Tools You Can Use:

Practical Team Science Guidance

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Tools You Can Use in Team Science ♦ HRA Members' Meeting
April 1, 2016

Health Research Alliance

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INTRODUCTION

"Team research, especially interdisciplinary research, is characterized by synergies among experts that can transform both scholars and scholarship“

- *John Cacioppo, PhD, the Tiffany and Margaret Blake Distinguished Service Professor in Psychology, The University of Chicago, from the Arete Initiative website http://arete.uchicago.edu/ (2010)*

Brief Bio

- Industry/Research Information/Publishing (3+ yrs)
  - Vice President, Strategic Alliances, Global Academic Relations, Elsevier
- Academia/Non-professoriate (20+ yrs)
  - Adjunct Lecturer, School of Professional Studies, Philanthropy & Nonprofit Program, Northwestern University
  - Director, Office of Research Development
  - Senior Lecturer and Research Assistant Professor, Northwestern University
  - Assistant Chair, Biology and Associate Director, STEM PhD program
  - Undergrad, PhD, Postdoc training
- Industry/Pharma (2.5 yrs)
  - Anti-infective research, Abbott Laboratories
- Nonprofit (7+ yrs)
  - Editor-in-Chief, AWIS Magazine
  - Founding President, National Organization of Research Development Professionals (NORDP)

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Team Science Experience

- Connecting researchers and resources in pursuit of large collaborative projects
- Compiled a 1.9K+ reference Team Science resource library
- Published primary research findings that inform effective collaboration, especially for science teams
- Developed and taught one of the first-ever Team Science graduate courses, co-developed an online Team Science course
- Chaired the Science of Team Science Conference for its first 3 years
- Team science consultant for almost two dozen US universities
- Involved with the US, UK, and Canadian national team science initiatives

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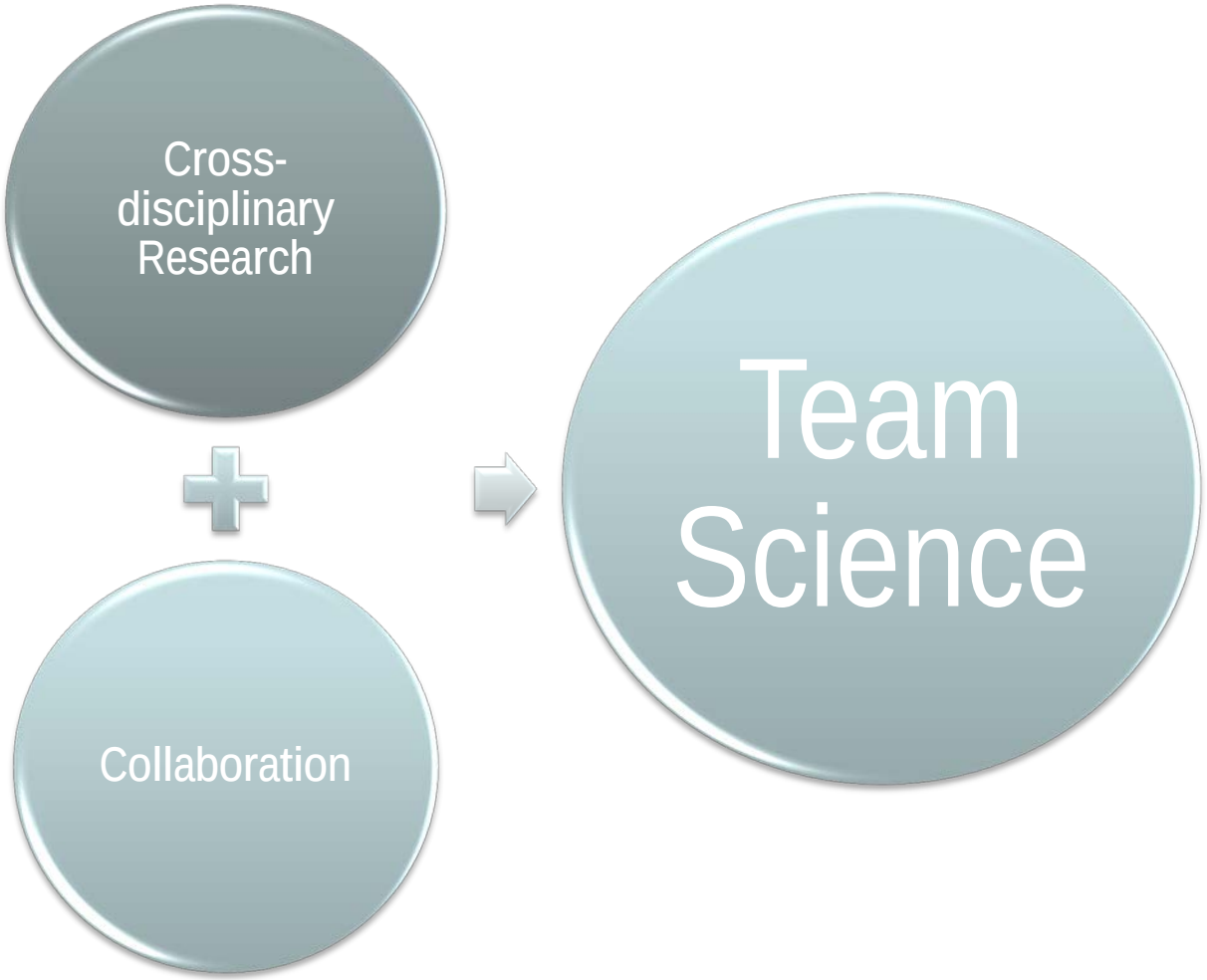
What is Team Science?



