Final Year Undergraduate research project OR a “Capstone Experience”

Do we need to re-think?

Dave Lewis
d.i.lewis@leeds.ac.uk  @lewisd99
Thank you

Biosciences: J Allen (Salford); S Bailey (Bath); R Bevan (Newcastle); D Bevitt (Newcastle); C Chalmers (Napier); A Coney (Bham); G Lace-Costigan (Salford); N Freestone (Kingston); M Hardy (Bradford); M Hejmadi (Bath); J Horrocks (Abertay); D Johnson (USW); I Kay (MMU); L Kindred (Leeds); L Lione (Herts); J Lodge (Bham); S McClean (Ulster); R McCaw (Leeds); A Muellar (UEA); E Muir (Leeds); C Palfrey (Leeds); S O’Hara (Salford); R Shiner (Wolv); D Skingsley (Staffs); R Stubbington (NTU); I Turner (Derby); K Yeoman (UEA).

Leeds: H Atherton (FMH); K Bacon (Geog); A Bruning-Richardson (Med); M Cordingley (FBS); A Cuncliffe (FBS); S Gorman (MAPS), B Henson (Eng); S Hodkinson (Geog); V Honeyman (ESSL); N Jackson (LUBS); V Manville (Env); J McKinnon (PCI); J Mellor (Med); C Morley (FBS); C Pask (MAPS); J Peacock (Geog); S Petzold (SMLC); J Robinson (LUBS); N Vasudev (Med); E Venn (Music); K Watkins (FAHC); C Watkins (Design); K Wilcockson (FBS).

Elon Univ. (USA): J Bean (Akron); C Beaudoin (Grand Valley State); C Van Zile-Tamsen (Buffalo); T von der Heidt (Southern Cross, Aust.).
Why offer research projects?

- QAA
- Accrediting Bodies
- Institutional
What is their educational purpose?

Staff (437):

Research Intensive
- Gain research experience
- Provide an insight into career in research
- Develop an understanding of the research process
- Inform career choices

Research & Teaching
- Undertake research in area of interest
- Gain new knowledge & understanding
- Opportunity for independent learning
- Critical thinking
- Develop ethical awareness & responsibility
Students have different expectations!

2\textsuperscript{nd} Yr Bioscience (989):

Level 2
- Gain new knowledge & understanding (3>4>2)
- Research into an area of interest
- Develop employability skills
- Enhance employability
- Gain relevant real-life work experience
- Inform career choices

Level 3
- Build on previous knowledge, understanding & skills (3>4>2)
- Gain research experience
- Develop expt. & technical skills
- Publication
2nd Yr Bioscience (1516):

Gain new knowledge and understanding
Gain research experience
Undertake research in an area of personal interest
Enhance employability

Develop experimental and technical skills
Develop research skills

Develop employability skills

2nd Yr Media & Communications:

Creative output
Challenging
Showcase knowledge understanding and skills

Develop employability skills
Gain relevant real life work experience
Enhance employability

Gain new knowledge understanding and skills
Build on previous knowledge understanding and skills
Portfolio development

Technical skills
Personal development
Research into an area of interest
Good degree
Professional development

Positive attitude to work
Traditional research projects @Leeds

• Individual lab-based
• Critical reviews
• Team-based laboratory
• Bioinformatics/Big data
• Computational & computer modelling

“Dreading my final year project since I started university, thought of having to do a "traditional" lab project terrified me.”
Bioscience graduate career destinations

- Scientific or medical research: 37%
- Medicine or Healthcare professions: 12%
- Non-scientific graduate employment: 15%
- Non-graduate employment: 9%
- Unpaid voluntary work: 16%
- Employment overseas: 1%
- Temporary employment: 2%
- Unemployed: 7%
- Not in employment for other reasons: 1%
- Other: 1%
“Culminating experience(s) in which students are expected to integrate, extend, critique and apply knowledge, skills and understanding gained in earlier years to a problem”

“Opportunity to showcase knowledge, skills and understanding”
What constitutes a Capstone Experience?

- Workplace Co-operative
- Oral Histories
- Portfolio
- Prototype
- Enterprise
- Student challenge
- Students in Schools
- Translation
- Media Product
- Reflective Case studies
- Students as Partners
All honours degree students are expected to have some personal experience of the approach to, practice and evaluation of scientific research, such as a project/research based assignment. Such work is likely to include data collection and analysis from, for example, laboratory, field or literature work. It may sometimes be appropriate for students to work outside the laboratory or field environment, for example, in education or in the public understanding of science. However the research project is delivered, it is expected to include an element of novelty satisfied by work that is hypothesis-driven or which leads to formation of an hypothesis.
Criteria for accreditation

To achieve accreditation for a programme, HEIs will need to provide robust evidence in support of their application, which will be judged by peer review against the standard metrics listed below. The evidence should show how the intended learning outcomes are being achieved by all graduates through appropriate assessment strategies.

