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## Linking Teaching with Research

### Case studies for Bioscience Courses and Course teams

#### *Supporting Final Year Undergraduates when Critically Reviewing Scientific Literature*

##### Contact Details

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**Classification Category:** Using assignments which involve elements of research processes e.g. *Literature reviews*

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##### Context:

- **Course/unit/module title:** Final Year Neuroscience (Part: Journal Club)
  - **Course title:** BioMedical Science (BMedSc)
  - **Level:** H, 3<sup>rd</sup> Year BMedSc Students
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## What does the teacher do?

My primary aim is to engage the students in critically analysing a research article.

Students are given a recent research article; (i) structured in a format that the students are required to use when writing their laboratory reports, (ii) demonstrating a variety of research methods relevant to current research, and (iii) which supported the subject content of the prior lecture to reinforce the subject content and put this into context of experimental research. All students (15) are instructed to read the article in advance of the two tutorials provided. The first tutorial (1 hour) addresses; (i) the relevance of the exercise (reinforces understanding of subject content and encourages skill of critically reviewing research articles in preparation for final year dissertation project), (ii) the structure of research articles and (iii) provides the opportunity to discuss the materials and methods of the article. Discussion and explanation of the methods is necessary to ensure the students clearly understand the nature of the research prior to their critical evaluation of the data and interpretation. The tutor requests the students form groups of two or three, the number of groups correspond to the number of result figures within the article. The students are given a handout containing the structure of the sessions, expectations (read article, work in groups, questions to answer) and tasks to prepare prior to the second tutorial; each group is given a set of data (a figure from the article) to interpret with accompanying questions to guide and structure their thinking. The students were not restricted to work in their pairs only; they were encouraged to discuss their research with any group and / or the tutors. In the second tutorial (90 minutes) the student groups are required to explain the data, their understanding of the interpretation made by the authors, consider if appropriate controls were used and suggest alternative methods that could have been employed. Reflection on the interpretations and conclusions was encouraged as a group discussion.

This was a formative exercise and the requirement of attendance and engagement in the activity was encouraged by emphasising the benefits to be gained (the need to construct their upcoming laboratory reports in the same format, and to support literature review activities associated with their laboratory dissertation).

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## Hot tips and things to look out for:

Choose a paper that reinforces the subject content of the module / lectures. The article was chosen using a search engine to include the current year and keywords that referred to the research methods the lecture was introducing. The article needed to relate well to the prior lecture so the students perceive the content as being relevant. The article chosen was published in the same year as the teaching session and it was thought the students would perceive this as up-to-date. The intention is to find a similar article each year to keep current and enable discussion of new scientific research. However, there will be a requirement each year to formulate new questions relevant to the chosen article. With time a bank of articles related to the lecture will be generated, this will ensure articles already prepared are available to share with colleagues, and also enable reflection and modification of questions after the sessions, ready to be used the following year.

There is no direct assessment associated with this activity (critically reviewing literature), so promoting the relevance to the students at the start of the tutorial is important to ensure attendance and engagement in the activity. The students need to know this will help build their knowledge of the prior lecture and by discussing the article they can check their understanding. Critical reading will help with the student's future reading of scientific articles for their taught modules and laboratory dissertation.

Students may find research articles to be complex and hard to read. Engagement in discussion, presentations and answering relevant questions can illustrate the research article, and its analysis, can be broken down in to manageable pieces (handout).

Use informal arrangement of seating – more comfortable to sit around table to make notes and spread out paperwork.

This could be an activity introduced to Y1 or Y2 students, and may encourage students to engage more in reading primary literature and feel better prepared for their final year. There would need to be some consideration of article type which reflects the year of their study. Another consideration to take into account would be the number of students in each year. You would need to keep numbers in the module low, approximately 15-20 students. If the numbers were higher then there would need to be parallel tutorial sessions for each tutorial group which would require more tutors to deliver the tutorial.

To review a similar activity provided in our Y2, called Research Methods for BMedSc students where the students are introduced to primary literature, have to identify key points, interpret data and review a research article please view Shuttleworth, 2009  
[www.bioscience.heacademy.ac.uk/resources/problemsolving/probsolv.pdf](http://www.bioscience.heacademy.ac.uk/resources/problemsolving/probsolv.pdf) .