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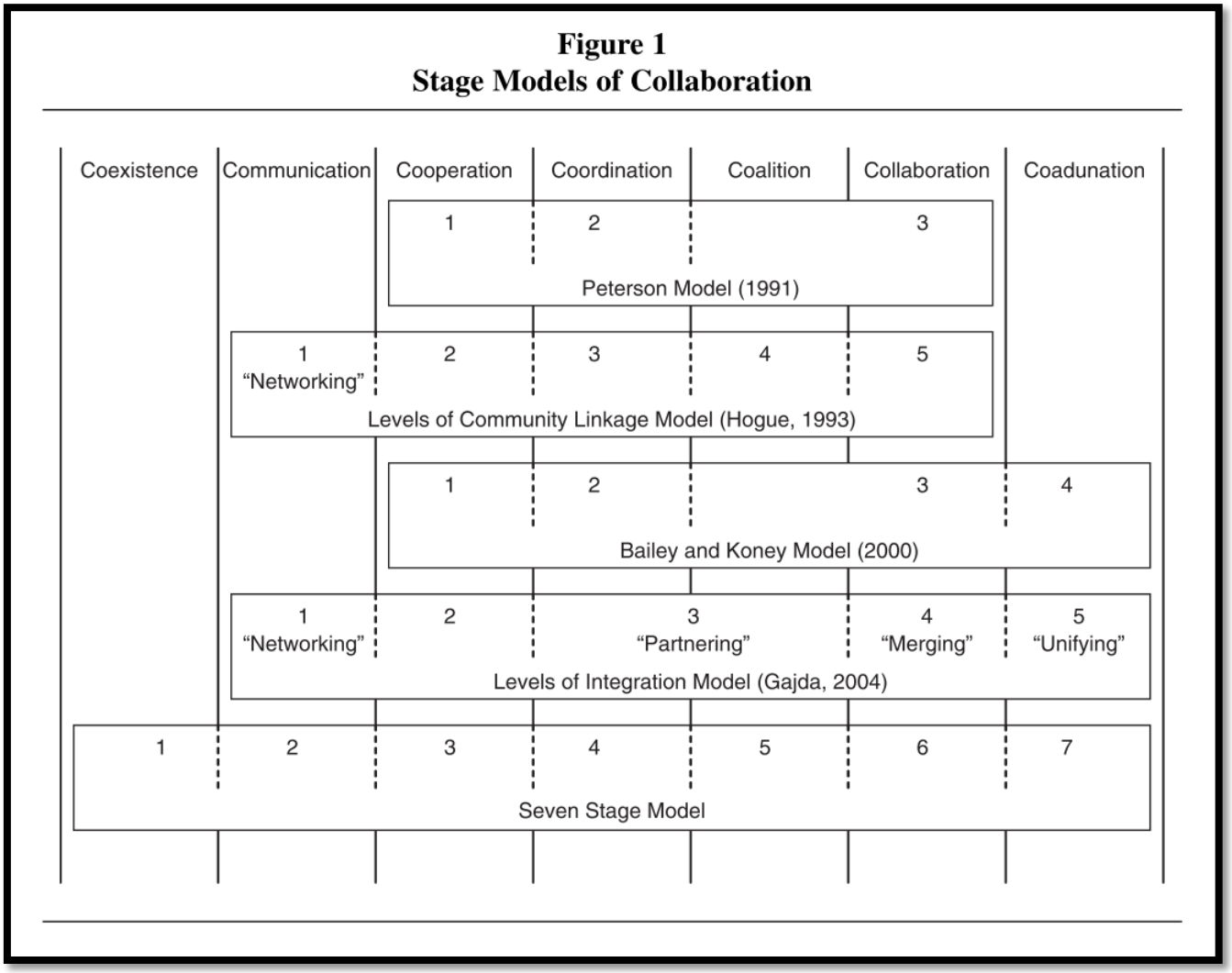
Cross-disciplinarity

