Transdisciplinary and Interdisciplinary Research Teamwork

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Interdisciplinary (ID) and Transdisciplinary (TD)

- Interdisciplinary science teams: include 2 out of 3 of categories – social and/or natural and/or engineering sciences.

- Transdisciplinary science teams: interdisciplinary + include non-scientists, such as agency managers, policy makers, community members, NGO staff

Our backgrounds

- Many, mostly IAI CRN3 and US National Science Foundation SEES (Science, Engineering, and Education for Sustainability) projects on water, bioenergy, climate change, energy conservation
- Highly interdisciplinary, international proposals and grants
- Teams of 3-40 social, natural, and engineering scientists with US$ 300,000-4.8 million
- Taught international graduate classes on ID science team skills, publishing about it, and have new IAI grant on ID teamwork
- Natural resource policy scientist and conservation biology

Why do ID or TD science work?

ID and TD Team Science Advantages

- Solving global change problems: climate change, sustainable agriculture, biodiversity losses, health issues
- ID/TD teams have broader expertise, better fit to study and solve complex environmental research problems
- Learning about other fields is satisfying
- Science agencies require it

Challenges!

- Managing ID science teams is very hard
- Managing TD science teams is even harder

How are ID and TD processes difficult?

ID/TD Scientific Proposals: Common Problems

- Poor integration of scientists and non-scientists
- Poor integration across disciplines and research questions
- Poor integration across products/outcomes
- Poor balance between practice, management, policy, and science goals

Why is it so hard to do ID and TD work?

Differences

	Industry	NGOs	Government	Scientists
Values	Product creation, profits, competitive-ness, market stability, dependable supply chains,	Solve problems, generate grant funding,	Solve problems, happy constituency /voters, protect budgets,	Research Productivity, peer reviewed articles, research $, training graduate students,

Differences

	Industry	NGOs	Government	Scientists
Beliefs/knowledge	Product design, marketing, materials, competitors,	Problem context, key players, relationships,	Political context, problem context, policy context,	Discipline-specific, research design, methods, analysis, publication and proposal writing,

Differences

	Industry	NGOs	Government	Scientists
Norms (rules for behavior, common behaviors)	New products, protect competitive-ness, launch and market products,	Find new problems, fund projects, implement, evaluate, demonstrate	New administratn, new policies and problems,	Develop, fund, publish research, fund and train graduate students,

Differences

	Industry	NGOs	Government	Scientists
Goals	Generate profit, maintain competitive-ness,	Solve problems, show funders effectiveness Protect recipients	Solve problems, keep constituents happy, manage resources well,	Publish highly cited research, train productive graduate students, fund and solve problems,

Differences

	Industry	NGOs	Government	Scientists
Organization Types/context	Companies, corporations, commercial businesses, associations,	Local, regional, national, international,	Local, state, provincial, regional, national, international	Universities, research institutes, science agencies

Differences

	Industry	NGOs	Government	Scientists
Rewards	Profit generation,	Outcomes, outputs,	Outcomes, outputs,	Promotion, tenure, raises, status, $ generated, graduates,

Differences

	Industry	NGOs	Government	Scientists
Language				Scale, variation, hypotheses, methods, research design, broader impacts, intellectual merit

Differences

	Industry	NGOs	Government	Scientists
Training/skills	Product design, development Managemen t Production, Marketing,	Managemen t Grants, Project development Implement, Evaluate	Technical, planning, budgets, management Administratn Policy development	Graduate school, post doc, tenure process: gaining research design, publishing, proposal writing skills

Transdisciplinary =

- A LOT of differences!

Research Teams = Small Work Groups

- Effective small work groups MUST have:
  - Shared language, concepts, values
  - Shared goals
  - Shared norms and roles
  - Shared identity with the group.

Creating effective small work groups is HARD!

- The more differences within the group, the harder it is to get:
  - Shared language, concepts, values
  - Shared goals
  - Shared norms and roles
  - Shared identity with the group.

ID group: Social, natural, and engineering scientists

- Shared language, concepts, values?
- Shared goals?
- Shared norms and roles?
- Shared identity with the group?

Social scientists?

- Language, concepts, values?
- Goals?
- Norms and roles?
- Identity with the group?

Natural scientists?

- Language, concepts, values?
- Goals?
- Norms and roles?
- Identity with the group?

TD group: Social, natural, and engineering scientists, policy makers, managers, NGO staff, community members…

- Shared language, concepts, values?
- Shared goals?
- Shared norms and roles?
- Shared identity with the group?

Interdisciplinarity = Heterogeneity

- Of knowledge,
- scientific norms (research questions v. hypotheses; experimental v. research design; credit),
- language (gradients v. variation),
- respect (unintended insults: soft v. hard science; science v. social science);
- scale, etc.
- HETEROGENEOUS SMALL GROUP MANAGEMENT IS HARD!!!!!

Best Practices

(from Halvorsen et al. 2016)

- **The development and management of a successful ID scientific team is hard.**
  - Be ready for frustration and challenges.
  - Have strategies to fix common ID and TD problems.
  - Be patient.

Best Practices

- Invest time in the development of team member and/or leader training in ID and TD team social interaction and task skills.

Best Practices

- **Choose team members carefully.**
  - Social skills are as important as scientific skills.
  - Choose people committed to good ID/TD work.
  - Some team members should have ID/TD experience.
  - ID and TD work can be easier for some disciplines, for instance, applied fields, environmental social sciences.

- **Including some people with strong relationships helps kick-start cohesion, identity, and commitment.**

Best Practices

- **Start meeting as a team early.**
  - The development of group cohesion and identity takes time but it is essential to success.
  - Plan for twice as much meeting and work time as for a unidisciplinary proposal or project.
  - Assign responsibilities, for instance, socioeconomic and natural scientific subteam leaders.
  - Plan to present across disciplines about scientific philosophies, concepts, research design, theory, and methods.

Best Practices

- **Smoothly functioning small groups require clear norms, roles, and expectations. Be careful to show respect across disciplines.**
  - Begin by discussing good and bad prior ID and TD experiences.
  - Agree on strategies to avoid common ID and TD problems.
  - Agree on rules to show respect, for example, never use terms like: “science and social science” or “hard and soft science.” Treat non-scientists as equals.

Best Practices

- **The creation of successful ID teams requires good leadership.** The team leader should:
  - Have experience in working in successful ID and TD teams.
  - Invest time in learning about other disciplines, for instance, there is no "Social Science" discipline, there ARE anthropologists, geographers, political scientists, etc. with different skills and approaches to scientific work.
  - Demonstrate respect across disciplines.

Best Practices

- **Successful teams have a shared purpose.**
  - You will have an idea of the scientific goals to start…
  - But people in different disciplines will probably have different goals.
  - Investing extra time in meeting and discussing goals and research designs and integration will help create success.

Best Practices

- **Include critical mass of scientists and team members of various types, avoid "tokens."**
  - A 10 person TD team should not have just 1 social scientist, 1 policy maker and 8 natural scientists.

?Preguntas?