

QAA Enhancement Theme on Research Teaching Linkages

A physical sciences perspective

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Outline

1. Background to the theme
2. The Physical Sciences discipline project
3. Current theme: 'Graduates for the 21st Century'

Background

- From 2003, approx year-long themes
- Wide range of topics: first year, integrative assessment flexible delivery
- “Research-Teaching Linkages: Enhancing Graduate Attributes” began July 2006

Background

- Guided by steering committee (HEIs, HEA, SFC, QAA Scotland, sparqs)
- Sector-wide project
- Discipline-based projects (9)

Background (pre-history)

(Boyer Commission on Educating Undergraduates in the Research
University: REINVENTING UNDERGRADUATE EDUCATION, 1999)

OUTLINE SUMMARY OF BOYER REPORT RECOMMENDATIONS

Reinventing Undergraduate Education: A Blueprint for America's Research Universities
by the Carnegie Foundation's Boyer Commission

This page gives the Boyer Report's ten suggestions for improving undergraduate education, followed by the report's specific recommendations for each point. The language is taken directly from the report, which is available online:

<http://notes.cc.sunysb.edu/Pres/boyer.nsf>

Basic Outline: Ten Ways to Change Undergraduate Education

[I. Make Research-Based Learning the Standard](#)

[II. Construct an Inquiry-Based Freshman Year](#)

[III. Build on the Freshman Foundation](#)

[IV. Remove Barriers to Interdisciplinary Education](#)

[V. Link Communication Skills and Course Work](#)

[VI. Use Information Technology Creatively](#)

[VII. Culminate with a Capstone Experience](#)

[VIII. Educate Graduate Students as Apprentice Teachers](#)

[IX. Change Faculty Reward Systems](#)

[X. Cultivate a Sense of Community](#)

[Link to Model Program Innovations](#)

I. Make Research-Based Learning the Standard

1. Beginning in the freshman year, students should be able to engage in research in as many courses as possible.
2. Beginning with the freshman year, students must learn how to convey the results of their work effectively both orally and in writing.
3. Undergraduates must explore diverse fields to complement and contrast with their major fields; the freshman and sophomore years need to open intellectual avenues that will stimulate original thought and independent effort, and reveal the relationships among sciences, social sciences, and humanities.

