... tell the story of the evolution of a curriculum in which undergraduates learn as researchers:

Part 1: Models of 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 2002-2017
6. Five ecology papers (out of 20)
Three Strategies

- **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, Haskey & Zetter (2007)
Higher Education Academy

Epistemological beliefs

Strategy 3 (capstone) reflects Christopher Winch’s ideas about epistemic ascent, a foundational concept for most subjects pre-mass higher education, e.g. “in disciplines with a very hierarchical (knowledge) structure, the relationship between teaching and research can only be activated effectively at postgraduate level. At undergraduate level students lack the disciplinary framework to engage in inquiry” (in Jenkins, et al 2007, 38)

But: Lewis Elton and primary school: just get the level right

One hierarchical model?

- **Strategy 1:** Making the links between research and learning experiences
- **Strategy 2:** Training students in research (includes 1 and 3)
- **Strategy 3:** Making the links but ending with a capstone research project
Part 2: The ecology curriculum

Ecology and Strategy 2:
Research from Day 1 – thread in curriculum for three year’s training in research

Using the tutorial, laboratory and field course space

The lectures focus on Strategies 1 and 3 and provide foundational ecological knowledge

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

Part 2: The ecology curriculum

Early observations of change

1 Forced new assessment and curriculum practices

- Fewer assessments
- Integration of knowledge
- Systematic inquiry made public
- New emphasis on peer assessment (peer review) [Harland, Wald, & Randhawa 2016]
- Feedback on drafts of most work
- Students develop as ‘teachers’

2 Academic’s research benefited
(Harland, 2016)

... but practice lacked robust theoretical explanation

Part 3: The development of theory

- to explain what we were doing
- to provide a unifying theory to guide (new) practices
- to contribute our own ideas to educational theory

Theoretical phases:

- 2002-2007 A good way of developing ‘Critical Thinking’ ✓
- 2008-2013 Teaching ALL students something ‘Worthwhile’
- 2014-2017 ‘Powerful Knowledge’ as an outcome

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

Time

“Slow–contemplative” versus “Fast non-reflective”

“Access to an academic practice, like access to any fairly sophisticated practice, is not something that can be accomplished in an instant; it requires persistent and focused effort from the learner over a fairly extended period of time. Furthermore, because academic practices are essentially opaque, a ‘normal’ learner needs the reliable assistance of someone who already understands the practice.”

Morrow 2009, 106

Authenticity

<table>
<thead>
<tr>
<th>Authenticity Values</th>
<th>Focus</th>
<th>Alignment</th>
<th>Knowledge outcomes</th>
<th>Student outcomes</th>
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<tbody>
<tr>
<td>Authentic to the corresponding code</td>
<td>Task</td>
<td>Student’s research and study design</td>
<td>Original knowledge producer</td>
<td>Knowledge producer</td>
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<tr>
<td>Authentic to the aesthetic self</td>
<td>Assessment</td>
<td>Knowledge for the world</td>
<td>Knowledge evaluator</td>
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<tr>
<td>Authentic to the ecological self</td>
<td>Similar student relationship</td>
<td>Knowledge about one’s values and self</td>
<td>Self-identified learner</td>
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<tr>
<td>Authentic to the ethical self</td>
<td>Reflective practice</td>
<td>Self and other’s respect</td>
<td>- Commitment - Belonging - Satisfaction and enrichment</td>
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<tr>
<td>Authentic to the epistemic self</td>
<td>Knowledge about epistemology</td>
<td>Contribution to a community of practice</td>
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<tr>
<td>Authentic to the ontological self</td>
<td>Original contribution</td>
<td>Original knowledge producer</td>
<td></td>
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</tr>
</tbody>
</table>

Wald & Harland 2017
Phase C: Powerful knowledge

A socio-epistemic theory

- It is disciplinary specific, specialised, theoretical context-independent knowledge
- It is produced and transmitted by subject specialists in educational institutions
- It is knowledge that goes beyond an individuals’ everyday experiences

These characteristics allow those that have it to:

- Evaluate arguments
- Apply knowledge beyond specific contexts
- Become responsible citizens who can engage in matters of public importance

(School and vocational education: Bernstein, Young, Muller, Wheelahan)

Epistemic access

Powerful knowledge requires epistemic access

To achieve a high standard in research requires good subject and theoretical knowledge, as well as methodological knowledge that allows epistemic access to how knowledge is produced in a discipline

"Unless students have access to the generative principles of disciplinary knowledge, they are not able to transcend the particular context ... what knowledge is relevant for a particular purpose .."  
Wheelahan 2007, 648

"Gaining access, thus, was learning how to become a participant in practice, and since academic practices have developed around the search for knowledge, access to an academic practice entailed epistemological access”  
Morrow 2009, 70
**Epistemic access**

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

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**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

Harland 2017

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Outcomes space

Knowledge outcomes
• Critical thinking
• Epistemic access to help create own knowledge and critically evaluate knowledge claims

Personal outcomes
• Confidence in own abilities
• A strong value for taking responsibility for others
• Caring enough to challenge knowledge claims

These outcomes have been transferred to other courses, subjects and learning situations (e.g. Geography, Zoology, and tutoring)

Principal challenges (practical)

• Continuity and planning across three years in a modular curriculum
• Working with colleagues who may not have same commitment
• Repetition and re-enforcement for (new) teaching staff
• That the idea did not seem transferrable to teaching other subjects (e.g. ecology to botany). Is this related to leadership?
• Assessing original work

Principal challenges (theoretical)

Powerful action and values
A theory affords power when it allows someone to do something new (John Dewey and human action)
• Will a research-based education allow students (and teachers) to do something new that also embodies the values of powerful knowledge?
• Evidence for powerful knowledge that transcends disciplinary context during university study but not yet for powerful action after graduation
• Evidence that teachers re-evaluate purposes of higher education
Conclusion

Authentic research experiences have the potential to produce genuinely new scientific knowledge as well as a positive effect on students’ existential sense of being and belonging.

Seeking authenticity sets a high bar but project ownership gives a degree of meaning important for instilling confidence and responsibility for self and others.

Powerful knowledge is part of the process of a university education. There is a possibility of powerful action after graduation in work and life.

Powerful knowledge is a suitable ‘aim’ for higher education (more so than graduate attributes frameworks or over-specified outcomes-based education - current research).