better student's aspirations/needs
- Caveats:
  - Tough to monitor progress
  - No control over teachers

The End!

- Contact details:
  - Phil.langton@bris.ac.uk
  - Department of Physiology, Medical Sciences Building, University Walk, Bristol University, Bristol BS8 1TD
  - Tel: 0117 928 9142
  - Mobile: 07742 264846
  - Fax: 0117 928 8923
- Sponsors needed – Running the Flora London Marathon for the British Heart Foundation

outline

- Degree structure & limitations
  - Numbers (& intercallators), 120 credit point unit
- Final year projects overview
  - 26% of final year attributed to project (5% on review essay, 3% of supervisor's report & 18% on dissertation and poster)
  - Need for lab-based projects
  - Pressure of numbers and changes in common lab techniques
- UAS scheme in context
  - Decision to run UAS projects as full option to lab-based projects – same requirements for data and same assessment methods etc.
- Implementation issues
  - Selection and training
- Supervision issues
  - Communication with schools; commonality of advice
  - Need for regular meetings
- Assessment issues
  - Projects should expose students to experimental design, data acquisition & analysis
  - Departmental supervisor responsible for grading dissertation – need for documentation of project I.e. a project diary.
- Reflection & conclusions
  - A worthwhile exercise for the Uni and for all three schools – all wish to continue.

RECOGNITION SCHEME FOR SUBJECT BENCHMARK STATEMENTS

The Quality Assurance Agency launched the new arrangements for promoting the drafting and publication of additional, as well as revising existing subject benchmark statements on the 23rd November 2004.

This recognition scheme is intended to enable the Agency to respond to requests from a range of subject communities to develop and/or endorse new benchmark statements.

THE ARRANGEMENTS

Were finalised after a widespread consultation on draft criteria and guidelines for the scheme.

The scheme (fully described in a document **Recognition Scheme for Subject Benchmark Statements** available from the QAA November 2004) is developed and managed by the Agency's Steering Group for Benchmarking.

OF INTEREST TO HUBS ARE THAT EXISTING BENCHMARKS:-

a) will be subject to a 5-yearly cycle of review commencing April 2005 (that can result in minimal, moderate or substantial change) or

b) may be changed earlier, if this is regarded as an appropriate development for a 'new' subject area rather than creating a separate benchmark.

OPERATION OF THE SCHEME

The QAA will operate through subject communities (these are increasing likely to involve professional and statutory bodies as well as academic representatives) and will maintain transparency by posting notice of proposals on its web site (www.qaa.ac.uk).

BENCHMARKING AND BIOSCIENCES

The current **BIOSCIENCES** Benchmark also includes **Pharmacology** but not **Pharmacy**

It includes both **Organismal** and **Molecular Biosciences** as used in the HEFCE subject review

Is one of 42 terms selected by QAA

IT WAS NOT THOUGHT APPROPRIATE OR POSSIBLE TO SPECIFY CURRICULA

As this is best left to accrediting bodies?

Transcripts seemed the best means of indicating knowledge?

GENERIC SKILLS seemed more appropriate

It was thought useful to indicate content of degree schemes by giving sets of examples of the kind of skills expected of graduates in different fields of biology

The resulting **Biosciences benchmark** is clearly a 'catch-all' document

It has the advantage of avoiding creating a plethora of individual benchmarks for named degree schemes (from Algology to Zoology)

It is different from benchmarks in e.g. Chemistry where the greater homogeneity of the subject allows one to specify curriculum elements

QUESTIONS TO BE POSED WHEN THE BENCHMARK COMES UP FOR RECONSIDERATION IN EARLY 2007

SATISFACTION WITH THE CURRENT BENCHMARK

If we are broadly happy with the catch-all nature of the current benchmark and its emphasis on generic skills, HUBS can advocate minimal change.

That would mean merely format and editorial changes.

DISATISFACTION WITH THE CURRENT BENCHMARK

If we are unhappy with the current benchmark, HUBS can advocate moderate or substantial change.

