Teaching undergraduate students as researchers

Professor Tony Harland
Teaching students as researchers

The relationship between research and teaching

1. University Audit 2000
2. Ecology Review 2001
3. Course team challenged to articulate how ecology was ‘research informed’
4. Alan Jenkins’ visit 2005
5. Ecology Programme 2002-2018
6. Five ecology papers (out of 20)
Three Strategies for teaching students as researchers

• **Strategy 1**: Develop students’ understanding of the role of research in their discipline

• **Strategy 2**: Develop students’ abilities to carry out research

• **Strategy 3**: Progressively develop students’ understanding

Jenkins, Healey & Zetter (2007)
Higher Education Academy
Strategy 2 Training students in research

Includes strategies 1 and 3:

1. Making the links between research and learning experiences clear to students

3. Making the links but ending with a capstone research project
Discussions about teaching students as researchers

- The ways in which we learn as researchers can be offered to students
- This work changes the relationship between lecturer and student (postgraduate culture)
- Ecological thinking rather than knowing about ecology
- Being against modular and micro-modular education
- Building on knowledge and skills over time
- Challenging students – what can they achieve in their education?
The present ecology curriculum and Strategy 2

- **Research from Day 1** – thread in curriculum for three year’s training in research

- The lectures help develop strategies 1 and 3 and provide foundational ecological knowledge

- Students end up with some differences in ecological subject knowledge but similar research skills

- Using the old tutorial, laboratory and field course space

- Lecturers make links to this new space during lectures
<table>
<thead>
<tr>
<th>Do you:</th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
<th>Might consider</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) develop the lecture to bring out current or previous research developments in the subject?</td>
<td>11</td>
<td>1</td>
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<td>2) develop students’ awareness of the nature of research and its role in knowledge creation?</td>
<td>8</td>
<td>4</td>
<td></td>
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<td>3) develop students’ awareness of learning from your own research projects?</td>
<td>8</td>
<td>4</td>
<td></td>
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<td>4) ensure that students are taught experimental design principles?</td>
<td>6</td>
<td>6</td>
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<td>5) develop students’ understanding of how research is organised and funded in the discipline, institution and profession?</td>
<td>5</td>
<td>7</td>
<td>2</td>
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<td>6) ensure that courses induct students into the idea of knowledge as created, uncertain and contested?</td>
<td>11</td>
<td>1</td>
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<td>7) ensure students understand that the Ecology Programme focuses on research training</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>2</td>
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<td>8) explain the reasons why students need to learn through research training</td>
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<td>5</td>
<td>7</td>
</tr>
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The development of theory

- Theory explains teaching and learning
- Theory informs teaching development
- Teaching development informs theory

Theoretical phases:

A: 2002-2007  A good way of developing ‘Critical Thinking’

B: 2008 -2013  Teaching ALL students something ‘Worthwhile’

C: 2014 -2018  ‘Powerful Knowledge’ as an outcome

NOTE: Each phase incorporates previous ideas
Phase B: Teaching **ALL** students something ‘worthwhile’

**Grid: Authentic vs. Inauthentic**

- **Axes:**
  - **Horizontal:** Fast (Non-Reflective) vs. Slow (Contemplative)
  - **Vertical:** To be (subject) vs. About (subject)

**Cells:**
- **a:** Original knowledge production
- **b:** Established knowledge production
- **c:** Knowledge consumption
- **d:** Knowledge wastage

**Legend:**
- **Authentic**
- **Inauthentic**
Phase C: Powerful knowledge

What makes powerful knowledge ‘powerful’?

1. Being skilled in producing one’s own knowledge
2. Being able to evaluate knowledge claims
3. Being able to apply the skills of production and evaluation to different knowledge contexts over time
4. Being prepared to use knowledge wisely for the good of oneself and others
Epistemic access through a ‘research apprenticeship’

- Allows understanding of how knowledge is created through research
- Develops new ways of critically evaluating published knowledge
- Is *transferable* to similar contexts during the degree and radically changes the student experience (e.g. Geography, Surveying, Zoology: peer review for friends)
An Authentic Research-Based Undergraduate Curriculum

- **Time**
  - Slow scholarship

- **Values**
  - Real world corresponding
  - Existential self
  - A degree of meaning

- **Knowledge & skills**
  - Subject
  - Methodological

- **Personal outcomes**
  - For self & others:
    - Care
    - Responsibility
    - Confidence
    - Insight

- **Knowledge outcomes**
  - Epistemic access
  - Knowledge creation
  - Knowledge evaluation