- (Uni)**Disciplinary** research
- Three **Cross-disciplinary** research orientations
  - Combine or integrate from more than one field
    - Concepts, Methods, and Theories
  - ***Multi*disciplinary**
    - Independent, Sequential, Divisional
    - Exchange
  - ***Inter*disciplinary**
    - Joint, Interactive, Partnership
    - Dialogue, Hybridization, Complementary
  - ***Trans*disciplinary**
    - Integrative, Interdependence, Emergence
    - Reciprocity, Discourse, Share Vocabulary, Extends

Collaboration

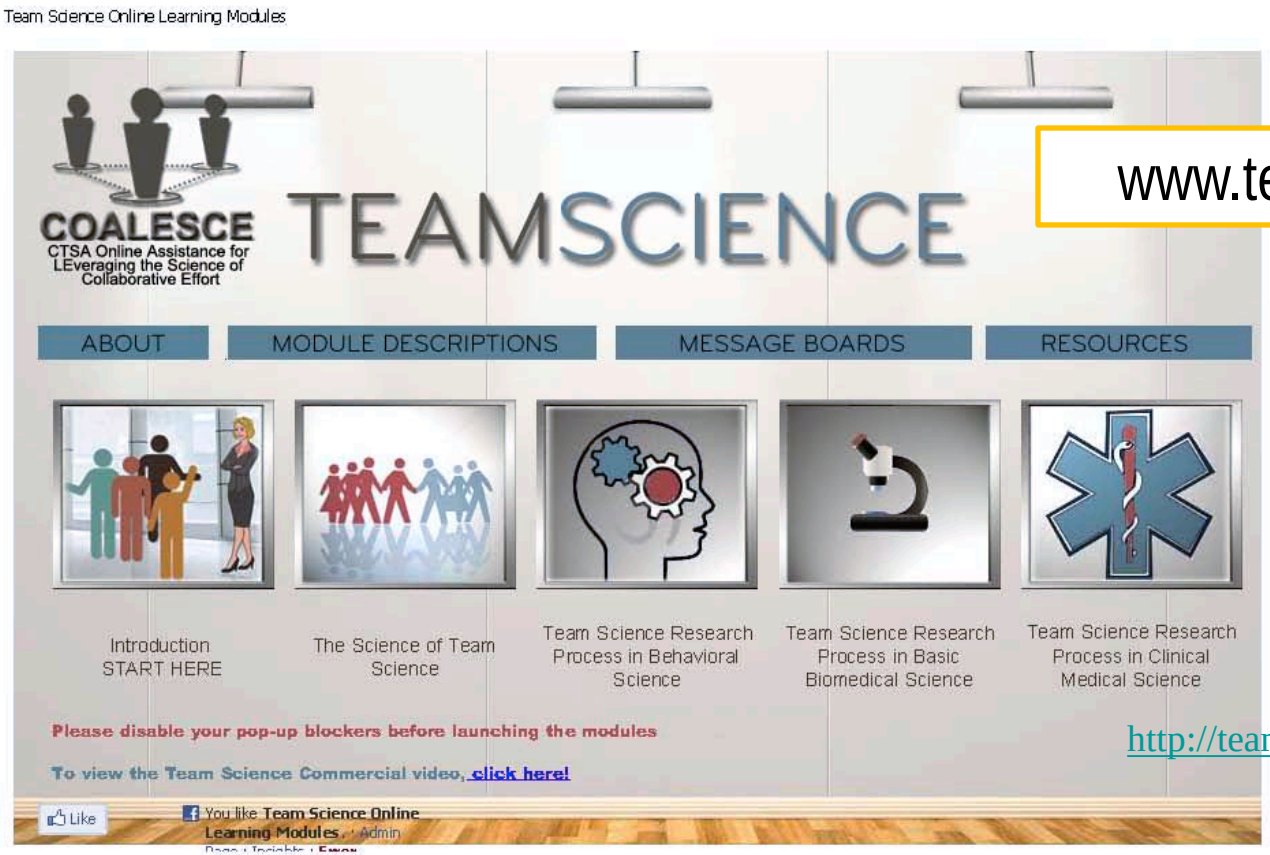


Frey, B.B., Lohmeier, J.H., Lee, S.W., and Tollefson, N. (2006). Measuring collaboration among grant partners. Am. J. Eval. 27, 383–392.

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

TeamScience.net



www.teamscience.net

http://teamscience.net/intro/index.html

NUCATS
CLINICAL AND TRANSLATIONAL SCIENCES INSTITUTE

Supported in part by: CTSA grant 3UL1RR025741 Multidisciplinary Clinical and Translational Science Program (PI: Philip Greenland) and National Library of Medicine contract N01-LM-6-3512 from the Office of Behavioral & Social Sciences Research, (PI: Bonnie Spring)

NORTHWESTERN UNIVERSITY

References: Hesse, B.W. (2011). COALESCE (CTSA Online Assistance for Leveraging the Science of Collaborative Effort). JAMA: The Journal of the American Medical Association *306*, 1925-1926.

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Toolbox Project

