Interdisciplinary learning and teaching: researching current and future challenges

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Overview

- Current focus on interdisciplinary provision?
- University of Edinburgh study for HEA
- Sharing experiences of interdisciplinary learning and teaching
Acknowledgements

Dr Laura Meagher, Technology Development Group
Justyna Bandola
Dr Shawn Harmon (illustrations)
HEA
Institute for Academic Development, UoE
Diet and obesity
Climate change and the low carbon economy
Health and ageing
“Grand challenges”

“Societal challenges”
UK research policy context

Although much effort must be made to sustain the health of individual disciplines, the social scientist’s value is increasingly realised in interdisciplinary work

(Foreword ESRC Strategic Plan 2009-14)
## RCUK ID investments (2008-2011)

<table>
<thead>
<tr>
<th>Programme title</th>
<th>Programme funding</th>
<th>Lead Research Council</th>
<th>Research Council partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageing: Life long Health &amp; Wellbeing</td>
<td>£486m</td>
<td>MRC</td>
<td>EPSRC, BBSRC, ESRC, NERC, STFC, AHRC</td>
</tr>
<tr>
<td>Living with Environmental Change</td>
<td>£363m</td>
<td>NERC</td>
<td>EPSRC, BBSRC, ESRC, STFC, MRC, AHRC</td>
</tr>
<tr>
<td>Energy</td>
<td>£319m</td>
<td>EPSRC</td>
<td>BBSRC, ESRC, NERC, STFC</td>
</tr>
<tr>
<td>Global Uncertainty: Security for All in a Changing World</td>
<td>£114m</td>
<td>ESRC</td>
<td>EPSRC, BBSRC, NERC, STFC, MRC, AHRC</td>
</tr>
<tr>
<td>Digital Economy</td>
<td>£53m</td>
<td>EPSRC</td>
<td>AHRC, ESRC, MRC</td>
</tr>
<tr>
<td>Nanoscience through Engineering to Application</td>
<td>£51m</td>
<td>EPSRC</td>
<td>BBSRC, ESRC, NERC, STFC, MRC</td>
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Introduction

Rural Economy and Land Use Programme

Harnessing the sciences for sustainable rural development
Rural areas in the UK are experiencing a period of considerable change. The Rural Economy and Land Use Programme aimed to advance understanding of the challenges caused by this change today and in the future. Interdisciplinary research was funded between 2004 and 2013 in order to inform policy and practice with choices on how to manage the countryside and rural economies.

The Rural Economy and Land Use Programme enabled researchers to work together to investigate the social, economic, environmental and technological challenges faced by rural areas. It was an unprecedented collaboration between the Economic and Social Research Council (ESRC), the Biotechnology and Biological Sciences Research Council (BBSRC) and the Natural Environment Research Council (NERC). It had a budget of £24 million, with additional funding provided by the Scottish Government and the Department for Environment, Food and Rural Affairs.
What is Horizon 2020?

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world firsts by taking great ideas from the lab to the market.

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness.

Seen as a means to drive economic growth and create jobs, Horizon 2020 has the political backing of Europe’s leaders and the Members of the European Parliament. They agreed that research is an investment in our future and so put it at the heart of the EU’s blueprint for smart, sustainable and inclusive growth and jobs.

By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

Horizon 2020 is open to everyone, with a simple structure that reduces red tape and time so participants can focus on what is really important. This approach makes sure new projects get off the ground quickly – and achieve results faster.
Contributing projects

II-FP5 Interdisciplinary Integration in the Fifth Framework Programme

Evaluation of Research Development Grant

Evaluations of ESRC-NERC and ESRC-MRC schemes

ESRC Researcher Development Initiative: ISSTI Interdisciplinary Masterclasses

ESRC International Peer Review

Quest: Capturing Lessons for Interdisciplinarity

Deputy Director, ESRC Innogen Centre (2007-12)

Deputy Director, ESRC Genomics Forum (2012-13)
Strategic management of IDR

• Supporting and developing interdisciplinary research teams

• Providing insights into enabling organisational infrastructures for IDR programmes

• Looking for obstacles and good practice in achieving effective interdisciplinarity

• Comparing structures, mechanisms and experiences of initiatives, nationally and internationally
Identifying and meeting a demand

Meagher L. and Lyall C. (2005), *Evaluation of the ESRC/NERC Interdisciplinary Research Studentship Scheme*

Meagher L. and Lyall C. (2009), *Evaluation of the ESRC/MRC Interdisciplinary Research Studentship and Post-Doctoral Fellowship Scheme*

Key finding from evaluations of interdisciplinary research studentship schemes:

⇒ Need for ID training and community building
It's terrible! I've just learned that my research is on a fault line.