- **POWERFUL KNOWLEDGE**

- **POWERFUL ACTION**

Life after Graduation
“.. the push to be authentic and self-driven definitely gave me a lot of confidence and taught me to trust my own judgements and decisions. I think the personal outcomes are perhaps particularly what sets the ecology course apart because through my experience with my other course, zoology, I was definitely taught to evaluate knowledge and become a critical thinker, and I think this is inherent in most science degree programs. The personal development I experienced from ecology on the other hand was pretty unique.”
Theoretical Phases

A: 2002-2007  A good way of developing ‘Critical Thinking’ ✓

B: 2008 -2013  Teaching ALL students something ‘Worthwhile’ ✓

C: 2014 -2018  Powerful Knowledge as an outcome ✓

D: 2018  Powerful action after graduation ??
1) Civic engagement (e.g. volunteer work, fundraising)
2) Formal political participation (e.g. lobbying, run for office)
3) Activism (e.g. demonstrating, online activism)
4) Contributing to work environment (e.g. providing critical lens)
5) Contributing to family and social life (e.g. social groups)

(1-3) from Ekman and Amna (2012)
Thoughts on embedding the concept

- Buy in to the idea in the first place
- Research training ‘thread’ a priority in curriculum planning
- Staff meetings to discuss the theory
- Job adverts for TFs ask for this commitment
- Demonstrators trained
- Explained to students and written in course documents
- Research done - published internationally
- Contacts around the world to share practice (e.g. UCL-London, UCC-Cork, UNIS-Svalbard, SSU-Southampton, UUM-Malaysia)
Evidence for success: teaching students as researchers

Research and evaluation data including:

1 Student publications in journals
2 Lecturers research has improved
3 Student opinion survey
4 Graduate opinion survey (18 months after graduation)

Both surveys use the same questions based on the CEQ

Surveys also collect student comments, employment data etc. etc.

Sept 2018 DVC: “most impressive evaluations I have ever seen at Otago”
Student publications

New Zealand Journal of Marine and Freshwater Research
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/trzm20

Size-based dominance hierarchies in the New Zealand freshwater crayfish (koura) Paraneophrops zealandicus
C Stewart a & J Tabak b
a Ecology Degree Programme, Department of Zoology, Dunedin, New Zealand

Factors influencing spatial variation and abundance of a mermithid parasite in sand hoppers
Trent K. Rasmussen • Haseeb S. Randhawa

New Zealand Journal of Marine and Freshwater Research
ISSN: 0028-8330 (Print) 1175-8805 (Online) Journal homepage: http://www.tandfonline.com/loi/trzm20

Neighbour density, body size and anti-predator hiding time in the New Zealand mud-crab Austroholice crassa
M. Guerra-Bobo and T.E. Brough
Ecology Programme, University of Otago, PO Box 56, Dunedin, New Zealand

Trade-off between safety and feeding in the sea anemone Anthopleura aureoradiata
E Haag & K Dyson
Student opinion survey: on completion of a degree

Strongly Agree
- Good Teaching
- Clear Goals and Standards
- Learning Community
- Appropriate Assessment
- Generic Skills
- Organisation and Management
- Student Engagement
- Overall Satisfaction

Agree

Neutral

Disagree

Strongly Disagree

- 2017 All Bachelors (Excluding Ecology) [n=2970, 54%]
- 2014-2017 All Division of Sciences Bachelors (Excluding Ecology) [n=2595, 50%]
- 2017 Bachelor of Science in Ecology [n=66, 67%]
Graduate opinion survey: 18 months after graduation

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

- 2017 All Bachelors (Excluding Ecology)[n=1529, 46%]
- 2015-2017 All Division of Sciences Bachelors (Excluding Ecology)[n=1179, 49%]
- 2017 Bachelor of Science in Ecology [n=9, 53%]

- Good Teaching
- Clear Goals and Standards
- Intellectual Motivation
- Appropriate Assessment
- Generic Skills
- Organisation and Management
- Student Engagement
- Overall Satisfaction

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<tr>
<td>Agree</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>35 37 59</td>
<td>35 34 56</td>
<td>35 37 59</td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
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The new ecology degree started with a discussion about the relationship between research and teaching and the various ways in which students can encounter knowledge.

The relationship manifests itself in ‘learning’ – student’s learning and teachers learning.

Personal outcomes change learning experiences.

There were three theoretical phases to guide practice.

Powerful knowledge radically changes experiences of learning while at university.

What happens after graduation?