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.

[1]*Eigenbrode, S.D., O'Rourke, M., Wulfhorst, J.D., Althoff, D.M., Goldberg, C.S., Merrill, K., Morse, W., Nielsen-Pincus, M.A.X., Stephens, J., Winowiecki, L., et al. (2007). Employing Philosophical Dialogue in Collaborative Science. Bioscience 57, 55-64.*
[2]*Crowley, S., Eigenbrode, S.D., O'Rourke, M., and Wulfhorst, J.D. (2010). Cross-disciplinary localization: A philosophical approach. MultiLingual, September, 1-4.*

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Toolbox Questionnaire

Philosophical domain and issue	Core question	Probing Statements
Epistemology		
Motivation	Does the principal value of research stem from its applicability for solving problems or its potential for making basic discoveries?	1. Applied research is more important to me than basic research. *Disagree* *Agree* 1 2 3 4 5 2. Cross-disciplinary, collaborative research is better suited to addressing applied questions than basic questions. *Disagree* *Agree* 1 2 3 4 5 3. My research primarily addresses basic questions. *Disagree* *Agree* 1 2 3 4 5 4. The importance of our project stems from its applied aspects. *Disagree* *Agree* 1 2 3 4 5 5. The members of this team share similar views concerning aspects of basic and applied research. *Disagree* *Agree* 1 2 3 4 5

Collaboration Readiness

- 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.

