TOOLS YOU CAN USE:

Practical Team Science Guidance for Research Leaders & Funders

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Vice President, Global Academic & Research Relations

Translating Science to Practice

- There is an increased demand for team science initiatives in academia and by external funding agencies.
- Coordination costs mean that team science takes more time, at least proximally; distal payoff in terms of acceleration.
- Imperative that we understand the most effective practices for productive cross-disciplinary collaboration and team science.
- Then train individual investigators, institutional leaders, and funders to employ them.
TEAM SCIENCE
Volume 2, Issue 2 – 2012

In our new issue, academic leaders around the globe share their knowledge of and experience with team science. Authors from the United States, Germany, Malaysia, and India explore team science in terms of institutional and national influence, team science tools and leadership, team formation and research networking systems.

Case Study Approach:


- What was the nature/impetus for the collaboration?
- What factors helped the team build trust?
- What factors threatened that trust?
- How did the team use communication effectively?
- What communication issues were problematic for the team?
- How did the team manage conflict?
- What role, if any, do power and hierarchical relationships play in this case?
- What strategies did the team employ to share credit?
The **Toolbox Project**\(^1,2\) Collaborative Communication Workshop provides a philosophical yet practical enhancement to cross-disciplinary, collaborative science. Rooted in philosophical analysis, the Toolbox workshop enables investigators, research development professionals, project managers, and collaborators to engage in a structured dialogue about their research assumptions and cross-disciplinary collaboration. This yields both self-awareness and mutual understanding, supplying individuals with the robust foundation needed for effective collaborative research. Led by Toolbox Project Facilitators, Workshop participants will engage in small group discussion and share respective views in response to a number of probing statements about science motivation, methodology, confirmation, objectivity, values, and reductionism.


### Toolbox Questionnaire

<table>
<thead>
<tr>
<th>Philosophical domain and issue</th>
<th>Core question</th>
<th>Probing Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Epistemology</strong></td>
<td>1. Applied research is more important to me than basic research.</td>
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<tr>
<td>Motivation</td>
<td>Does the principal value of research stem from its applicability for solving</td>
<td>Disagree  1  2  3  4  5</td>
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<tr>
<td></td>
<td>problems or its potential for making basic discoveries?</td>
<td>2. Cross-disciplinary, collaborative research is better suited to addressing</td>
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<tr>
<td></td>
<td></td>
<td>applied questions than basic questions.</td>
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<td></td>
<td></td>
<td>Disagree  1  2  3  4  5</td>
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<tr>
<td></td>
<td></td>
<td>3. My research primarily addresses basic questions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disagree  1  2  3  4  5</td>
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<tr>
<td></td>
<td></td>
<td>4. The importance of our project stems from its applied aspects.</td>
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<td></td>
<td></td>
<td>Disagree  1  2  3  4  5</td>
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<tr>
<td></td>
<td></td>
<td>5. The members of this team share similar views concerning aspects of basic and</td>
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<td></td>
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<td>applied research.</td>
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<td></td>
<td></td>
<td>Disagree  1  2  3  4  5</td>
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On-line diagnostic survey for geographically distributed collaborations. The survey probes factors that may strengthen or weaken the collaboration. The Wizard provides both personal and project-level reports to help build successful and productive collaborative projects.

Collaboration & Team Science: A Field Guide

- Overall Goals & Vision
- Who Will Do What
- Sharing/Storing Reagents & Data
- Authorship, Credit
- Contingencies & Communicating
- Conflict of Interest


http://ombudsman.nih.gov/collaborationTS.html
Team Composition

Team of Experts ≠ Expert Team
The Winning Model

- Right mix of expertise and team-players
- Intervention/coaching to help use the collective expertise well

Collaboration Enhancement

- Complex societal research problems to require cross-disciplinary collaborative investigation and scholarly activity, with more work being done in teams
- Effective practices and tools to support the efforts of researchers and research development professionals to initiate and nurture partnerships and secure collaborative extramural research funding are needed
- Collaboration facilitation necessary to reduce time spent searching, to find matches more quickly, and to help make non-intuitive matches—accelerate knowledge discovery
Research Networking Systems

- Web-based knowledge management system for the research enterprise
- Faculty expertise/profile systems
  - Harvest expertise and scholarship information
  - Automatic ingest from authoritative systems, validated data
  - Interoperability and connectivity with: school-level resources, University enterprise systems, national research networks, publicly available research data, and restricted data about faculty expertise and scholarly/research activity
- Recommender system
- Analytics to evaluate research, scholarly activity, and resources
- Facilitate new collaborations through discovery of expertise
- Intellectual networking vs. social networking
- Research network visualization
Elsevier’s Pure Experts Portal

Facilitate collaborations by exposing publishing connections and make researchers' accomplishments readily discoverable

- Demonstrate researchers' activities to the research community, government agencies, industry, media and the public
- Facilitate cross-institutional collaborations, economic development initiatives and other external partnerships through public portals
- Identify potential collaborators by accessing researchers with similar expertise via semantic profile mapping and via coauthor and institutional visualizations
Grant Proposal Fodder

Team Development Activities

- Identify and engage potential collaborators and assemble the team
- Develop partnerships, a collaborative research agenda, shared conceptual framework
- Consider how to expand the number and type of investigators working in the collaboration
- Promote mentoring, conflict management, cross-talk, integration
- Disseminate findings, sustain the collaboration
- Evaluate process and outcomes
Levels of Collaboration Survey

- Measuring Collaboration Among Grant Partners
  - Evaluate collaboration and communication
  - Levels of Collaboration Scale
  - Visually display results of collaboration

This form is designed for those who work in one of the organizations or programs that are partners in the Safe Schools, Healthy Students initiative. Please review these descriptions of different levels of collaboration.