That would mean QAA consulting the community and constituting a panel to rewrite the document.

OTHER SCENARIOS

Moderate or substantial change might also be required if new degree schemes (e.g. Forensic biology) were advocated for inclusion under our 'umbrella'.

Communities within our benchmark (e.g. Pharmacology) might advocate creating their own specialist statement.

REVISITED ISSUES

Should all modern bioscientists have some knowledge of **levels of biological explanation-** from molecular to organismal to environmental?

Should Biologists ensure that students are trained to maintain the **currency** of their knowledge post-graduation, especially in fast-changing areas?

MORE REVISITED ISSUES

Do all bioscientists consider **hypothesis formation** rather than certainty and, if so, how are students trained to deal with this as well as **hypothesis testing**?

Would all biologists still support the view that the high public profile of biosciences necessitates providing students with some **bioethics training**?

THE REQUIREMENT FOR PRACTICAL PROVISION

The costs of practical elements appear to cause biosciences to be viewed as not financially viable in some HE establishments.

Would it be true to maintain that (even with improving IT) all bioscientists should have some opportunity to physically carry out subject-related practical exercises?

Are Projects an essential element of all bioscience degree schemes?

ALL THE PREVIOUS

Are elements of the current biosciences benchmark.

Altering them would necessitate more than minimal change.

There might well be other changes that people feel to be essential.

Overseas Field Courses

Malcolm Press
Department of Animal and Plant Sciences
University of Sheffield

Location, duration
Aims, objectives, assessment
Costs
Logistics, safety
Added value – student/staff perspective
Added risks – student/staff perspective

- Arctic ecosystems – Sweden
- Tropical Biology – Sabah
- Mediterranean Ecosystems – Portugal
- Environmental Interpretation – Ireland
- Behavioural Ecology – Peak District
- Wetland ecosystems – Norfolk
- Upland ecology – Peak District

- 7-10 days; 10 credits; level 2 or 3

Issues common to all field courses include:

Planning and logistics
Allocation and capping
Staff numbers and local support
Teaching and assessment
Safety and risk evaluation

Safety and risks - Sabah

- Full briefing prior to expression of interest
- Identification of medical conditions
- First Assist medical evacuation insurance
- Awareness of evacuation times
- Health and Safety declaration & risk analysis
- Half-day medical/forest survival course
- First aider present
- No lone working

Costs

£50 (Peak District) to £1,200 (Sabah)

- Includes:
  - All travel
    (flights to Borneo, transport to and from Danum Valley and transport at the Field Centre).
  - Accomodation at the Hyatt Hotel in KK at the beginning of the field course.
  - Full board and lodging at the Field Centre
  - Day excursion to the logging front
  - Medical and cancellation insurance
- Not included:
  - Specialist items and vaccinations

Preparing the students: logistics

Climate, weather and field equipment

Aims

To provide an introduction to:

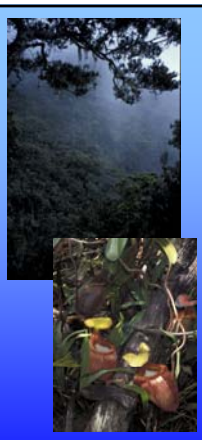
- The structure and functioning of the tropical rain forest ecosystem
- Issues surrounding conservation and biodiversity in tropical rain forests
- Field experimentation:
  - Hypothesis testing
  - Experimental design
  - Collecting and analysing data
  - Collaborative/group work

Project work is carried out in pairs

Examples of projects :

- Ant foraging and pheromone trails
- Leeches: Tigers of the jungle
- Ant Lions: The effect of prey density and substrate on behaviour
- The position and form of buttress roots
- Dead wood: Life after death
- Food webs in rain forest streams

