Undertaking Interdisciplinary Research

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Are interdisciplinary researchers born or made?
Objectives

"I'm on the verge of a major breakthrough, but I'm also at that point where chemistry leaves off and physics begins, so I'll have to drop the whole thing."
• Increased focus on problem-orientated research.
• Desire for research to have impact and effect change.
• Efficiencies in research funding.
• Drive to more closely link science/research with society
• Impact of globalisation on research questions and problems.
“Disciplines have contrasting substance and syntax...ways of organizing themselves and of defining rules for making arguments and claims that others will warrant. They have different ways of talking about themselves and about the problem, topics, and issues that constitute their subject matters”.

Schulman, 2002, pp. vi-vii

“The defining elements of a discipline’s perspective include the phenomena it studies, the kind of data it collects, the assumptions it makes about the natural and human world, its epistemology or rules about what constitutes evidence or “proof”, its theories about the causes and behaviours of certain phenomena, and its methods”.

Repko, 2008, p. 58
What do different disciplines do?

Working in pairs, write 2-3 sentences that attempt to define the work and approach of the three disciplines below:

- Earth Science
- Cultural Anthropology
- Art History

While writing your brief definition, think about the types of knowledge that are valued and the assumptions at play.
Earth Science focuses on the large-scale physical processes of planet Earth and is concerned with both the details and functions of the four subsystems and their interactions.

- Humanity is subject to the forces and laws of nature.
- The principle of uniformitarianism is used. Since geologists are concerned about the history of the Earth but can’t directly observe it, they accept that natural laws and processes have not changed significantly over time.
- Methods: quantitative – displaying and analyzing data, stats, geographic information systems, computer modeling...
Anthropology sees individual cultures as organic integrated wholes with their own internal logic and culture as the set of symbols, rituals, and beliefs through which a society gives meaning to daily life.

- Human behavior is patterned, lawful, and principled.
- Cultural relativism – the notion that people’s ideas about what is good and beautiful are shaped by their culture – assumes that systems of knowledge possessed by different cultures are incommensurable.

- Methods: reconstruction techniques, sampling, cultural immersion, fieldwork, interviewing, observation, description, behavioral analysis, archaeology...
Art history views art in all of its forms as reflecting the culture in which it was formed and therefore proving a window into a culture.

Human behavior is idiosyncratic, unique, and the result of free will and not determined.

Modernists assume that the intrinsic value of the object is primary and compare works with standards of aesthetics and expertise. New art history considers social and cultural contexts and conflicting understandings of art.

Methods: theorising of art techniques, structure and meaning, formal analysis of art works, iconographic studies, audience studies, societal studies.
“Multidisciplinary research tackles a research project from the perspective of a range of disciplines, but researchers from each discipline work in a self-contained manner with little cross-fertilization among disciplines, or synergy in the outcomes”.

“Interdisciplinary studies is a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline and draws on disciplinary perspectives and integrates their insights to produce a more comprehensive understanding or cognitive advancement”.

“Transdisciplinary, like interdisciplinarity, is descriptive of collaborative research and problem solving that, unlike interdisciplinarity, crosses both disciplinary boundaries and sectors of society by including stakeholders in the public and private domains”.

Curiosity-led research is where the aim is to answer academic questions, usually as a result of a discipline having reached the limits of its methodological capacity and needing to bring new insights to overcome a blockage or to bridge a gap.

Problem-led research focuses on a social, technical, and/or policy issues that require the input of multiple disciplines in order to be answered or solved.
Pushing The Need for Interdisciplinary Work | Stéphanie Walsh Matthews | TEDxRyersonU

https://www.youtube.com/watch?v=QNqoLybBljs
DISCUSSION

What are the benefits of interdisciplinary research?
• For Funders?
• For Institutions?
• For Researchers?

What are the challenges of interdisciplinary research?
• For Funders?
• For Institutions?
• For Researchers?
BENEFITS

- Access to equipment and knowledge.
- Solution to increased specialisation.
- Address complex research questions.
- New knowledge complexes.
- Cutting-edge research.
- Cross-fertilisation.
- Global perspectives.
- Expanded networks and influence.
- Increase quality and number of publications.
Might undertaking interdisciplinary research impact on your career?

• What do you think are the risks?

