WELCOME: SciTS 101: Fundamentals of the Science of Team Science

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History and Philosophy of Science

- Decades long tradition of scholarly work examining science and medicine through historical lens
  - Examines how humanity's understanding of the natural world has changed over the centuries
  - Studies the cultural, economic, and political impacts of scientific innovation
The Scholarly Study of Science
Foundational Approaches

Social Studies of Science
- Studies of scientific knowledge, and R&D
- Examines dynamics of science including relationship to politics, society, and culture

Science & Technology Studies
- Examines social dimensions of science and technology
- Explores the role and ethical implications of S&T in society
The Scholarly Study of Science
Foundational Approaches

Scientometrics
- Measures and analyzes science, technology, and innovation
- Examines scientific impact (e.g., bibliometrics)
- Maps scientific fields

Science of Science Policy
- Relies on quantitative data and qualitative information
- Seeks to provide rigorous, quantitative basis for science policy
- Develops theory and models to guide decisions about investments in science
A New Field - *Science of Team Science*

- Commitment to develop scholarly examination of teamwork in science
- Goal to understand and improve how scholars interact and integrate across disciplinary, professional, and institutional boundaries

“the inherent complexity of contemporary public health, environmental, political, and policy challenges... [leads to] realization that *an integration of multiple disciplinary perspectives is required* to better understand and ameliorate these problems” (Stokols et al., 2008).

- Must understand how to make full use of the **scientific capacity** of science teams (Salazar et al., 2012)


The Science of Team Science
Why Study Teams in Science

- What we mean by teams is the same inside and outside of science
  - Multiple information sources and intensive communication
  - Task-relevant knowledge with meaningful task interdependencies
  - Coordination among members with specialized roles
  - Affective and attitudinal factors influence group dynamics

- Reframing science collaboration as a process of teamwork to be mastered (Fiore, 2008)
  - Allows us to leverage social sciences
  - Changes question to understanding team activities necessary for science
  - Makes the achievement and measurement of team science more tractable

Scientific study of teamwork is important catalyst

- Matured into its own area of inquiry producing a rich base of knowledge
- Helped us to better understand the complex coordinative processes engaged by teams

Applying the science of teams to team science

- Physician heal thyself...

### Key Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Ranges Possible in Team Science</th>
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<tbody>
<tr>
<td><strong>Size</strong></td>
<td>Small (2)</td>
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<tr>
<td></td>
<td>Mega (1000s)</td>
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<tr>
<td><strong>Task Interdependence</strong></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>High</td>
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<tr>
<td><strong>Boundaries</strong></td>
<td>Stable</td>
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<td>Fluid</td>
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<td><strong>Goal Alignment</strong></td>
<td>Aligned</td>
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<td></td>
<td>Divergent or Misaligned</td>
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<tr>
<td><strong>Integration</strong></td>
<td>Unidisciplinary</td>
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<tr>
<td></td>
<td>Transdisciplinary</td>
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<tr>
<td><strong>Diversity</strong></td>
<td>Homogeneous</td>
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<td></td>
<td>Heterogeneous</td>
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<tr>
<td><strong>Proximity</strong></td>
<td>Co-located</td>
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<td>Globally Distributed</td>
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NRC Report on *Enhancing the Effectiveness of Team Science*
The GOOD NEWS
There is a rich and robust scholarly literature on team performance that can be extended to improve team science effectiveness

- The science points to interventions for:
  - Assembling teams
  - Providing professional development and education opportunities
  - Supporting leadership development opportunities
  - Virtual collaboration
  - P&T credit for team-based work
  - Study and measurement of science teams

Report Free for Download
http://sites.nationalacademies.org/DBASSE/BBCSS/Enhancing_Effectiveness_of_Team_Science/index.htm
Duality of the Science of Team Science (SciTS)
- Exists a complementarity in our goals
- Draws from iterative give-and-take between understanding and use

