Engaging undergraduate students in research and inquiry

Mick Healey
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Student research at Sydney

Undergraduate Research Scholarship Schemes at Sydney

IT; civil engineering; chemistry; mathematics & statistics; molecular & microbial sciences; physics; medicine; pharmacy

Source: Jewell (2009)
Linking teaching and research in disciplines and departments

Alan Jenkins
Mick Healey
Roger Zetter

April 2007

Developing undergraduate research and inquiry

Mick Healey
Alan Jenkins

June 2009
Brief Biography

• HE Consultant and Researcher
• Economic geographer and Director Centre for Active Learning
• Director HE Academy projects on ‘Undergraduate research’ and ‘Honours and Capstone Projects’
• Ex-VP for Europe International Society for Scholarship of Teaching and Learning
• National Teaching Fellow and Senior Fellow HE Academy
• Advisor to National Academy for Integration of Research, Teaching and Learning (Ireland) (2007-11)
• Advisor to Australian Learning and Teaching Council Project on the ‘Teaching-research nexus’ (2006-08) and ‘Undergraduate research’ (2009-10)
• Advisor to League of European Research Universities on research-based teaching (2009)
• Honorary Professor University of Queensland; Visiting Professor Edinburgh Napier and University of Wales Newport
• Research interests: scholarship of teaching; linking research and teaching; active learning; developing an inclusive curriculum for disabled students
Linking research and teaching

"Postgraduate study is too late to start; research attributes need to be integrated fully into undergraduate courses"

Ian Diamond, Chair Research Councils UK, 2010
“For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidence, take decisions on a rational basis, and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.”

Brew (2007, 7)
Linking research and teaching

“Developing the Student as Scholar Model requires a fundamental shift in how we structure and imagine the whole undergraduate experience. It requires, as a minimum, the adoption of the Learning Paradigm in everything from the first introductory course through the final capstone experience. It requires a culture of inquiry-based learning infused throughout the entire liberal arts curriculum that starts with the very first day of college and is reinforced in every classroom and program.”

(Hodge et al. 2007, 1)
## Changing paradigms for teaching and learning

<table>
<thead>
<tr>
<th>Paradigm</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>Telling students what they need to know</td>
</tr>
<tr>
<td>Learning</td>
<td>Engaging students in learning how to learn; emphasis on learning what they need to know</td>
</tr>
<tr>
<td>Discovery</td>
<td>Encouraging students to seek and discover new knowledge</td>
</tr>
</tbody>
</table>

Source: Hodge et al. (2007, 3)

See Table 6 p6 for application of Baxter Magolda’s ideas to Miami, Ohio
Engaging students in research and inquiry

1. Different ways of linking research and teaching
2. Strategies for engaging students in first year and interdisciplinary courses
3. Strategies for engaging students in research and inquiry in disciplines and departments
4. Action planning and conclusion
Undergraduate research: Line-up

I want you to position yourself on a line according to the extent to which you agree or disagree with the following statements.

Talk to the person next to you about why you have positioned yourself where you have and as a consequence you may need to ‘move’.
Undergraduate research: Line-up

It is essential that undergraduate students are aware of the research which goes on in their departments

Strongly agree ........................................ Strongly disagree
Undergraduate research: Line-up

“Undergraduate research is for ALL undergraduates in ALL HE institutions”

Strongly ----------------------------- Strongly
Agree                                      Disagree
Our argument: a ‘research active curriculum’

“All undergraduate students in all higher education institutions should experience learning through, and about, research and inquiry. … We argue, as does much recent US experience, that such curricular experience should and can be mainstreamed for all or many students through a research-active curriculum. We argue that this can be achieved through structured interventions at course team, departmental, institutional and national levels” (Healey and Jenkins, 2009, 3).
Different ways of linking R&T

• Learning about others’ research
• Learning to do research – research methods
• Learning in research mode – enquiry based
• Pedagogic research – enquiring and reflecting on learning
Research enriched learning and teaching (RELT) at Sydney

RELT refers to four aspects of the curriculum:

• **Content** – the what
• **Student learning outcomes** – the how to
• **Teaching and learning processes** – learning in research like ways
• **Broader experience of learning** – the extra-curricular learning community
Mainstreaming undergraduate research & inquiry in year one & interdisciplinary cases

In pairs, each skim read at least ONE different year one case study (pp 7-8) OR one interdisciplinary case study (pp 9-11)

Discuss whether and how any of the ideas may be amended for application in your contexts.