• What do you think are the benefits?
# Risks and Benefits

## Risks
- Methodological Confusion
- Lack of focus
- Difficulty with evaluation and validation
- Fewer high quality journals
- Disagreements over ownership
- High Risk of Failure
- Bottlenecks due to interdependencies
- Understanding of recruitment panels
- Job market focuses on discipline-based teaching.

## Benefits
- Interesting and exciting
- Flexible and diverse
- Larger methodological portfolio
- New perspectives
- Enhanced communication skills
- Practical and relevant research.
- Complex
- Cost effective
- Wider audience
- Valued by funders.
Team Identities

• Allow for start-up time
• Promote collaborative dialogue to find common ground.
• Be flexible and adaptable – roles may change
• Foster a learning environment
• Encourage debate, but minimise conflict
• Ensure a culture of trust.
What are the attributes, skills, and traits of interdisciplinary researchers?
Attributes, Skills, and Traits

- Tolerance for Ambiguity
- Imagination and Creativity
- Humility
- Team Player
- Inquisitive
- Flexibility
- Adaptability
- Abstract Thinker
- Dialectical Thinker

- Holistic Thinker
- Willingness to learn
- Open mindedness
- Listener
- Communicator
- Connector
- Patience
- Perseverance
1. What do we expect to get out of this?
2. Who is going to do what and by when?
3. Who will have access to our data?
4. Who will give public presentations, and how much data will they reveal?
5. How will we assign authorship?
6. How will we decide when to publish?
7. Who owns the intellectual property?
8. Will we share our data with others?
9. What happens if one of us leaves the project?
10. What happens if one of us wants to form a separate, but related, collaboration?

Ledford (2008)
It is important for leaders to be selective, to vet the possible collaborators, because you only have so much time and so much resource. You want to have a collaboration with others who are successful in what they do, you also want them to have the reputations to be complementary with what you do, to ensure that you get maximum return.

Meahger and Lyall, 2005c: 13
DESIGN

- strength of interdisciplinary research
- degree of focus
- connectivity with users
- duration of project
- size of team
- number of institutions
- number of countries
- number of disciplines
- maturity of relationships
- support and resources

Adapted from Lyall, Bruce, Tait, and Meagher (2011).
1. Define the problem and state the focus.
2. Justify the interdisciplinary approach.
3. Identify the relevant disciplines.
4. Conduct the literature search.
5. Develop adequacy in each discipline.
6. Analyse the problem and evaluate each insight.
7. Identify conflicts between insights and their sources.
8. Create or discover common ground.
9. Integrate insights.
10. Produce an interdisciplinary understanding and test.
Repko’s 5 Modes of Integration

1. Theory Expansion is used to modify a theory so that it can address all of the causation factors pertaining to the problem,

2. Redefinition involves modifying or redefining concepts and assumptions used by the relevant disciplines to bring our a common meaning.

3. Extension addresses conflict between disciplinary concepts or assumptions by extending the meaning of an idea beyond the domain of one discipline into the domain of another discipline.

4. Organisation identifies underlying commonalities in meaning of different disciplinary concepts or assumptions and then redefines and organize these to bring out a relationship between them.

5. Transformation uses continuous variables in contexts where concepts or assumptions are not merely different, but opposite. Opposing assumptions are transformed are transformed into variables or a continuum to resolve the dichotomy.
Validation

Depth:
Derived from competence in pertinent knowledges and approaches.

Rigour:
Derived from the attentiveness to process and integration.
Disciplinary Differences

Conflict Objectives

Communication Barriers

Expectations

Attitude and Bias
The Nature of Knots
This topic covers the nature of knots, which includes uncovering the unifying and organising ideas that underpin knottedness in nature, establishing mathematical methods for quantifying knottedness, measuring experimentally and developing techniques to control knottedness and identifying the scientific and technological consequences and implications of knottedness.

Innovation for Sustainable Living
This topic covers innovation for sustainable living, which might involve disruptive science and engineering and their role in new energy, materials and transport, mathematics and statistics, public policy, economics and the complexities of trade-offs, psychology and determining the driers of behaviour change, lessons from history and comparative social analysis.
1. Why do you want to undertake interdisciplinary research?
2. Where do you want to make your contribution?
3. How might you ensure you are networked with the disciplines that you wish to work with in the future?
4. What support, training and resources do you need?
5. How will you ensure that interdisciplinary work adds value to your chosen career path?
6. How will you demonstrate the quality of your interdisciplinary approach and outcomes?
Thank You

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