(1) Studying science teams to:
- Gain fundamental understanding about the production of knowledge
- Develop methods and models to improve the scientific enterprise

(2) Applying what is known to improve effectiveness of science teams
- Utilize concepts from study of other team types (e.g., team training)
- Draw from measures and metrics of teamwork (e.g., information sharing)
Practice Active Listening

- **Carefully attend** to what is said
- Ask other party to **explain what is meant**
- Request that **ambiguous ideas** or statements are **repeated**
- Targets “**listening to learn and understand**” and “**listening to contribute and integrate** to problem solving”

Practice Assertive Communication

- **Directly express** ideas and opinions
- **Address conflict** purposely and openly
- **Address differences** without intimidation
- Targets the ability to “**propose ideas**”, to “**question disciplinary values/methods**” and to “be directive and **appropriately assert your needs** and views”
## Workshop Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td><strong>SciTS 101: Laying the Foundation</strong> (Stephen M. Fiore)</td>
<td>8:30-8:45</td>
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<tr>
<td>8:45-9:00</td>
<td>Understanding Integrative Capacity for Science Teams</td>
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<td>9:00-9:30</td>
<td>Developing Integrative Capacity</td>
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<tr>
<td><strong>Integrative Capacity</strong> (Maritza Salazar)</td>
<td>9:30-9:45</td>
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<td>9:45-10:00</td>
<td>Break</td>
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<td>10:00-11:00</td>
<td>Facilitating Team Communication Using the Toolbox Dialogue Method</td>
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<td><strong>Collaboration Planning</strong> (Kara Hall and Amanda Vogel)</td>
<td>11:00-11:15</td>
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<td>11:15-11:45</td>
<td>Considerations for Collaboration</td>
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<tr>
<td><strong>SciTS 101: Keeping Perspective</strong> (Stephen M. Fiore)</td>
<td>11:45-12:00</td>
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Dealing with Scholarly Structure

- Disciplines are distinguished partly for historical reasons and reasons of administrative convenience (such as the organization of teaching and of appointments)... But all this classification and distinction is a comparatively unimportant and superficial affair. **We are not students of some subject matter but students of problems. And problems may cut across the borders of any subject matter or discipline** (Popper, 1963).

Dealing with University Structure

- What is critical to realize is that “the way in which our universities have divided up the sciences does not reflect the way in which nature has divided up its problems” (Salzinger, 2003, p. 3)

**NEXT STEPS** – Collaborations influencing the practice of science and production of knowledge. To achieve success we must surmount these challenges.

**Conclusion: Looking Back to Look Ahead**

**These fictions we call disciplines**

“Academic disciplines are made, not found. They are socially constructed, just like ideas, organizations, identities or relationships... Like other social constructs, disciplines have become reified, such that social actors forget their responsibility as creators, perceiving what they themselves have made as solid and unchanging... In particular, universities are responsible for the reification of disciplines, and surprisingly recently... University departments [are] now well established “as the basic unit of academic organization”. As is the case with other social constructs, once disciplines were built into the design of a university in the form of departments, they became solid in a new way, and consequently more difficult to question or modify” (Leeds-Hurwitz, 2012)

- **NEXT STEPS** – Academic and scholarly cultures need to move beyond the artificial organization of knowledge.

Collaborate to Solve the Big Problems

“Forget about finding your passion. Instead, focus on finding big problems. Putting problems at the center of decision-making changes everything. It’s not about the self anymore. It’s about what you can do and how you can be a valuable contributor. People working on the biggest problems are compensated in the biggest ways... in a deeply human sense. For one, it shifts your attention from you to others and the wider world. You stop dwelling. You become less self-absorbed. Ironically, we become happier if we worry less about what makes us happy” (Segovia, 2012).

- NEXT STEPS – (Understanding) scientific and professional collaboration is the most likely path to solving complex societal problems.

Thank You!

Questions or Comments?

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