http://hana.ics.uci.edu/wizard/index.php

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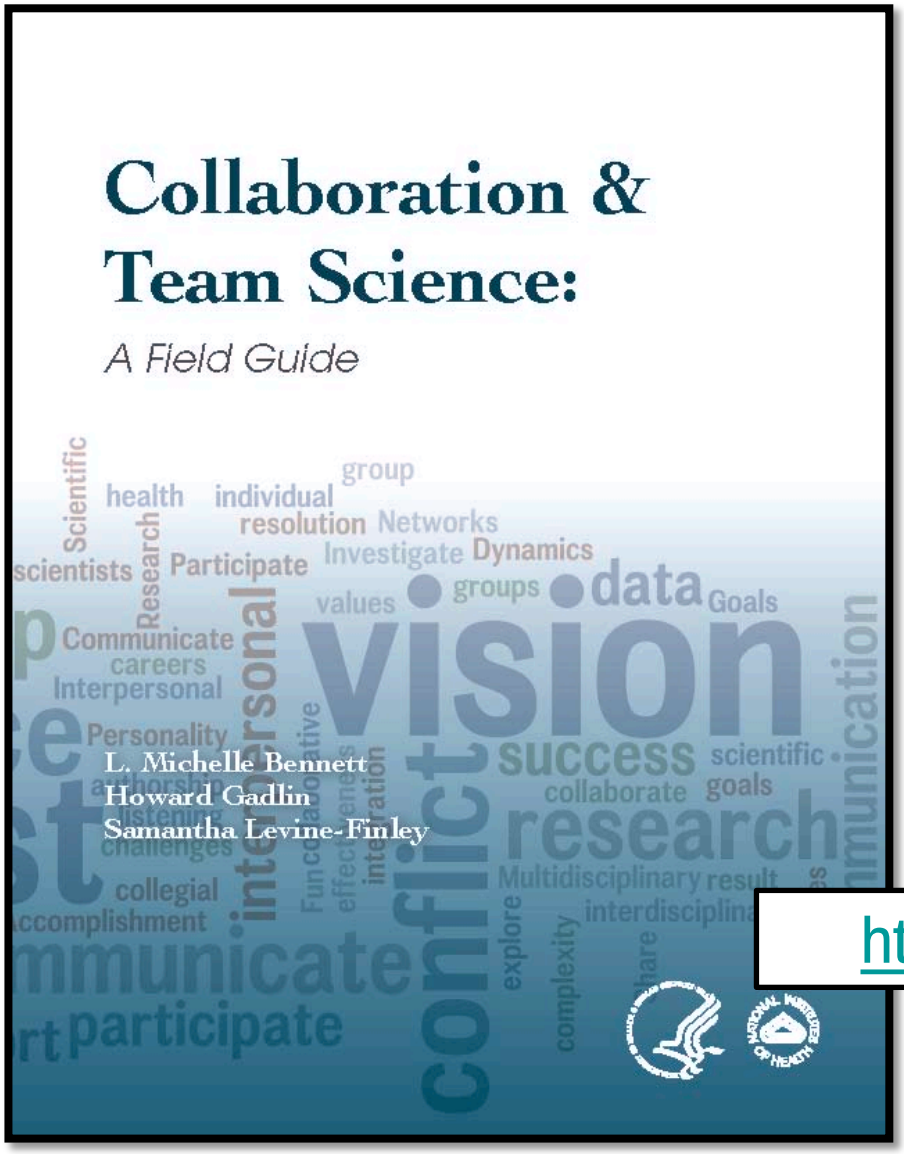
A Field Guide/Partner Agreement



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

http://teamscience.nih.gov

See also Bennett, L.M., and Gadlin, H. (2012). Collaboration and Team Science: From Theory to Practice. J Invest Med 60, 768-775