How is your PhD thesis going?
<table>
<thead>
<tr>
<th>I work in</th>
<th>but get paid by</th>
<th>My Advisor is in</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lab)</td>
<td>(Program)</td>
<td>(Department)</td>
</tr>
<tr>
<td>...but my <em>real</em></td>
<td>Officially, I'm part of</td>
<td>...even though my office is in</td>
</tr>
<tr>
<td>Advisor is in</td>
<td>(another Department)</td>
<td>(Research Center)</td>
</tr>
<tr>
<td>(another Department)</td>
<td></td>
<td>(Basement of another building)</td>
</tr>
<tr>
<td>Most of my classes are on</td>
<td>yet technically, my degree is in</td>
<td>So basically, I belong</td>
</tr>
<tr>
<td>(Stuff I haven't seen since High School)</td>
<td>(Major other than my undergrad's)</td>
<td>(Nowhere)</td>
</tr>
</tbody>
</table>
Interdisciplinary Masterclasses

• Residential, workshop based
• Capacity- and community-building, advanced training not teaching
• Focus on ID between natural & social sciences
• Evidence of demand: 1st event 4X oversubscribed
• Audience: from students to research directors
What did we learn?

• These masterclasses are worth doing

• Early career and established researchers benefit from reflecting on ID processes

• Participants valued opportunity to network and benefit from shared learning

• Just the tip of the iceberg; funding environment challenging

(Lyall & Meagher 2012)
First destinations of doctoral graduates in the social sciences

- Commercial, industrial and public sector managers: 18.6%
- Scientific research, analysis & development professionals: 6.0%
- Engineering professionals: 0.7%
- Health professionals and associate professionals: 0.2%
- Education and teaching professionals: 10.6%
- Business and financial professionals and associate professionals: 6.7%
- Information technology professionals: 2.0%
- Marketing, sales, media and advertising professionals: 0.7%
- Researchers (university or unspecified): 6.7%
- Other professionals, associate professional and technical occupations: 2.0%
- Armed forces and public protection services occupations: 0.2%
- Numerical clerks and cashiers, clerical, retail and bar staff: 49.6%
- Other occupations: 0.2%
- Unknown occupations: 0.7%

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Interdisciplinary provision in higher education: current & future challenges

Contract with Higher Education Academy to:

– provide a literature review of interdisciplinary provision (national and international perspective)

– map scale and type of current interdisciplinary provision; classify different forms; identify UK plans for future – expansion, steady state or reduction
Deliverables (by end June 2015)

• a review of the literature about the effectiveness of interdisciplinary provision and the pedagogies which provide distinctive opportunities for interdisciplinarity
• the results of a survey indicating the scale of interdisciplinary provision and a typology of different approaches to interdisciplinarity
• case studies of effective approaches to promoting, evaluating and sustaining interdisciplinarity
literature review
  pedagogy related to interdisciplinarity, including international good practice

document analysis
  sample of offerings known to ‘demand’ ID (sustainability; international development; social dimensions of health; games design; and culture)
  UCAS search for related UG and PGT courses

on-line survey to directors of these ID programmes

short overview survey to Pro VCs
  scale & type of current ID provision; future plans
  opportunity for some ‘snowball’ sampling

semi-structured interviews
  approx. 12 deans/pro-vcs of teaching, from different sorts of institutions

case studies
  selected purposively to illustrate a range of types of ID offerings at different sorts of institutions
  1-2 interviews each, survey results

international dimension and ‘critical friend’
  University of Copenhagen study of pedagogical issues related to multiple ‘experiments’ in ID across UC

integrative analysis and reporting
  principles for supporting ID in UG and PGT education
  tools and practices; institutional approaches to addressing critical current and future challenges
Literature review

Active Learning in Higher Education
Assessment and Evaluation in Higher Education
College teaching
Higher Education
Higher Education Research and Development
Innovative Higher Education
Journal of curriculum studies
Journal of Higher Education
Review of Higher Education
Studies in Higher Education
Teaching in Higher Education
Emerging themes

• Case studies presenting implementation of interdisciplinary teaching projects, focusing on the challenges of interdisciplinary teaching

• Teaching strategies aimed at specific fields/subject areas (e.g. medical sciences, law and engineering)

• Outcomes and challenges of interdisciplinary education

• Broader context of interdisciplinarity e.g. sociocultural and communication approaches
Arguments for ID teaching

1. Educational benefits – the ability to critically assess one’s stand by viewing it from another discipline’s point of view
2. The reality of modern workplace requiring multi-professional team work
3. The global challenges (global warming, pandemics, international crime, migration, etc.) requiring critical thinking and holistic approaches

