Scientific Collaboration in Interdisciplinary and International Settings

Eversole Associates, April 26th 2023

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Introductions

Jeni Cross, PhD

Anne Mook, PhD
Objectives

- Trends in the Science of Team Science
- The Impact of Team Science
- Interdisciplinary and international communication
Poll: Where in the World are You?

- US South
- US Northeast
- US Midwest
- US West
- Canada
- Latin America
- Scandinavia
- Western Europe
- Mediterranean
- Eastern Europe
- Africa
- Elsewhere in the world
TRENDS IN THE SCIENCE OF TEAM SCIENCE
POTENTIAL

GLOBAL IMPERATIVES

UNIQUENESS PEOPLE, PLACE & TIME
Climate Change
Feeding the Globe
Human Health
Ending Homelessness
Exploring Universe

The grand challenges of today will not be solved by one discipline alone. They require convergence: the merging of ideas, approaches and technologies from widely diverse fields of knowledge to stimulate innovation and discovery.
Current Shifts in Science
The complexity of science.

Science can be seen as an expanding and evolving network of ideas, scholars, and papers. SciSci searches for universal and domain-specific laws underlying the structure and dynamics of science.

ILLUSTRATION: NICOLE SAMAY

Science of Science  (Fortunato et al. 2018)
Science is Growing in Complexity

Open Science

VERY Big Team Science

New Analytic Power

Data Intensive Science

Complexity Science
Research driven by a specific and compelling problem. Convergence Research is generally inspired by the need to address a specific challenge or opportunity, whether it arises from deep scientific questions or pressing societal needs.

Deep integration across disciplines. As experts from different disciplines pursue common research challenges, their knowledge, theories, methods, data, research communities and languages become increasingly intermingled or integrated. New frameworks, paradigms or even disciplines can form sustained interactions across multiple communities.
Teams are Growing in Size (Fortunato et al. 2018)

A team-authored paper in science and engineering is 6.3 times more likely to receive 1000 citations or more than a solo-authored paper.
Interdisciplinarity in Published Articles 1950-2010

(Van Noorden 2015)
Some Fields are More Interdisciplinary

(Van Noorden 2015)
International Collaboration Science & Engineering Articles 2020

https://ncses.nsf.gov/pubs/nsb20221
Impacts of Team Science
Bigger Teams, Bigger Questions  (Sharma et al. 2015)
New Ecological Science is Possible

(Cheruvelil & Soranno 2018)
Multi-Layer Network Studies

(Hammoud and Kramer 2020)

New Discoveries for Treatment

DRD2 Genes

G protein-coupled receptor

Reward Mediating Pathways

ADHD
Sleep Duration
Schizophrenia

Risk Factors

Suicide Attempts

(Kimbrel et al. 2022)
Long-term Impacts  (Van Noorden 2015)

Three years after publication: less impact
Citations decrease as a paper’s interdisciplinarity increases.

Thirteen years after publication: more impact
Citations increase as a paper’s interdisciplinarity increases.

In the long term, citations rise sharply when a paper’s references point to distant disciplines (for example, engineering and biology).

Two measures of interdisciplinarity:
- Variety: the spread of references across disciplines
- Disparity: the ‘intellectual distance’ between disciplines in references
Flatter Teams = Greater Impact
(Xu, Wu and Evans 2022)
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when more members of the team are integrated into leading roles, the character of research changes and comes to influence unfolding scientific advance in strikingly different ways
Interdisciplinary and International Communication
What is your home discipline?

Share in the chat!
## Barriers to Effective Communication

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>Intonation, colloquialism, accents, non-verbal</td>
</tr>
<tr>
<td>Power and status</td>
<td>Order and rules, who comes to, maintains, and loses power</td>
</tr>
<tr>
<td>Physical preferences, intimacy</td>
<td>Personal space, use of time, expectations of coworker relationships, relationships between sexes</td>
</tr>
<tr>
<td>Rewards and punishment</td>
<td>Agreement on good and bad behavior, what should be rewarded and disciplined</td>
</tr>
<tr>
<td>Ideology</td>
<td>Giving meaning to unexplainable events</td>
</tr>
<tr>
<td>Emotional</td>
<td>Expression of emotions, stress, uncertainty</td>
</tr>
<tr>
<td>Cultural</td>
<td>Attitudes, values, believes</td>
</tr>
</tbody>
</table>
# International miscommunication

<table>
<thead>
<tr>
<th>American saying</th>
<th>American meaning</th>
<th>Dutch interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you want more tea? “I am good”</td>
<td>No, thanks</td>
<td>Yes</td>
</tr>
<tr>
<td>Break a leg</td>
<td>Good luck</td>
<td>F*** you</td>
</tr>
<tr>
<td>How are you?</td>
<td>Hi</td>
<td>I want to know exactly how you are feeling</td>
</tr>
<tr>
<td>Compliments</td>
<td>Appreciation/friendliness</td>
<td>What do you want from me?</td>
</tr>
<tr>
<td>Avoidance of negative emotions/criticism</td>
<td>Professional</td>
<td>Fake</td>
</tr>
</tbody>
</table>
## Interdisciplinary miscommunication

<table>
<thead>
<tr>
<th>Biology</th>
<th>Biology meaning</th>
<th>Sociology interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>Group of organism</td>
<td>Group of people</td>
</tr>
<tr>
<td>Protein</td>
<td>Macromolecular polypeptides</td>
<td>Chicken, beef, or scrimp?</td>
</tr>
<tr>
<td>Concentration</td>
<td>The amount of a substance that is in a certain amount of</td>
<td>Focus</td>
</tr>
<tr>
<td></td>
<td>tissue or liquid</td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>Any member of two classes of chemical compounds derived</td>
<td>Drink with bubbles</td>
</tr>
<tr>
<td></td>
<td>from carbonic acid or carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>Colony</td>
<td>Two or more conspecific individuals living in close</td>
<td>Territory subject to a form of foreign rule</td>
</tr>
<tr>
<td></td>
<td>association</td>
<td></td>
</tr>
</tbody>
</table>
Problem of Unacknowledged Differences

We are different from one another... But we don’t necessarily know how... We tend to assume that we are more alike than we are.

(Eigenbrode et al. 2007)
Difference is not the problem!
Solution: Guidelines for Communication

Set up norms and expectations regarding interpersonal communication in your team

- Language (e.g., use of slang, acronyms, jargon)
- Norms what should and should not be discussed
- Formality (e.g., use of titles)
- Platform (e.g., text, email, Basecamp)
- Frequency, duration, and timing
- Turn taking, participation, silence
- Cameras & microphones online
Solution: Address issues early

For other individuals they may not be aware that their message is not received the way they intended

• Observe non-verbal cues
• Seek clarification (e.g., what do you mean by that)
• Repeat your interpretation
• Offer resources to overcome intercultural/interpersonal barriers
  • Information on cultural differences
  • Guidelines to specific organizations
  • Counseling
Solution: Be aware of self and others

Everyone is different. No guide or strategies can overcome all individual nuances. With some people a certain communication style works, while others may need a different approach.

- Be genuine and share who you are and why
- Be curious and get to know others and their styles
Citing this presentation:

References


Thank you