# Linking Teaching with Research in the Disciplines

# Case studies for Courses and Course teams

## Research is competitive - working as 'internationally renowned research scientists'

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**Classification Category:**
- Developing student appreciation of research in the discipline
- Using teaching and learning processes which simulate research
- Using assignments which involve elements of research

**Context**

- **Course title: BSc Biochemistry**

- **Level: 2**
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**Background and rationale**

Level 2 biochemistry students in Cardiff School of Biosciences have day long practical classes one day a week. They engage in a number of experiments over a 4 week block of teaching which builds into an extended practical investigate on a theme, that they then write up in the form of a paper. I was responsible for running one such series of experiments which investigated the quaternary structure of haemoglobin, bringing in gel exclusion chromatography, protein assays, SDS-PAGE and Urea gel electrophoresis. Many of the students, particularly the weaker ones, found it hard to integrate the findings of these various investigations to draw overall conclusions, particularly if one of the experiments hadn't gone well and was providing confusing data. They couldn't see the bigger picture, so their interpretation of the data was often poor. A poster session was introduced as part of this practical to give them experience of a different form of presenting data but this also had the benefit of giving them immediate feedback on their interpretation of the data, prior to them writing their extended "paper" style write-up. This was the state of play when I took over this practical from a retiring colleague. It was an interesting practical with a novel and beneficial method of assessment but somehow it didn't seem to quite "work".

**What does the teacher do?**

To engender a sense of fun, competition and hence greater interest in the activity, I started introducing the 4 week practical by telling the students that they were to imagine that they are not students in a level 2 lab, but rather a team of research scientists working in an internationally renowned laboratory on the quaternary structure of a novel protein. They suspect that other groups have found a similar protein and you want to publish your results at a forthcoming international conference and get recognised as the group that came up with the definite structure. I give each team an identity as the team from a particular country and try to always refer to them as the representatives of that country over the next 4 weeks.

This is the first time the students have made scientific posters, so I send some time during the 4 weeks explaining the sort of information that you would expect to find on a scientific poster at a conference and what the elements of a good poster are, without being too prescriptive. I explain that at many society meeting, e.g. Physiological Society, British Pharmacological Society; posters and presentations are assessed to see if they merit publication, and likewise their posters were going to be assessed at their conference. I ask them to think of other work based scenarios where they think they might need to use peer/ self assessment. We usually manage to generate a list of 5 or 6 instances, including appraisals, team meetings, grant applications, papers etc. I point out that in many work environments, industrial or academic you are going to have to peer assess colleagues. That being able to provide critical but positive feedback to other people is an important skill that they need to practice and will need to use in their future workplace environment- whatever those maybe. I then explain that they are going to peer assess each others posters. Although the students were obviously given practical manuals etc, they were not given written material in advance relating specifically to the peer/ self assessment. Rather I would use a blank OHP and having given them the example of learned societies using peer assessment of posters and presentations at conferences ask them to think of other work based scenarios, where they think they might need to use peer/ self assessment. We usually managed to generate a list of 5 or 6 instances on the OHP, including things such as appraisals, team meetings, grant applications, papers etc

I point out that this MUST be done in a positive way. They aren't to criticise anyone else's efforts but rather I want them to think of something that was particularly good about the poster or the data and the way that it was presented, plus one way in which they think this could be improved. Each group must comment on each of the other posters AND on their own. To establish a score, I also ask them to rank order the posters. Each group will do this for each of the posters, as I will. I will then add up the rank ordered positions of each poster and use this to assign a mark, i.e. the poster that gains the most first place positions will get the highest score etc. Thus the teams peer assess each others work.

Within a team however, different members will make a different level of contribution to the team. To assess this, I asked each member of the team to give a score rating (A to D) for each member of the team including themselves. To encourage them to be critical and to acknowledge that different students bring different talents and contributions to a group, I ask them to assess each other under a number of different headings, such as artistic contribution, background research and understanding, quality of data, and team-working skills. This then leads to a score of the individual's contribution to the team effort.

**Hot tips and things to look out for**

For this session to work well, I found it was very important that you presented it to the students in the right way. It needed to be upbeat and engender a sense of fun and competition, so the students took on their roles as country representatives and took suggestions and criticisms onboard without feeling victimised or resentful. It was also very important to explain the professional context, so they saw this as a real-life experience and understood that this was an important transferable skill not just some weird activity that I had dreamed up, that didn't have a place in the "serious" business of passing grades and becoming a scientist! On one occasion, I let pressure from other teaching activities; project and PhD students cause me to rush some of these important "communication" parts of the sessions and just ran through the motions of the students doing the practical and posters without setting the context up fully. The result was a disaster, the students failed to fully engage with the activity, the posters were poor and the student feedback on the session even worse- in complete contrast to that from other groups that had been through the "full" experience.

**Does it work?**
Yes!  This was a novel activity that taught transferable and employment skills that the students didn't experience anywhere else on the course.  The students left the session talking about what had happened and discussions with former students have shown that they remembered the activity several years after the event.  With a few limited exceptions, I would say that most found it a positive and enjoyable experience.  Feedback on module questionnaires produces comments like "wish we did posters more often" and "I enjoyed this session".  The use of country names for teams adds a sense of fun (with teams often getting into character with bilingual presentations, flags or other emblems depicted on the posters and even a recorded speech by the President of the USA, on one occasion!) but also keeps any comments from becoming too personal.  Comments are directed at a "team" not an individual and I insisted that they must be balanced, one "best point" and one thing that could be improved.  The activity did not do away with the formal written assessment component but lowered the emphasis placed on this, as the posters and peer/self assessment marks also contributed to the overall grade awarded.  Thus a variety of skills were assessed and weak students given immediate feedback and guidance on how to improve their written assessment.

**What problems/issues have arisen?**
Students find the idea of assessing friends difficult.  Initially I just used to ask them to give a single grade to their team members, to grade their contribution to the team.  In some instances, usually when genuine shirkers where involved, grades reflected this, but on the whole, these grades weren't too discriminating.  By asking students to recognise specific skills in their peers, I found the grades became more discriminating and I would like to think, it encouraged them to think about the benefits of team working and the various talents that members bring to that team- but maybe this is just me being idealistic!  Students found particular difficulty when a team member had been absent for one of the sessions for a genuine reason, such as sickness.  I was usually asked for advice with scoring that individual and discussed with the students whether they thought someone should be penalised in such circumstances but I always said that it had to be their decision, they had to take on that responsibility.
The format described here is the result of a couple of years evolution and represents the best model I have been able to come up.