1. A graduating level capstone experience which includes analysis, synthesis and critical evaluation, resulting in a defined output
   i. The capstone experience will integrate and develop the skills and knowledge gained in earlier years; bring reflection and focus to the whole of the degree experience; and provide students with the opportunity to demonstrate and apply the understanding and skills that they have developed.
   ii. The capstone experience will be:
       a. An extended piece of enquiry-based work, relevant to the degree, with a justified approach that effectively communicates its outcomes
       b. Underpinned by a range of relevant sources, and will show recognition of health, safety, environmental and ethical considerations
       c. Contextualised, and show recognition of the provisional nature of knowledge, building to an appropriate conclusion
       d. Based on the processes of critical thinking, synthesis, reflection and evaluation.
Non-traditional Bioscience Capstones

Systematic Reviews

Educational Development

Scientific Writing

Surveys

Science in Schools

Public Engagement
Demand for non-traditional Capstones

Students wishes & Staff willingness to offer

Student 1st choice vs Actual allocation

73 vs 69
8 vs 22
18 vs 8
Opinions same one year post-graduation

77% vs 65%

Undertaken vs. Preferred

7% vs 4%

10% vs 31%
Capstone Experiences across the World

- Citizenship
- Oral histories
- Systematic Reviews
- Performance
- Grand Challenges
- Engineers without Borders
- Student Challenge
- Community partnership
- Enterprise
- Civic
- Public engagement
- Reflective Portfolio
- Community
- Internship
- Students in Schools
- Translation
- Prototype
- Overseas Internship
- Client partnership
- Practice as Research
- Consultancy
- Students as Partners
- Practice as Research
Next steps @Leeds

- Large, team-based multi-laboratory
- More non-traditional
- Time “unlimited”
- Team-based systematic rather than individual critical reviews
- Grant proposals
- Commercial/Technical reports
- Rethinking assessments
- Interdisciplinary
My “ideal” Capstone

• Student centred
• High impact educational practice
• Transformational and transitional
• Build-on, showcase & apply knowledge, skills & understanding
• (Co-)Create new knowledge & understanding
• Develop new skills
• Inform career choices
• Work experience & employability
Increased focus on personal & professional development

**Females:** Independent working; Team working; Self management; Use of Initiative; Professionalism

**Males:** Experimental & Technical skills
Employability skills:

Capstone vs Employment
Learning Outcomes

- Develop and utilise employability skills
- Gain discipline specific research experience
- Develop research skills
- Gain experience of research design
- Develop discipline specific technical skills

Employability skills

- Planning and organisational skills
- Independent working
- Communication skills
- Information and communications technology skills
- Critical thinking
- Numerical skills
- Creative problem solving
- Analytical skills
- Ethical awareness and responsibility
Re-think Learning Outcomes

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Suggested Learning Outcomes

• Apply knowledge, understanding and skills gained in earlier years to a problem

• Gather or generate information: critically analyse this information to address the problem

• Gain new knowledge, understanding and skills in creating a solution to, or output for, this problem

Research Enquiry-based Learning
Re-thinking Assessments

• Valid- of learning
• Relevant and applicable

• Scientific paper
• E-portfolio

• Manage risk!
• Learn from others
Long term impact of Capstones
Impact of Capstones: Career Choices

Reconsidered but not necessarily change plans: 24
Confirmed my decision to follow particular career: 32
Made me change my plans: 4
Informed my choice of career post-graduation: 16
Opened my eyes to new career options: 20
Irrelevant to my career prospects: 31
Dissuaded me from my previous plans: 3
Impact of Capstones: Employability

- Definitely: 30%
- Probably: 38%
- Probably not: 22%
- Definitely not: 10%

Factors influencing employability:
- Valued Relevant Experience
- Competitive
- Transferable Soft Skills
- Applicable Technical Skills
- In Relevant Field
- Irrelevant to Employer's Interest
- Irrelevant to Current Role
- Not in Relevant Field
- Other Factors Greater Impact
- Prior Job Offer
- Not in Employment
Summary

• Rethink concept/scope- Capstone Experience
  ➢ Intended Learning Outcomes
  ➢ Assessments
  ➢ Relationships
• Increased focus on skills development & application: A showcase
• Retain & expand range of provision
• Multi-disciplinary, open-ended
• Transformational and translational
• Enhance employability & inform career choices
In terms of what I gained personally, the thing I will remember in 10 years time, is schoolchildren running across the playground towards me screaming Miss S, Miss S, are you coming back tomorrow to teach us!

So rewarding, the highlight of my four years in Medicine, indeed my whole education. I gained so much from it personally and professionally.................