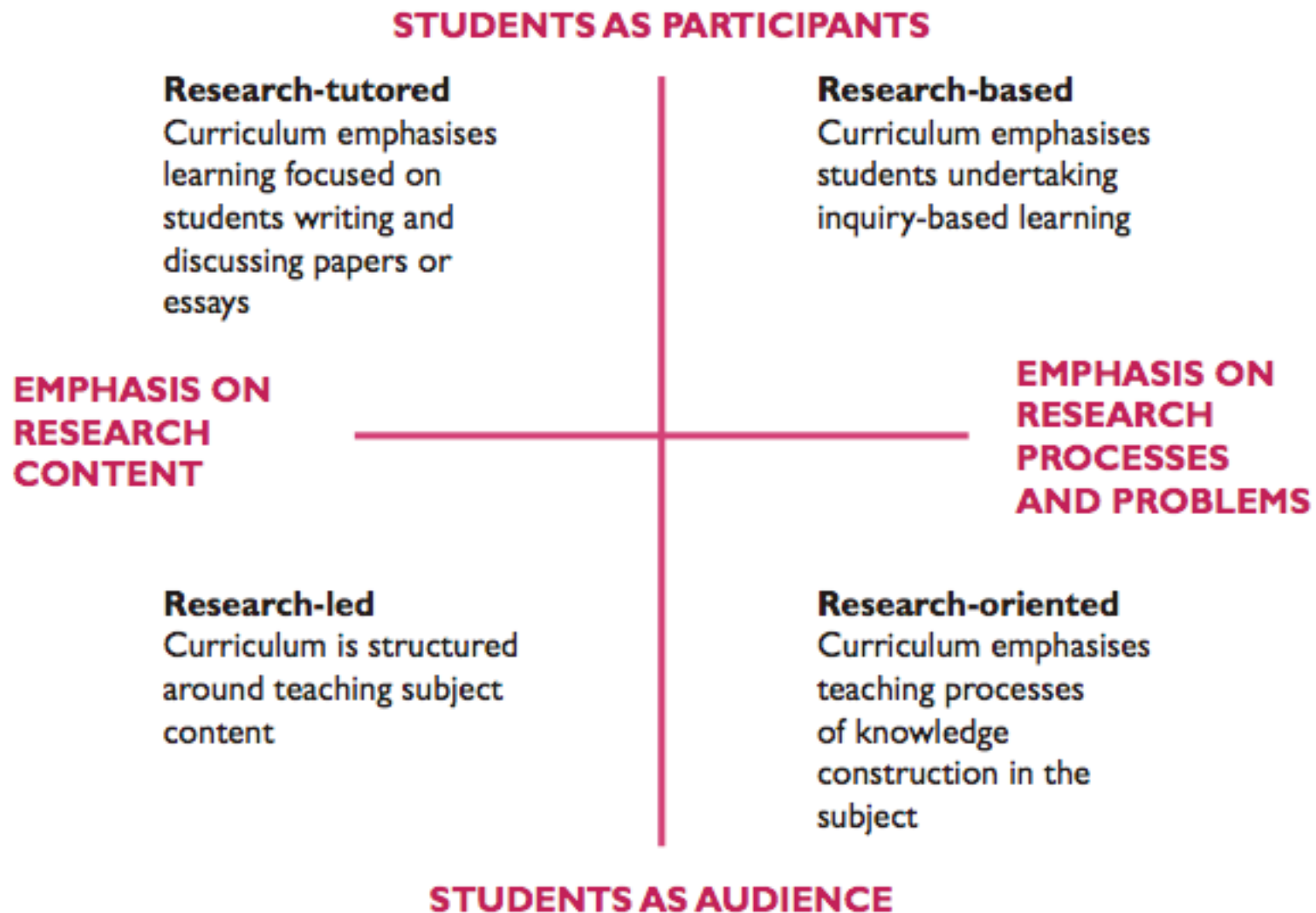
Phys Sci discipline-based project

Simon Bates, Marialuisa Aliotta
(Edinburgh, Physics and Astronomy)

Bruce Sinclair, Antje Kohnle
(St. Andrews Physics and Astronomy)

Our brief was simple....

Fig. 1: Curriculum design and the research-teaching nexus



How academics understand the term '*research-led teaching*'

- Presenting research to students
- Learning through research
- Researching teaching

Disciplinary differences

(Brew 2006)



A simplified linear model

- *Exposure*

research mode

do

- *Pedagogic*



Enhancing practice

Research-Teaching Linkages: enhancing graduate attributes

Physical Sciences



Outcomes

- We found a lot
- 13 case studies
- 10 shorter 'snapshots'

Headlines

- Breadth and depth, with plenty of scope for transfer
- It's not just about the final year project
- Though that remains as the capstone, with appropriate pre-project support and training
- You can do research-based teaching in large early years classes
- What recent graduates thought

Highlights

3.1 Telling students about research, encouraging an atmosphere of independent learning

Case study: Integrated transferable skills

This case study describes a series of classes on transferable skills, which feature in years one, two, three and five of our courses. The first is a Scottish Credit and Qualifications Framework (SCQF) level-7 class of five credits (approximately one-twentieth of a full-time year) entitled Transferable Skills 1. This is followed by an SCQF level-8 class (five credits), Transferable Skills 2; an SCQF level-9 class (five credits), Transferable Skills 3; and finally an SCQF level-11 class (five credits), Transferable Skills 5.

All classes are compulsory for chemistry students (approximately 150 students per year). They cover topics such as IT skills, oral and written presentation skills and group working skills. Up to 12 staff are involved, but only to a minimal extent. The bulk of the teaching is carried out by two members of academic support staff trained to PhD level. The activity is supervised by an academic member of staff, the Transferable Skills Coordinator.

Contact: Debbie Willison

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Institution: University of Strathclyde

Discipline area: chemistry

Highlights

3.2 Implementation in first-year classes

Case study: Experimental tutorials

This case study describes a Physics 1 laboratory class at SCQF level 7, which forms 20 per cent of the 40-credit Physics 1 course. It is compulsory for students studying physics in the first year (approximately 175 students per year). Staff involved: up to seven academic staff (lab head, deputy lab head and demonstrators); up to 30 post-docs and PhD students (demonstrators); two technicians.

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Institution: University of Glasgow

Discipline area: physics

Brief description of course

The Physics 1 laboratory class forms part of the level 1 Physics course taken by all students intending to study physics to degree level, as well as those who simply have an interest in the subject.

The laboratory course has been radically redesigned to update the content and create direct links between the practical work covered there and the theory covered in the

Highlights

3.10 Final-year research project

Case study: Final-year research project modules: an overview

This case study is written with knowledge of the St Andrews physics and astronomy versions of final-year projects, but tries to incorporate what is being done across many Physical Sciences departments.

The final-year project is usually a compulsory 'capstone' module for undergraduates' learning. At St Andrews, Physics BSc projects are 30 credits, and MPhys projects are 60 credits.

Contact: Bruce Sinclair

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Institution: University of St Andrews

Discipline area: physics

Brief description of course

Most departments have a final-year project as the 'capstone' of the student learning experience. Students often work within research teams on a chosen topic of research, and can sometimes produce work that is published in the scientific literature. Indeed, some departments producing work of a quality suitable for publication is a stated goal of the project. This type of module often forms a major part of the final year, and is probably the most obvious example of the research-teaching linkage. Students can get

Sector-wide project

A major challenge surrounds the largely implicit, almost tacit, nature of individually-held views on research-teaching linkages. This was neatly captured in one report where a respondent compared articulating the linkages to what he termed the 'oxygen' problem, implying that the linkages were simply taken for granted as part of the institutional environment and culture and were no more consciously thought about than one would consciously think about the air one was breathing. Further issues arise from problems which some academics have in agreeing the role research should play in directly contributing to all undergraduate learning and teaching, and from the 'silo' problem, which is a structural problem reported in a number of the HEIs where an unhelpful separation or compartmentalisation of teaching and research through contracts, professional activities and other structural mechanisms is apparent.

Current enhancement theme

- Graduates for the 21st Century
- Integrating aspects of all previous themes
- What should the attributes of a Scottish HE graduate be?
- How can the achievement of these be best supported?

Links

QAA RTL site:

<http://www.enhancementthemes.ac.uk/themes/ResearchTeaching>

Outline summary of Boyer recommendations:

<http://www.as.wvu.edu/~lbrady/boyer-report.html>

Phys Sci RTL project pages:

<http://physci.rtl.googlepages.com>