5 minutes
STUDENTS ARE PARTICIPANTS

<table>
<thead>
<tr>
<th>EMPHASIS ON RESEARCH CONTENT</th>
<th>EMPHASIS ON RESEARCH PROCESSES AND PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research-tutored</td>
<td>Research-based</td>
</tr>
<tr>
<td>Engaging in research discussions</td>
<td>Undertaking research and inquiry</td>
</tr>
<tr>
<td>Learning about current research in the discipline</td>
<td>Developing research and inquiry skills and techniques</td>
</tr>
<tr>
<td>Research-led</td>
<td>Research-oriented</td>
</tr>
</tbody>
</table>

STUDENTS FREQUENTLY ARE AN AUDIENCE

Curriculum design and the research-teaching nexus

(based on Healey, 2005, 70)
EXPLORING AND ACQUIRING EXISTING KNOWLEDGE

Pursuing (information-active)

Identifying (information-responsive)

Producing (discovery-responsive)

Authoring (discovery-active)

PARTICIPATING IN BUILDING KNOWLEDGE

STUDENT-LED

STAFF-LED

Inquiry-based learning: a conceptual framework
(Based on Levy, 2009)
Different views on undergraduate research and inquiry

“An inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline”
Centre for Undergraduate Research

“Undergraduate research is original work conducted by undergraduate students working in collaboration with a faculty mentor”
University of Central Florida

“Discovery Learning”
University of Alberta
# Different views on undergraduate research

## Dimensions of undergraduate research

<table>
<thead>
<tr>
<th>Student, process centred</th>
<th>Outcome, product centred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student initiated</td>
<td>Faculty initiated</td>
</tr>
<tr>
<td>Honors students</td>
<td>All students</td>
</tr>
<tr>
<td>Curriculum based</td>
<td>Co-curricular fellowships</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Individual</td>
</tr>
<tr>
<td>Original to the student</td>
<td>Original to the discipline</td>
</tr>
<tr>
<td>Multi-or interdisciplinary</td>
<td>Discipline based</td>
</tr>
<tr>
<td>Campus/community audience</td>
<td>Professional audience</td>
</tr>
<tr>
<td>Capstone/final year</td>
<td>Starting year one</td>
</tr>
<tr>
<td>Pervades the curriculum</td>
<td>Focussed</td>
</tr>
</tbody>
</table>

(Source: Adapted from Beckham and Hensel, 2007)
Different views on undergraduate research and inquiry

Our working definition includes Boyer’s (1990) scholarships of discovery, integration and application (engagement) and is characterised by breadth:

“undergraduate research describes student engagement from induction to graduation, individually and in groups, in research and inquiry into disciplinary, professional and community-based problems and issues, including involvement in knowledge exchange activities”

Childs et al., 2007
Different ways of linking R&T: disciplinary perspectives

How may the linkages between research and teaching be developed to enhance the benefit for student learning?

In pairs each skim read the discipline based abstracts for ONE of the four ways of engaging students in research and inquiry (pp.11-16). Discuss whether any of the ideas may be amended for application in your context.

5 minutes
“Once you have learnt how to ask questions – relevant and appropriate and substantial questions – you have learnt how to learn and no one can keep you from learning whatever you want or need to know.”

Postman and Weingartner (1971, 23)
**Students experience of learning in a research environment: Physics**

<table>
<thead>
<tr>
<th>What is research?</th>
<th>Breaking new ground; moving forward; exploration and discovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>How visible is it?</td>
<td>Laboratories and machinery (ie tools) but often behind closed doors</td>
</tr>
<tr>
<td>Where is it located?</td>
<td>Out there; at a higher level</td>
</tr>
<tr>
<td>Who does it?</td>
<td>Lecturers</td>
</tr>
</tbody>
</table>

Source: Robertson and Blackler (2006)
**Students experience of learning in a research environment: Geography**

<table>
<thead>
<tr>
<th>What is research?</th>
<th>Gathering information in the world; answering a question</th>
</tr>
</thead>
<tbody>
<tr>
<td>How visible is it?</td>
<td>Most visible in the field</td>
</tr>
<tr>
<td>Where is it located?</td>
<td>Out there in the field</td>
</tr>
<tr>
<td>Who does it?</td>
<td>Lecturers and (increasingly over time) students</td>
</tr>
</tbody>
</table>

Source: Robertson and Blackler (2006)
# Students experience of learning in a research environment: English

<table>
<thead>
<tr>
<th>What is research?</th>
<th>Looking into; gathering; putting it together; a focus of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>How visible is it?</td>
<td>Not tangibly visible but apparent in the dialogue</td>
</tr>
<tr>
<td>Where is it located?</td>
<td>In the library; in the head</td>
</tr>
<tr>
<td>Who does it?</td>
<td>Lecturers and students</td>
</tr>
</tbody>
</table>

Source: Robertson and Blackler (2006)
Different ways of linking R&T: Departmental perspectives

A key issue:
How may the linkages between research and teaching be developed to enhance the benefit for student learning?