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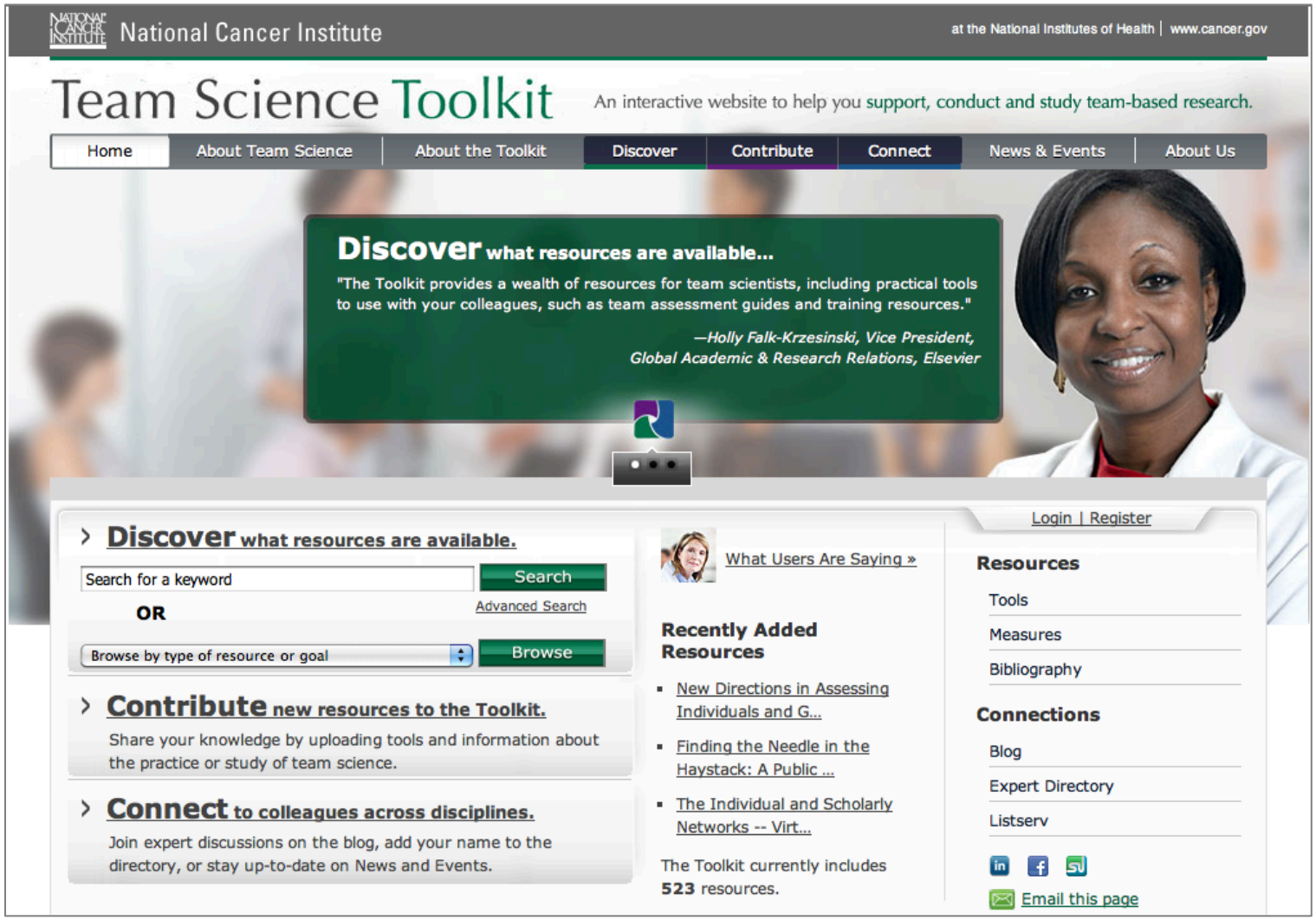
Team Science Toolkit



www.teamsciencetoolkit.cancer.gov

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SciTS Listserv

- 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) at the NIH.
  - TO SUBSCRIBE: Send an email with a blank subject line to: listserv@list.nih.gov. The message body should read: subscribe SciTSlist [your full name]. Please do not include the brackets. For example, for Robin Smith to subscribe, the message would read: subscribe SciTSlist Robin Smith. You will receive a confirmation email.
  - TO POST TO THE LISTSERV: Send an email to SciTSlist@list.nih.gov. Any subscriber may post to the list.
  - TO VIEW THE ARCHIVES: To view the archives of all previous postings, go to: http://list.nih.gov/archives/SciTSlist.html
  - TO RECEIVE MESSAGES IN A DAILY DIGEST: The default setting sends you each message as it is posted to the listserv. To receive one daily digest, instead, go to: http://list.nih.gov/cgi-bin/wa.exe?SUBED1=SciTSlist&A=1 and select “digest” as your subscription type.
  - TECHNICAL PROBLEMS WITH YOUR SUBSCRIPTION? Contact the list administrator, Judy Kuan, at: kuanj@mail.nih.gov. Please be sure to state that your email is in reference to the SciTS listserv.

Levels of Collaboration Survey

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

Frey, B.B., Lohmeier, J.H., Lee, S.W., and Tollefson, N. (2006). Measuring collaboration among grant partners. American Journal of Evaluation *27, 383-392.*