Mount Kinabalu National park



http://www.sabahtourism.com/

http://www.borneo-online.com.my/tourism.htm

Novel forms of assessment: self and - peer assessment

Mediterranean Environments

Groups give a presentation every night

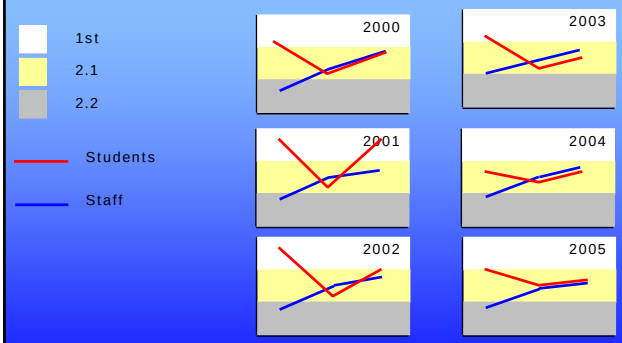
3 are formally "assessed" by peers and staff

Marks are awarded for :

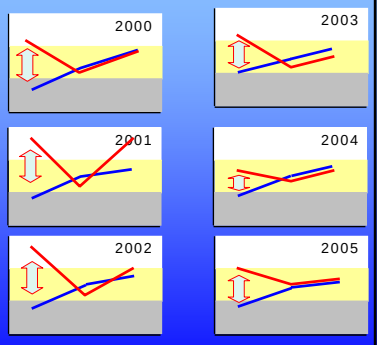
- Structure
- Content
- Presentation

At the end of the session marks and feedback given

Analysis



By the end of the 2nd year students still have an unrealistic grasp of our standards



Added value – student perspective

Learning outcomes may be similar but …

Experience and study new ecosystems and climates

First hand exposure to new environmental challenges

Experience and work in different cultural settings

Exposure to international research stations

Exposure to long term studies/plots

Interactions with scientists of different nationalities

Awareness of the challenges and rewards of research overseas

Specialist knowledge

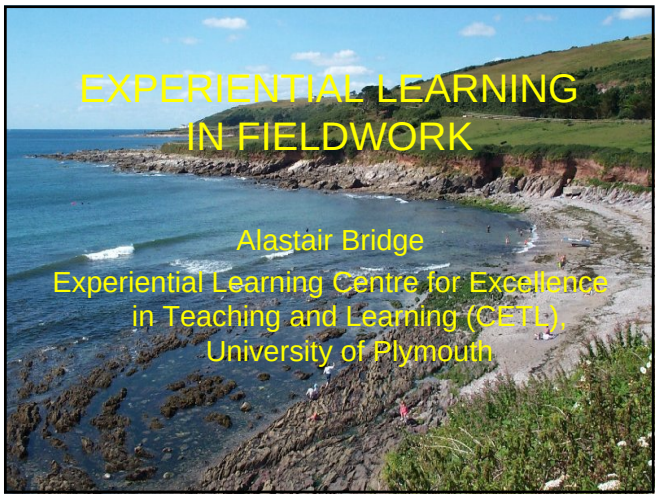
Generic skills

Motivation

Inspiration

Added value – staff/department perspective

- Stimulating
- Research spin offs
- Marketing – recruitment



Structure…

1. What is experiential learning?
2. How is it achieved?
3. Why use it?
4. Role in fieldwork
5. EL CETL Role

What is 'experiential learning'?

"I hear and I forget. I see and I remember. I do and I understand".

Confucius

"Learning is experience, everything else is just information."

Einstein

'Transformation of experience into knowledge via process of learning'

Kolb (1984)

Theories

John Dewey: educational theorist
Kurt Lewin: social psychologist
Jean Piaget: developmental psychologist

David A Kolb: social psychologist

Phil Race + ?????

David A Kolb

- Professor of Organizational Behaviour, Weatherhead School of Management, Case Western Reserve University, Cleveland.
- Initially developed the approach for adult education, career development and professional education
- Experiential Learning Theory

How? – The Learning Cycle

Why experiential?