In pairs each skim read the abstracts for ONE different group of DEPARTMENTS (pp.16-18). Discuss whether any of the ideas may be amended for application in your context

5 minutes
The developmental journey of the student

University curricula need to support student and citizen development from

“absolute knowing [where] students view knowledge as certain; their role is to obtain it from authorities … (to) contextual knowing [where] students believe that knowledge is constructed in a context based on judgement of evidence; their role is to exchange and compare perspectives, think through problems, and integrate and apply knowledge” (Baxter Magolda, 1992, 75).
### The developmental journey of the student

<table>
<thead>
<tr>
<th>Developmental Level</th>
<th>Student traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance on external</td>
<td>Knowledge viewed as certain</td>
</tr>
<tr>
<td>references [Foundations]</td>
<td>Reliance on authorities as source of knowledge</td>
</tr>
<tr>
<td></td>
<td>Externally defined value system and identity</td>
</tr>
<tr>
<td>At the crossroads [Intermediate Learning]</td>
<td>Evolving awareness of multiple perspectives and uncertainty</td>
</tr>
<tr>
<td></td>
<td>Evolving awareness of own values and identity and of limitations of dependent relationships</td>
</tr>
<tr>
<td>Self-authorship [Capstone]</td>
<td>Awareness of knowledge as contextual</td>
</tr>
<tr>
<td></td>
<td>Development of internal belief system and sense of self capacity to engage in authentic, interdependent relationships</td>
</tr>
</tbody>
</table>

Source: Hodge et al. (2008)
Issues in mainstreaming undergraduate research and inquiry

- Is research and inquiry primarily for honours and graduate students?
- Is research and inquiry for all students or a highly selected group?
- How are students prepared to undertake research and inquiry?
- What are students' perceptions of research?
Students’ perceptions of research

A comparison of over 500 final year students’ perceptions of research in three universities CanRI; UKRI; and UKLRI:

• Students agreed that being involved in research activities is beneficial
• Students do not perceive the development of their research skills
• Communication is one of the issues that we need to address – language used can exclude
Students’ perceptions of research:

- About three-quarters of the items followed our hypothesis (particularly about the awareness of research)
- Those where the hypothesis did not hold up were mainly in the experiences with doing research, where there were no significant differences
- Regardless of institution, there is the perception amongst students that learning in an inquiry or research-based mode is beneficial
### Students’ experiences with research

<table>
<thead>
<tr>
<th>Activity</th>
<th>U of A History Faculty</th>
<th>U of A Student Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff discuss research</td>
<td>96%</td>
<td>85%</td>
</tr>
<tr>
<td>Reading research paper by staff</td>
<td>86%</td>
<td>60%</td>
</tr>
<tr>
<td>Undertaking independent project as part of course</td>
<td>77%</td>
<td>43%</td>
</tr>
<tr>
<td>Undertaking undergraduate dissertations</td>
<td>59%*</td>
<td>7%</td>
</tr>
<tr>
<td>Being subject of research</td>
<td>23%</td>
<td>47%</td>
</tr>
<tr>
<td>Development of research techniques</td>
<td>59%</td>
<td>27%</td>
</tr>
<tr>
<td>Attending research seminar</td>
<td>32%</td>
<td>27%</td>
</tr>
<tr>
<td>Contributing to research project outside of class</td>
<td>14%</td>
<td>17%</td>
</tr>
<tr>
<td>Attending research conference</td>
<td>27%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Strategies for engaging students in research and inquiry

In groups of threes and fours identify ONE possible strategy or practice that:

One of you would like introduced in your Department to engage students in research and inquiry

5 mins
Mainstreaming undergraduate research and inquiry: conclusions

• Getting students to produce knowledge rather than just consume knowledge is a way to re-link teaching and research.
• The challenge is to mainstream undergraduate research so that all students may potentially benefit.
• Adopting a broader definition of undergraduate research than is currently common is a way forward (Boyer et al.), which should benefit the learning of students in institutions with a range of different missions.
Mainstreaming undergraduate research and inquiry: conclusions

If undergraduate research is to be truly integrated into HE then the nature of higher education itself will need to be reconceptualised.

“universities need to move towards creating inclusive scholarly knowledge-building communities. ... The notion of inclusive scholarly knowledge-building communities invites us to consider new ideas about who the scholars are in universities and how they might work in partnership.” (Brew, 2007, 4)

There is a need to do more thinking ‘outside the box’
Engaging undergraduate students through research and inquiry

THE END

Thank You