

Research led teaching and learning in physiology

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'Research Led Teaching' (RLT) and its effective implementation and evaluation are the focus of my interests in improving Science Physiology teaching. My aim is to describe some findings during a recent overseas study tour. Since The Boyer Commission Report on Educating Undergraduates in Research Universities (1988), there has been a strong move by research universities to include RLT in their mission statements. The problem is how to marry the great success of research universities and the commitment of their researcher/academics to research with the effective sharing of their philosophy and enthusiasm with undergraduate students in a RLT philosophy. Projects in various universities address how to introduce this institutional ethos of RLT in curriculum design, such as Warwick University and others, and these can provide useful guides to best practice. Few research universities have published detailed management plans to implement their RLT policies, fewer still have definitive curriculum changes that reflect their mission statements and even fewer have yet provided evidence of changed student learning practices or learning outcomes. It has been difficult to find good examples of coherent and extensive use of RLT in biomedical science curricula, let alone in science physiology. However on my recent study tour I found good, but often isolated, examples of RLT in biomedical science courses as well as interest in other institutions in moving towards formally incorporating RLT practices into their curricula. In biomedical sciences, students usually undertake courses with lectures, laboratory classes and varying amounts of tutorials or e-Learning activities. There may be some problem-based learning elements introduced into science curricula, but funding limits for staff have restricted such approaches to medical courses. In trying to design appropriate science curricula within a research university, the limitations/advantages of each of these modes of delivery/interaction needs to be considered. Another important issue is how to provide central support to academic staff to help them initiate changes in their approaches to teaching to match the institutional philosophy.

An overall objective for graduates in Science physiology would be for them to have the skills of experimental investigators so that they can continue with a professional career in science or have a thorough appreciation of evidence based research to support other careers. Many of these skills are generic and apply widely across the spectrum of University graduates, whereas others more specific to biomedical sciences need to be added. These common generic skills are usually well identified within an institution's guidelines for teaching and learning.

A major task is to design a curriculum that help the students understand that the challenge for them is to become independent learners during their undergraduate courses so that they are able to be effective life long learners adapting to a rapidly changing world of science. Students are often driven by assessment and many will take a surface, rather than deep approach to learning if that is what is rewarded. It is essential that there is a constructive alignment of assessment that rewards a deep understanding of the subject, rather than using traditional examination processes that reward a detailed knowledge base in the discipline. It is also imperative that students have formative assessment of their progress with such skills, such as critical reviewing of literature and problem solving, rather than be assessed only in end of semester examinations. Traditional mentoring, with few students per academic, achieved this in the past. Increasing pressure of student numbers means this is no longer a viable option and new ways, supported by e-Learning, need to be incorporated to assist in the progressive development of many generic skills. Lecturers are slower to introduce RLT components into the earlier years of physiology, but many more elaborate on their own research in final years of physiology. Enquiry based learning is often practiced in student-centred laboratory classes, but formal structuring of hypothesis testing and experimental design is not often undertaken. There are some examples of on-line e-Learning to reduce staff workloads with new initiatives.

The final challenge is to evaluate whether or not RLT incorporated throughout a curriculum, has resulted in useful learning outcomes. Valid statistical comparisons of different curricula are always difficult in education, so it maybe more useful to see if the curricula goals are met. Student engagement questionnaires can help determine if the students have appreciated the RLT approach and have adopted a deeper learning style. However, new instruments need to be designed to see if students have the desired skills on graduation, such as hypothesis formation and testing, analytical and interpretive skills etc. Some such instruments are available, but more are needed.

The Boyer Commission on Educating Undergraduates in the Research University (1998) Reinventing undergraduate education: A blueprint for America's research universities.
<http://naples.cc.sunysb.edu/Pres/boyer.nsf/>