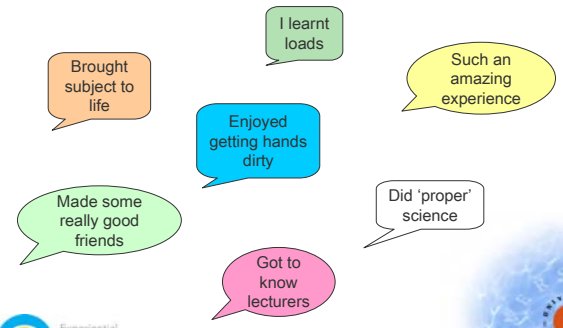
- Subject comes alive!
- All the senses are engaged
- Memorable events
- Contextualise
- Knowledge ownership

Why experiential?

- Intellectual development
- Linking theory with concepts
- Skills development
- Lifelong learning

- Course uptake/retention
- Course planning
- Benchmark statements!
- *'Biology is a subject where everything is related to observation or experiment'.*
- *The biosciences are essentially practical and experimental subjects*

What is good about fieldwork?



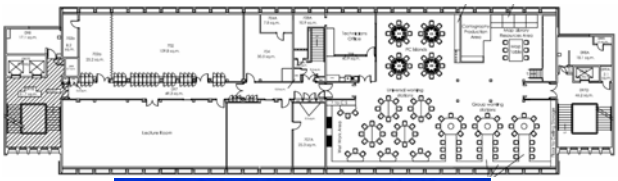
EL CETL Research

- Demonstrate the role of experiential learning
  - Via field and lab work, work based-learning
- Empirical evidence of the effectiveness of the experiential learning
- 3 topics:
  - inputs
  - processes
  - outcomes

EL CETL Development

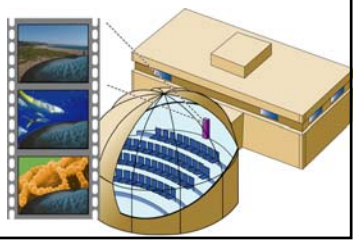
- Expanding existing field opportunities
  - ICT
- Capital developments
  - Integrated field resource
  - Lab+
  - Immersive Vision Theatre
- Aim to increase opportunity for students to plan, prepare and reflect. Not designed to replace fieldwork

Lab +



Experiential Learning CETL

Immersive Vision Theatre



Summary

- Learning by doing
- A process whereby experience is transformed into knowledge
- Develops subject specific and generic skills
- Requires good planning to be successful
- CETL is interested in your own thoughts and experience with respect to future research

Experiential Learning CETL

Contact:

