Exploring the potential of an innovative information system to support transdisciplinary learning, teaching and research on sustainability

Connections Seminar
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Presentation

• The idea and its origins
• Links with UNSW 2025 Strategy
• Overview of the potential information system
• Brainstorm
The system at present: at analysis and conceptualisation phase

The instructional design ADDIE cycle
Who and what is this system for?

• An innovative online Information System (IS) and educational technology to support those interested in addressing sustainability issues through a **transdisciplinary** approach.

• Could be used in learning, teaching, researching and tackling real-world problems related to environmental, social and economic sustainability.
What is transdisciplinary research?

“Transdisciplinary research is, essentially, team science. In a transdisciplinary research endeavour, scientists... strive to understand the complexities of the whole project, rather than one part of it. Transdisciplinary research allows investigators to transcend their own disciplines to inform one another’s work, capture complexity, and create new intellectual spaces.”

Transdisciplinary Research

What’s the difference?

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<tr>
<th>Transdisciplinary Research</th>
<th>Interdisciplinary Research</th>
<th>Multidisciplinary Research</th>
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<td>Collaboration in which exchanging information, altering discipline-specific approaches, sharing resources and integrating disciplines achieves a common scientific goal (Rosenfield 1992).</td>
<td>Researchers interact with the goal of transferring knowledge from one discipline to another. Allows researchers to inform each other’s work and compare individual findings.</td>
<td>Researchers from a variety of disciplines work together at some point during a project, but have separate questions, separate conclusions, and disseminate in different journals.</td>
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From Disciplinary to Transdisciplinary

Disciplinary (1) >>> Multidisciplinary (1+1=2) >>>> Interdisciplinary (1+1=2+) >>>> Transdisciplinary (1+1 > 2+)
Where did this IS idea come from?

Back in 2011, from reading the book *Tackling wicked problems through the transdisciplinary imagination* by Brown, Harris and Russell (2010) in particular Chapter 9a by Dovers ‘Embedded scales: interdisciplinary and institutional issues’ (pp.182-192)
Dovers’ ideas

Dovers identified the following needs in tackling wicked sustainability problems:

(a) the need to make explicit the disciplines, knowledge systems and institutional systems involved in tackling wicked sustainability problems

(b) the need to enhance our collective learning by connecting the many disparate inquiries and experiments in the sustainability field
Links with eMed Map

• eMed Map is an online curriculum map (in use since 2004) which forms part of the eMed curriculum management system developed by the Medical Faculty for staff and students of the Medicine Program.

• eMed Map makes explicit the graduate capabilities, content, disciplines, knowledge systems (biomedical, clinical and social), and institutional systems (teaching staff, campus and clinical schools, and faculties) which form part of the Medicine Program.

Further information:
• Map demo at http://web.med.unsw.edu.au/emed/Map.htm
• eMed Map at emed.med.unsw.edu.au (login required).
Links with eMed Map objectives

• Capture the structure and controlled vocabulary of the Medicine Program
• Enhance communication, collaboration and information sharing amongst staff and students located in various geographical locations
• Promote a knowledge sharing culture
• Support data-driven decision making
• Provide easy integration with other information systems
• Offer easy and reliable data capture and retrieval
Links with UNSW 2025 Strategy
Strategic Priority B: Social Engagement

Theme B2: Leading the debate on Grand Challenges

• Objective 1: To tackle real-world problems through the partnership of our staff, students, alumni and the community.

• Initiatives 1: Grand Challenges Program (interdisciplinary research programs; focus on climate change, energy, water...)

• Initiative 3: Fostering Partnerships (maximise cross-disciplinary expertise and public engagement with the work of UNSW)
Strategic Priority B: Social Engagement

Theme B3: Knowledge exchange for social progress and economic prosperity

• Objective 1: An open and flexible approach to working with government, industry and communities that focuses on translating and communicating the benefits of our research.

• Initiative 2: UNSW Knowledge Exchange Agent (foster relationships between UNSW researchers, industry and community; user-friendly digital pathway into UNSW for industry, government and the community seeking research engagement; foster exchange of ideas and expertise, and generate knowledge exchange opportunities).
Potential users and their needs

- Academia
- Industry
- Community
A transdisciplinary online system to help tackle wicked sustainability problems (TRANSform)
Transforming patterns of thought

Without changing our patterns of thought, we will not be able to solve the problems we created with our current patterns of thought

Albert Einstein
An online system to support transdisciplinary learning, teaching and research on sustainability
Mapping

