Linking Teaching with Research in the Disciplines

Case studies for Courses and Course teams

Learning the skills of reading scientific papers

Contact details

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Classification Category:

- *Using assignments which involve elements of research processes*

Context:

- **Course/unit/module title: Final Year Research Project (Part: reading the scientific literature)**
- **Course title: BSc in Biochemistry (and variations on this)**
- **Level: 3**

What does the teacher do?

The principle involved in this link between teaching and research, is to provide practice in critically analysing the research literature and data.

Series of weekly tutorials (6 of 1 hour duration): Students are asked to read one paper from the recent primary scientific literature in preparation for the tutorial. The papers selected over the 6 tutorials deal with a broad spectrum of subject matter selected to provide a broad overview of the current research directions in the subject area. All the students in the group (about 6 students) read the same paper. The suggested preparation time for each tutorial is 3 hours. Before tutorials 1, 3 and 5 students are asked to write an abstract (~250 words) for the paper they have read (the abstract was removed from the version they read prior to the tutorial). For tutorials 2, 4 and 6 the students have to come to the tutorial prepared to discuss in any detail the data elements (figures or tables) presented in the paper. In the tutorial they have to explain to the group a graph or table. This requires an interpretation of the scientific data and an understanding of the methods that have been employed. In discussion with the tutor, students are encouraged to be critical, for example by looking at graphs and tables and considering error bars, by trying to understand whether the appropriate controls have been done.
Attendance is compulsory and marks are awarded for attendance and active participation.

Hot tips/Things to look out for

* Do not be put off by the initial reactions of the students ["is this material going to come up in the exam?"] or that of the staff ["not my subject area"]. They will enjoy it and see its value eventually.

*Make attendance compulsory (give a mark for attendance).

*Choose easy papers first, leave *Science* and *Nature* until last.

Does it work?

The students' initial response is "why are we doing this?". The answer is that they are learning the important skills of reading papers from the literature and learning how to be critical – although this does not impress them at the time. They are very focussed on content and are resistant to reading things that they don't perceive as relevant to them. However, they are all doing lab or literary projects (which count for about 1/3rd of the final year mark) and they soon learn that it is very useful, even vital to be able to read a paper and get the guts out of it in 20-30 minutes, and that this helps them with their project.

What problems/issues have arisen?

Staff were (and still are) a bit resistant. Small group teaching uses up valuable research time and with over 90 students in the final year, this is not an insignificant consideration. However, as most of them are researchers they do see the importance of developing this skill. The number of sessions was reduced a bit to placate staff, and the writing an abstract part can be done as a written exercise separately and doesn't take that long to mark.

Details of support material/course work/assessment methods

Assessment: 10% of module mark for tutorial and 10% from a formal examination in which students have to write the abstract of an unseen paper from which the Abstract has been removed.

The instructions form the module manual are in Appendix 1

Relevant references

R J Beynon (1993) *A Researcher's Companion*. Portland Press, London

S Brown, L McDowell and P Race (1995) *500 Tips for Research Students*, p. 54, Kogan Page, London

M L Hall & A J Wolfson (1993) Journal Club as a supplement to the undergraduate biochemistry laboratory. *Biochemical Education* **28**: 71**7**3.

Appendix 1

Taken from Final Year Research Project Module Manual

TUTORIALS

Paper summary, critical analysis of scientific papers and oral presentation skills

There will be a weekly tutorial programme during Semester 2. Attendance is compulsory, and will be recorded and marks will be awarded for attendance and active participation. The tutorial sessions will contribute 10% towards your module mark.

Each tutorial will normally last for one hour, with six students in each group. You will be expected to complete work tasks before each tutorial.

- Tutorials 1, 3 and 5 will require you to write an abstract of a scientific paper as though you were one of the authors of the paper.
- Tutorials 2, 4 and 6 will require the interpretation of scientific data and an understanding of the methodological approaches that have been employed. You will be provided with a paper and asked to carefully read it and to come to the tutorial prepared to discuss in detail any of the data elements (Figures or Tables) presented in the paper. This includes understanding the aims of the experiment, the methods that have been used to collect the data, and the meaning of the results.

It is intended that these exercises should provide practice in analysing published papers and scientific data, and in group discussion skills.

A good scientist is capable of understanding and appreciating scientific papers across a range of specialist areas. The papers selected for the tutorials will deal with a broad spectrum of subject matter selected to provide you with an overview of the current research directions in Biochemistry and Molecular Biology.

Tutorial Preparation Time

You should spend around three hours preparing a paper abstract and about three hours when preparing for a data assessment tutorial.