- Alastair Bridge

Tel: 01752 238660
Email: elcetl@plymouth.ac.uk
www.plymouth.ac.uk/cetl/el

Experiential Learning CETL

FSC

BRINGING ENVIRONMENTAL UNDERSTANDING TO ALL

Slapton Ley Field Centre

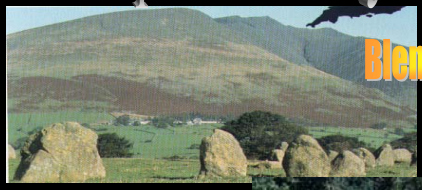
A Level Field Courses in Britain

Lowland Ecosystems

Flatford Mill

Juniper Hall

Upland Ecosystems



Blencathra

Rhyd-y-creuau

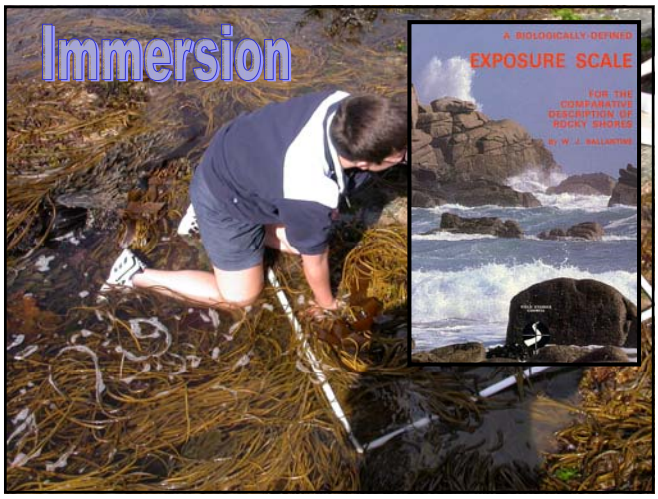
Marine Ecosystems

Dale Fort

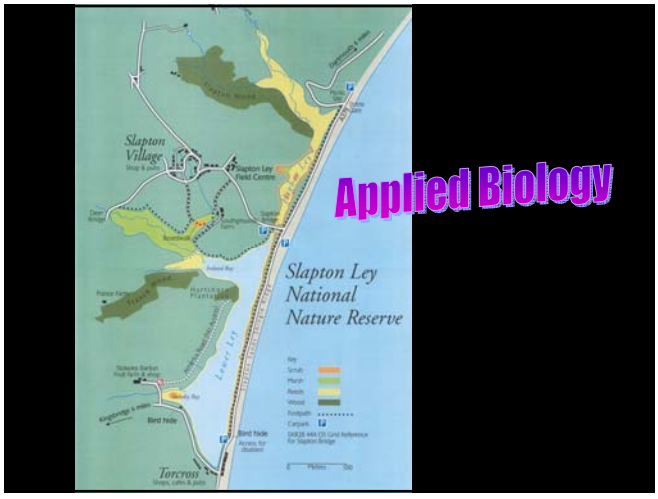
Slapton Ley


Preparing for University

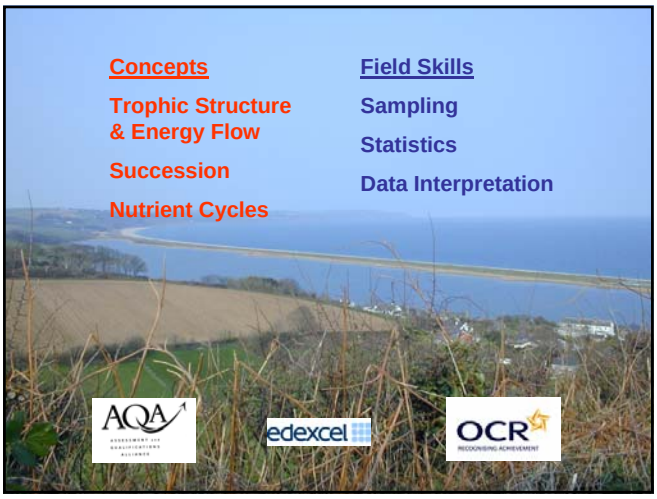

Away from Home


Immersion
A BIOLOGICALLY-DEFINED
EXPOSURE SCALE
FOR THE COMPARATIVE DESCRIPTION OF ROCKY SHORES


Teaching & Learning Styles

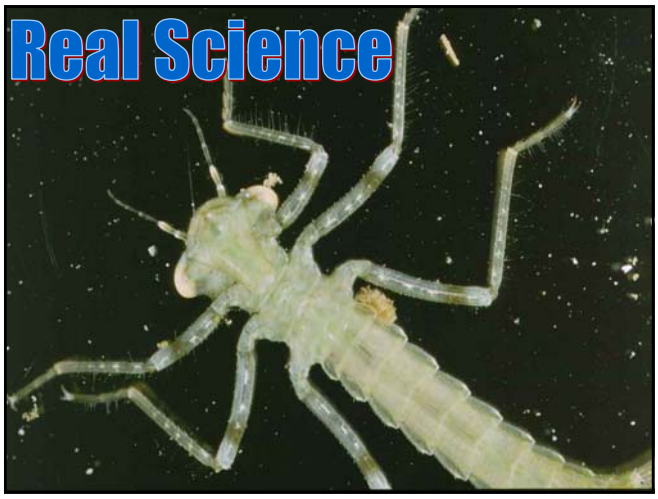

Applied Biology
Slapton Village
Slapton Ley Field Centre
Slapton Ley National Nature Reserve
Bird hide
Torcross