Woods, 2006
Scale and locus of provision

- Interdisciplinary programmes and courses are most commonly (but not exclusively) carried out on graduate level of education or during senior years of undergraduate education
- Scale of ID provision quite extensive – from singular workshops and courses to certification programmes and Master’s and PhD programmes
Drivers of interdisciplinarity

1. Individual-level drivers – such as personal connections between academics
2. University-level drivers – such as university strategy, university regulation regarding specific courses
3. External drivers
   • availability of funding e.g. IGERT
   • international initiatives e.g. Education for Sustainable Development by UNESCO
   • requirements of professional bodies
4. Socio-cultural and economic drivers – trends in education and workforce
5. Direction of the evolution of the discipline, for example neuroscience, law, environmental studies
Strategies for ID teaching

1. Co-teaching
   – techniques: negotiating teaching approaches, assessment criteria to mitigate the differences between teachers from different disciplines

2. Interactive methods
   – outcome-based teaching
   – real-life setting and classroom-setting
   – project-based learning, case study methods, simulation, role-playing, peer-review, peer-assessment, conferences, group projects, etc.

3. Programme-level strategies
   – combing learning and practical experience
   – core courses covering knowledge from different disciplinary approaches, interdisciplinary electives and practical implementation of knowledge from the early stages of graduate education, e.g. lab research, research teams
KEEP CALM AND CARRY ON
Discussion

- How has the provision of ID courses or programmes (not single modules) changed?
- How is this likely to change in the future?
- What are the drivers?
- What are the obstacles?
- Can we share some good practice?
Resources


Short Guide to ...

1. Developing Interdisciplinary Research Proposals
2. Reviewing Interdisciplinary Research Proposals
3. Building and Managing Interdisciplinary Research Teams
4. Supervising Interdisciplinary PhDs
5. Troubleshooting Common Interdisciplinary Research Management Challenges
6. Designing Interdisciplinary Research for Policy and Practice
7. Developing Interdisciplinary Strategies for Research Groups
8. For Funders of Interdisciplinary Research
9. Evaluating Interdisciplinary Research
10. Leading Interdisciplinary Initiatives

www.tinyurl.com/idwiki
About Interdisciplinarity

Welcome to a set of pages "About Interdisciplinarity" sponsored by the Association for Interdisciplinary Studies (http://www.units.muohio.edu/aisorg/). These pages have been housed here while under development, but will be transferred to the AIS website in due course. They are linked to from that site. Feel free to cite the contents of this website as you would any other published work.

Red font is utilized throughout to provide references to the literature.

Point form is used liberally in these pages. It is thus hoped that we can identify the key elements of definitions, history, and best practices. We hope that it will be easier to achieve consensus around particular points. We also hope to encourage discussion around particular points. We generally provide an introduction in prose form to new topics, and also a guide to references that provide more detailed discussions.

Contents:

Introductory Remarks

1. Definitions  A handful of key terms are defined.
2. Philosophy of interdisciplinarity  (very much a work in progress)
3. History of Disciplines and Interdisciplinarity
4. Interdisciplinary Best Practices  (Introductory Remarks)
   4.1 Interdisciplinary Communication
   4.2 Interdisciplinary Teaching  four types of undergrad program, graduate education, course syllabi, pedagogy, assessment, careers in interdisciplinarity
   4.3 Interdisciplinary Research  organized around nine broad steps with subsections for many steps
   4.4 Interdisciplinary Administration
   4.5 Interdisciplinary Public Policy Analysis
This section of the AIS Website (a site-within-the-site) is devoted to the Scholarship of Teaching and Learning (in general) and the Scholarship of Interdisciplinary Teaching and Learning (in particular). The Table of Contents identifies the discursive sections of the site (and the sequence in which they might best be read) and lists our resource sections for SOTL and SOITL materials. The introduction which follows will explain the option we’re offering readers to access the discursive sections in succinct form or developed form, see the last box for the developed form.

Experts in SOTL and SOITL Mary Huber, Senior Scholar Emerita of the Carnegie Foundation for the Advancement of Teaching, and Veronica Boix Mansilla, Principal Investigator of the Interdisciplinary Studies Project at Harvard University, presented on the Board-sponsored SOITL panel at the 2010 AIS conference in San Diego; not pictured, their fellow panelist Colleen Tremonte of Michigan State University, director of an initiative there in SOITL and graduate education.
Interdisciplinary Research and Team Science

In this blog entry, Julie Thompson Klein, PhD, Professor of Humanities and Faculty Fellow for Interdisciplinary Development at Wayne State University, discusses the relationship between team science and disciplinary integration. She describes the history of interdisciplinarity into the U.S. and identifies key online and print resources about collaboration and disciplinary integration.

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