**Discipline and knowledge mapping tool:** to help users recognise and appreciate the various disciplines, knowledge systems (formal and informal) and institutional systems potentially involved in tackling sustainability problems, including the disparate spatial and temporal scales, perspectives, cultures and language of different disciplines. Would also include key discipline-specific references (books, journals, websites, groups etc.) related to sustainability.
Learning resources and practitioner skills:

– Key resources on the transdisciplinary approach
– Key holistic theories, frameworks, methodologies and tools to support a transdisciplinary approach (e.g. systems theory / systems thinking)
– Capabilities and skills required by transdisciplinary team members
– Opportunities to practice transdisciplinary skills
– MOOC?
Sharing

**Communication tools:** to support communication, collaboration, networking and social learning amongst individuals and teams (online forum, chat room, videoconferencing etc.)
Sharing

**Case studies**: shared to support collective learning by encouraging users to share their (disciplinary, interdisciplinary or transdisciplinary) sustainability research projects including lessons learnt and recommendations so others can learn from the experience. This information could potentially feed into the decision-making tool.
Deciding

**Decision-making tool:** to help users identify the key disciplines, knowledge systems and institutional systems potentially required to collaboratively tackle a specific sustainability problem within a defined context and jurisdiction. This function would be developed around specific indicators and algorithms, and be derived (somehow...) from data captured in the system.
Structured, integrated and curated information

- Case studies, lessons learnt and recommendations
- Communication and collaboration
- How best to tackle a wicked problem through a transdisciplinary approach (indicators, algorithms etc)
- Transdisciplinary research knowledge and skills
- Systems theory / Systems thinking
- MOOC
- Disciplines or knowledge cultures, systems, scales, key references, learning resources
- Case studies, lessons learnt and recommendations
- Communication and collaboration

Mapping
Learning
Deciding
Sharing
Types of learning, teaching and research this system could support

• **Students:** what sustainability issues could I consider? What disciplines may be involved? *(e.g. MPH Env. Health poster)*

• **Staff:** who is working on various sustainability issues across UNSW? How could I collaborate through a transdisciplinary approach? How can this approach be incorporated into my teaching?

• **Industry:** What sustainability research is UNSW conducting in my industry area? Is it ready to be applied? How could my industry get involved?

• **Community:** What sustainability initiatives are ready for use? Who could help us with this particular problem? How could our community get involved *(e.g. citizen science approach, ‘living lab’ research approach)*?
What could this IS be based on?

Our experience with eMed Map and educational technologies:

- We could adapt the general concepts and lessons learnt with eMed Map to mapping other disciplines and knowledge systems related to the sustainability field.

Relevant information systems and initiatives on sustainability - for example:

- Global System for Sustainable Development (MIT) – sustainability knowledge domains and dimensions (https://gssd.mit.edu/)
- UNSW Sustainability Reports (http://sustainabilityreport.unsw.edu.au/)
- UNSW Research Office?
- RMIT Learning and Teaching for Sustainability - resource toolkit and templates (http://mams.rmit.edu.au/juh0e9o9onwd1.pdf)
- Landscape Essentials – Australian online information centre for natural resources skills (http://farmplus.net.au/landwater/)

Relevant information systems and initiatives on transdisciplinary research – for example:

- The Academy of Transdisciplinary Learning and Advanced Studies - TheATLAS (http://www.theatlas.org/index.php)
Is this an “Innovation”?  
(e.g. www.innovations.gov.au)

• It ticks the 10 boxes of Guy Kawasaki’s “The Art of Innovation” see TEDxBerkley video & slides

• The transdisciplinary approach certainly ‘Jumps to the next curve’ (TEDx slide #3)

• Potential mantras (TEDx slide #2):
  – TRANSform: Beyond the disciplines
  – TRANSform Sustainability: Quality of life
Presentation of idea so far...

- First presented at the Human Ecology Forum, Fenner School of Environment and Society (ANU) on April 8th 2011
- Shared idea with staff from UNSW & other universities (2014-2015)
- Presented at SPHCM on 30 Sept 2015
- Recently discussed with a community group developing a sustainable living residential precinct and potential education centre (2016)
Brainstorming...
Brainstorm

• The idea
• Users & needs
• Data captured (& possibilities)
• Data integration
• Development & maintenance
• Development team
• Development approach (traditional vs agile)
• IT platform
• Funding & support
• Where to from here?
Brainstorm - idea

• Have you seen or heard of such a system?

• Would we be re-inventing the wheel?