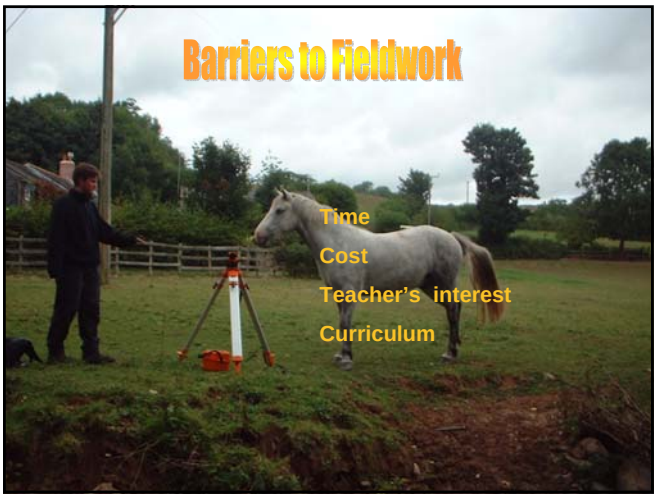

Long Term Monitoring


Concepts
Trophic Structure & Energy Flow
Succession
Nutrient Cycles
Field Skills
Sampling
Statistics
Data Interpretation
AQA
edexcel
OCR


Summer Field Courses


Individual Investigations


Real Science


Barriers to Fieldwork
Time
Cost
Teacher's interest
Curriculum


Save Our Biology
British Ecological Society
FSC
Bringing Environmental Understanding To All

The Employers' Perspective

Nick Jackson

Institute of Ecology and Environmental Management (IEEM)

HUBS Spring conference 2006

Overview

- Introduction to IEEM
- Overview of the sector
- Skills needed by employers
- The drivers of change in skills demand
- Skills gaps
- University applicants and courses
- Issues
- The way forward

Join the Rapidly Growing Organisation for Environmental Professionals

Introduction to IEEM

- IEEM is the professional body which represents and supports ecologists and environmental managers.
- Established in 1991, IEEM has over 2300 members drawn from local authorities, government agencies, industry, environmental consultancy, teaching/research, and NGOs.

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What does IEEM do?

- We provide a variety of services to develop the competency and standards of professional ecologists and environmental managers and also promote ecology and environmental management as a profession.
- Services include training workshops, conferences, publications, professional guidance and providing a wider voice for ecology via consultation responses.

Join the Rapidly Growing Organisation for Environmental Professionals

Join the Rapidly Growing Organisation for Environmental Professionals

Grades of membership

- Full (relevant degree and 3 years work experience)
- Associate (relevant degree and up to 3 years work experience)
- Affiliate (interest in subject)
- Student (in full time education in relevant course)

Join the Rapidly Growing Organisation for Environmental Professionals

Overview of the sector

- Businesses and Employment
  - Estimated 4900 organisations
  - Employing 56,100 and estimated 200,000 volunteers
  - Dominated by public sector and voluntary organisations (estimated to account for 4 out of 5 businesses)

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Overview of the sector

- Workforce characteristics
  - Gender balanced workforce
  - 29% work part-time
  - 55% employ casual staff
  - 4% self-employed
  - 10% workforce is estimated to be over 55 years old

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What skills are needed?