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### **Does it work?**

The students all attended, contributed to the discussion and engaged in the activity. This process has had one rotation in the current format. In the previous year the tutorial of reviewing a research article had no set questions or structure provided. The students arrived ill-prepared and unsure what to do. The session lacked discussion and limited time restricted detailed analysis of the article. This prompted the development of the structured format and provision of specific questions tailored to the chosen article to guide the students. The provision of two tutorials was designed to engage the students and provide opportunities to think and discuss the article as well as encourage the students to ask questions. Using this new format the first tutorial stimulated more discussion than anticipated which was encouraging. There was a need to understand the methods as the students were aware they would be presenting the data in the second tutorial, so there was value in having a clear understanding of how the research was undertaken. I requested the students complete a feedback questionnaire at the end of the second tutorial. All of the students agreed having identified tasks set by the lecturer helped preparation and enabled them to prepare and participate in the discussions. The students had time to reflect and think about the tasks, and there was opportunity to clarify areas of uncertainty. The exercise received very positive feedback, and the benefits were apparent by comparing the performance of students (participation and peer-learning) with the previous year. Different student cohorts intrinsically have variable levels of group interaction. However, regardless of the cohort dynamics the provision of a structure to guide the students through the research article should enable the students to fully participate and encourage peer-discussion. *"Use of a structured format (reading guides and checklists) to review the literature may improve understanding of the material, efficiency of presentations and their [student] satisfaction with the educational experience"* (Alguire, 1998). Some of the student comments were: *"fully understand methods and figures"*, *"useful for dissertation"*, *"useful task which I can use in the future"*. The exercise is worthwhile; the students engaged, received immediate feedback and valued the exercise. This is and will be worth repeating to the next cohort of students.

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### **What problems/issues have arisen?**

Based on student feedback (questionnaire) 7 out of 15 students responded two tutorials were not necessary to complete the task - two tutorials used up valuable time. Perhaps the suggestion of one tutorial arose because the activity was only a formative exercise? The sessions were designed to guide the students through the research article without the pressure of summative assessment. Students do not always appreciate engagement in active discussion and opportunities for immediate feedback to clarify understanding will deepen their knowledge. The tutor needs to ensure the value of the two sessions is clear, by addressing this at the beginning of the first tutorial. The first tutorial is necessary to set the scene and discuss the methods prior to setting tasks. The gap between tutorials allows students time to reflect and work through the exercise productively. The second tutorial allows the presentation of data, discussion of interpretations and methods used. Perhaps a further session using an alternative article will check the students can apply what they have learnt and reinforce the relevance. Further sessions using alternative papers would provide practice and should be considered. More practice will give the students more experience and ultimately more confidence in critically reading scientific literature. If time does not permit further structured sessions, the students can be encouraged to use this structured approach as a useful tool for future reading of scientific articles. Although the students did participate in this activity, if engagement did ever become a problem then assessment of attendance or participation could be considered. Motivating the students to participate was considered when choosing the article; it was intentional that the article linked well with a lecture to offer immediate relevance and encourage the students to read and engage in the set activity.

The research article was given to the students prior to the tutorials. Of the 15 students, 5 perceived the research article as being complex and hard to read. All the students engaged, contributed and broke down the research article into smaller sections to present and discuss. The tutor needs to provide a summing up session to address the students success (presentation, further interpretations gained, alternative methods discussed) and praise the students that they were able (with the support

of the set questions and their peers) to critically review the article. The tutor should explain that the students will be exposed to this level of complexity in their reading lists for the research-led module and literature searches to complement their laboratory-based dissertations. With the support provided, the completion of the exercise and engagement in discussion demonstrated the students were able to critically review this article.

The structure provided will guide and give confidence to the students to move from reliance of support to independence.

The students did not contact the tutors between tutorials to ask questions or clarify any misunderstanding. Perhaps providing an online discussion board would give a further opportunity for the students to contact tutors and their peers to discuss their findings.

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### **Details of support material/course work/assessment methods**

Handouts with research article, instructions and tasks were given to students (see handout found on case study web pages.)

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### **Relevant references**

Alguire, PC. 1998. A review of journal clubs in postgraduate medical education. *Journal of General Internal Medicine* 13: 347-353.

Willmott CJR, Clark RP, Harrison TM. 2003. Introducing undergraduate students to scientific reports. *Bioscience Education* 1 (1) <http://bio.ltsn.ac.uk/journal/vol1/beej-1-10.htm>

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