- On the response section at the bottom of the page, please circle the name of the organization or group with which you are associated.
- Using the scale provided, please indicate the extent to which you currently interact with each other partner. (Skip your own row.)

<table>
<thead>
<tr>
<th>Safe Schools, Healthy Students Partners</th>
<th>Networking (1)</th>
<th>Cooperation (2)</th>
<th>Coordination (3)</th>
<th>Coalition (4)</th>
<th>Collaboration (5)</th>
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<td>1</td>
<td>2</td>
<td>3</td>
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Visualize Collaborative Relationships

Comparing (cumulative) number of publications of TD initiative with matched R01 projects from the tobacco field over 10-year period

Centers initial lag in number of publications is eliminated around Project Year 4.

The Science of Team Science

Project Scope

The NRC will conduct a consensus study on the science of team science to recommend opportunities to enhance the effectiveness of collaborative research in science teams, research centers, and institutes. The science of team science is a new interdisciplinary field that empirically examines the processes by which large and small scientific teams, research centers, and institutes organize, communicate, and conduct research. It is concerned with understanding and managing circumstances that facilitate or hinder the effectiveness of collaborative research, including translational research. This includes understanding how teams connect and collaborate to achieve scientific breakthroughs that would not be attainable by either individual or simply additive efforts. The committee will consider factors such as team dynamics, team management, and institutional structures and policies that affect large and small science teams. Among the questions the committee will explore are:

- How do individual factors (e.g., openness to divergent ideas), influence team dynamics (e.g., cohesion), and how, in turn, do both individual factors and team dynamics influence the effectiveness and productivity of science teams?
- What factors at the team, center, or institute level (e.g., team size, team membership, geographic dispersion) influence the effectiveness of science teams?
- How do different management approaches and leadership styles influence the effectiveness of science teams? For example, different approaches to establishing work roles and routines and to the division of labor may influence team effectiveness.
- How do current tenure and promotion policies acknowledge and provide incentives to academic researchers who engage in team science?
- What factors influence the productivity and effectiveness of research organizations that conduct and support team and collaborative science, such as research centers and institutes? How do such organizational factors as human resource policies and practices and cyberinfrastructure affect team and collaborative science?
- What types of organizational structures, policies, practices and resources are needed to promote effective team science, in academic institutions, research centers, industry, and other settings?

Sponsored by the National Science Foundation and Elsevier, the project began in October, 2012. A report will be issued in late 2014 or early 2015.

Members

Dr. Nancy J. Cooke, Chair, Arizona State University
Dr. Roger Blandford, Department of Physics, Stanford University
Mendeley SciTS Group

http://www.mendeley.com/groups/3556001/science-of-team-science-scits/
### Groups of Documents

**Credit Promotion and Tenure in Science of Team Science (ScITS)**

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<tr>
<th>Authors</th>
<th>Title</th>
<th>Year</th>
<th>Published In</th>
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<td>Hurtado, Jessica; Sylvia and Shi...</td>
<td>Scholarship is Changing, and So Must Tenure Review</td>
<td>2008</td>
<td>Academe Online</td>
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<td>Irvine, UCAL; Pohlin den Cunn...</td>
<td>Importance of Team Research White Paper</td>
<td>2011</td>
<td>USC News</td>
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<td>Marzal, Carl</td>
<td>New Tenure Guidelines Recognize Team Research</td>
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<td>Lawrence, Mark S.; Frances and ...</td>
<td>Transforming the University: Recommendations of the Task Force on Collaborative Research</td>
<td>2004</td>
<td>Leading in Turbulent Times: Managing ...</td>
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<td>Salas, Eduardo; Kassarzyck, Mo...</td>
<td>Principles and Advice for Understanding and Promoting Effective Teamwork in Organizations</td>
<td>2011</td>
<td>Environmental Conservation</td>
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<td>Forman, R</td>
<td>Interdisciplinary research and academic sustainability: managing knowledge in an age of accountability</td>
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<td>Computers and Composition</td>
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<td>Organization theory and new ways of working in science</td>
<td>2010</td>
<td>Oxford Handbook of Interdisciplinarity</td>
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<td>Graybill, V, J and Sandhas</td>
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<td>Vanderbilt issues in higher education</td>
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<td>2000</td>
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<td>A Template for Integrating Interdisciplinary Research and Team Science into the Tenure Track Offer Letter</td>
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<td>Association for Integrative Studies ...</td>
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<td>Carp, Richard</td>
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<td>Feder, M E; Madara, J L</td>
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Team Science Toolkit

Discover what resources are available...

An interactive website to help you support, conduct and study team-based research.

- Holly Falk-Krzesinski, Vice President, Global Academic & Research Relations, Elsevier
The **Science of Team Science (SciTS) listserv** facilitates conversation among individuals who are engaged in, studying, or managing team science, in the US and internationally. The listserv is maintained collaboratively by the SciTS Team at the National Cancer Institute, Division of Cancer Control and Population Sciences, Behavioral Research Program ([http://cancercontrol.cancer.gov/brp/scienceteam](http://cancercontrol.cancer.gov/brp/scienceteam)) at the NIH.

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