• Could we link this project to an existing information system?
Brainstorm – users & needs

Users and their needs:
• Is such a system needed?
• Who do you think would use the system?
• Any specific organisations or groups (e.g. university, industry, government, NGO)?
• Compelling reasons for using it?
• Its uses in learning and teaching?
Brainstorm – data capture

• What data would we capture in the discipline maps?
• What categories would we map against?
• How would we structure these categories?
• How would we inter-relate the information?
• What level of granularity would we aim for?
• System flexibility and scalability (e.g. apply to other contexts)?
Brainstorm – data possibilities

What we could map (from *Tackling Wicked Problems*, Brown et al 2010):

- **Knowledge cultures and dimensions** (p.68):
  - Cultures: individual, community, specialist, organisation, holist.
  - Dimensions: content, method of inquiry, type of question, evidence, role model.

- **Knowledge systems and scales** (p.185-6):
  - Disciplines: ecology, economics, law, psychology, sociology, healthcare etc.
  - Other knowledge: Indigenous, professional, practitioner, local, community etc.
  - Spatial scales: individual, groups, jurisdiction, trade areas, global, regional, local etc.
  - Temporal scales: instantaneous, hours, days, weeks, decades.

- **Perspectives** (p.120):
  - Personal, disciplinary/scientific/technical, organisational.

- What other information is needed to match the best tasks and approaches for tackling *specific sustainability problems*? (p.190)
Brainstorm – integrating information

- Case studies, lessons learnt and recommendations
- Communication and collaboration
- How best to tackle a wicked problem through a transdisciplinary approach (indicators, algorithms etc.)
- Transdisciplinary research knowledge and skills
- Systems theory/Systems thinking
- Disciplines or knowledge cultures, systems, scales, references
- Case studies, lessons learnt and recommendations
- Communication and collaboration
Brainstorm – development

Development & maintenance:
• Who do you think would be interested in developing and maintaining the system (invest in cost and commitment)?
• Data ownership and quality control?
• User training?
• User access (institutional only, open access)?
• Use a business model (free or by subscription)?
• Form partnerships (e.g. for curating information)?
Brainstorm – development team

Team expertise required:
• Understanding of how to tackle sustainability problems through various disciplines/knowledge systems (social, biological, professional, Indigenous, organisational, community etc.) and at various levels (individual, local, national, international etc.)
• Transdisciplinary research skills
• Adult education, collective/social learning
• Information systems design – data structure, ontologies etc
• Computer science – programming, algorithms etc
• Project management
• Product management and marketing (business, start-up)
• Anthropologist (breaking down silos)?
• Other expertise?
Brainstorm – development approach

Business-systems approach used with eMed Map:

- **Literature review** and **market analysis** of systems available.
- Identify **system requirements** with a team of sustainability practitioners, researchers and students (and possibly industry and community groups).
- Prepare system **requirements document**, including workflow plan for data entry, review and maintenance.
- Complete **market analysis** – decide if to use/adapt existing system or building new one.
- **Prototype** system according to specifications.
- **Pilot** prototype and workflow, and revise as needed.
- **Build, test and release** final IT system.
- **Evaluate** system and business process.
- **Maintain** data quality.
- **Upgrade** system as needed.
Brainstorm – development approach

‘Agile’ development process?

• General **market analysis** of systems available.
• Identify **general system requirements** with a team of sustainability practitioners, researchers and students, and preferably also industry and community groups.
• **Prototype** system according to general specifications.
• **Pilot** prototype (and workflow) with users and evaluate.
• If **findings** show promise continue, if they don’t then re-design and re-test (or ditch idea...)
• Correct?
• Combine approaches?
Brainstorm – IT platform

What IT platform or system would we need?

• A robust database-driven online system that can support content management, communication and collaboration?

• A comprehensive wiki + database? For example:
  - Atlassian Confluence [https://www.atlassian.com/software/confluence](https://www.atlassian.com/software/confluence)
  - MediaWiki (with Semantic)
  - Tiki Wiki [http://info.tiki.org/Tiki+Wiki+CMS+Groupware](http://info.tiki.org/Tiki+Wiki+CMS+Groupware)

• A combination of IT systems?

• Any other ideas?
Brainstorm – funding & support

Funding and support:
• University, L&T grant?
• Research grant?
• Industry partnership? Community grant?
• ‘Innovations’ funding?
• Angel investors? Start-up?
• Link to other sustainability initiatives?
• Link with industry?
• Link with community or grass-roots projects?
• Any other ideas on funding, links or partnerships?
Where to from here?

• Would you like to see this move forward?
• Would you like to be involved?
• Would you like to stay in touch?
• Any final comments?

Thank you for your time and ideas

For further information please contact Eilean

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