- Background in biological sciences
- Good field skills
- Reasoning/analytical skills
- IT skills
- Report writing skills
- Key personal qualities
  - Communication
  - Time management

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The drivers of change in skills demand

- Government Policy
  - CAP reform
  - Countryside Rights of Way Act 2000
  - Sustainable development
  - Water Framework Directive
  - Other schemes
  - Climate Change
  - Health and Safety
- Consumer Demand
- Technological change

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Skills gaps

- Lantra Skills Foresight Report 2001
  - Almost 20% of employers identified skills gaps
    - Information Technology
    - Job specific skills (conservation skills)
    - Communication
    - Management skills
  - Level of skills needed in the industry expected to increase significantly
  - 13% of employers reported difficulties in recruiting staff

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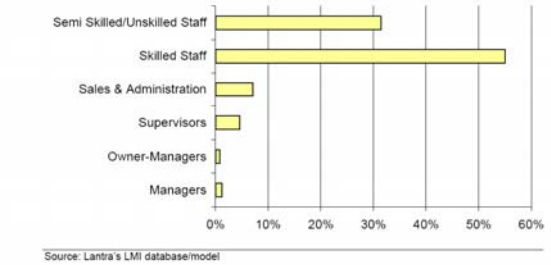
Reported recruitment difficulties in land based industries



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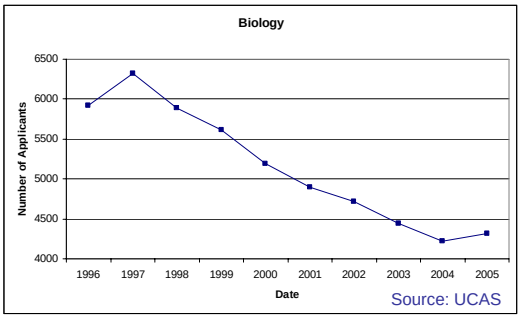
Breakdown of reasons for difficulties

Table 8.27 **Recruitment difficulties for Environmental Conservation**

- Lack of applicants with required qualifications and skills – 30%
- Lack of applicants with required work experience – 24%
- Lack of interest in this type of work – 11%
- Higher wages offered by other employers – 14%
- Remote location/poor public transport – 4%
- General lack of applicants – 8%

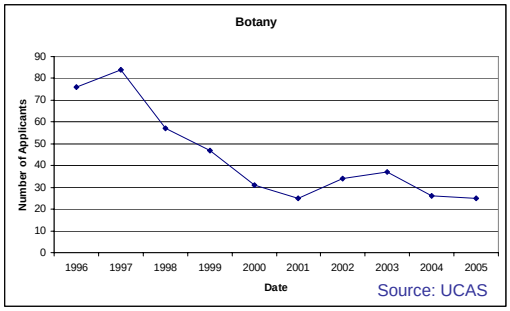
Source: Lantra's LMI database/model

Applicants by degree route



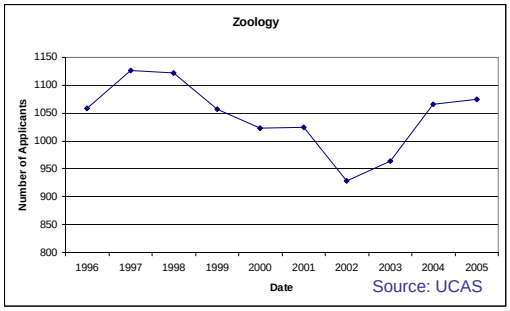
Source: UCAS

Applicants by degree route



Source: UCAS

Applicants by degree route



Source: UCAS

Number of environmental courses

Degree course	2003	2005
Biological Science	2528	1770
Botany	33	25
Zoology	78	126
Wildlife	64	39
Ecology	274	353
Conservation	305	225
Environment	1632	1052
Environmental Biology	121	130

Issues

- Is ecology and environmental management seen as an interesting/attractive subject?
  - Students not studying ecology as much – more psychology/TV media etc
- Are young people aware of ecology or environmental management as a career?
  - Ecology is undervalued as a profession

Issues (cont.)

- Low starting pay relative to skills and experience required
- 2 years relevant experience
  - Students come away from university with debt – how do they get this experience without volunteering?

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The way forward?

- School pupils (lack of field work in schools)
- First degree
  - Accreditation
  - Learning outcomes
- Postgraduate training and development
  - CPD
  - Mentoring
- Training networks of excellence (training the trainers)
- Embedding skilled amateurs into these networks

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