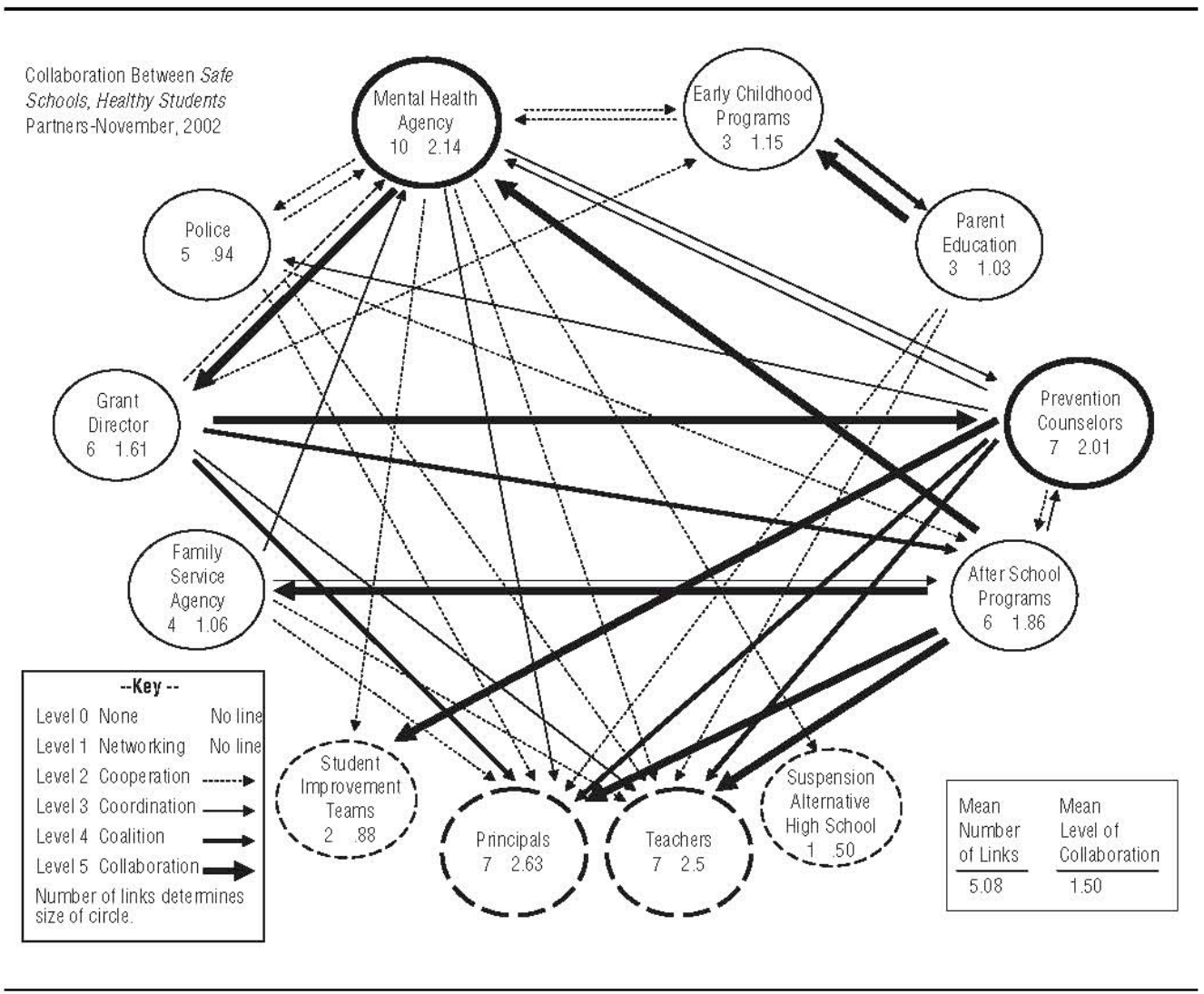
This form is designed for those who work in one of the organizations or programs that are partners in the *Safe Schools, Healthy Students* initiative. Please review these descriptions of different levels of collaboration.

- 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.)

	Five Levels of Collaboration and Their Characteristics				
	Networking 1	Cooperation 2	Coordination 3	Coalition 4	Collaboration 5
Relationship Characteristics	-Aware of organization -Loosely defined roles -Little communication -All decisions are made independently	-Provide information to each other - Somewhat defined roles -Formal communication -All decisions are made independently	-Share information and resources -Defined roles -Frequent communication -Some shared decision making	-Share ideas -Share resources -Frequent and prioritized communication -All members have a vote in decision making	-Members belong to one system -Frequent communication is characterized by mutual trust -Consensus is reached on all decisions

Safe Schools, Healthy Students Partners	No Interaction at All	Networking	Cooperation	Coordination	Coalition	Collaboration
Mental Health Agency	0	1	2	3	4	5
Early Childhood Programs	0	1	2	3	4	5
Parent Education Program	0	1	2	3	4	5
School District Prevention Counselors	0	1	2	3	4	5
After School Programs Director	0	1	2	3	4	5
Student Improvement Teams	0	1	2	3	4	5
Principals	0	1	2	3	4	5
Teachers	0	1	2	3	4	5
Police Department	0	1	2	3	4	5

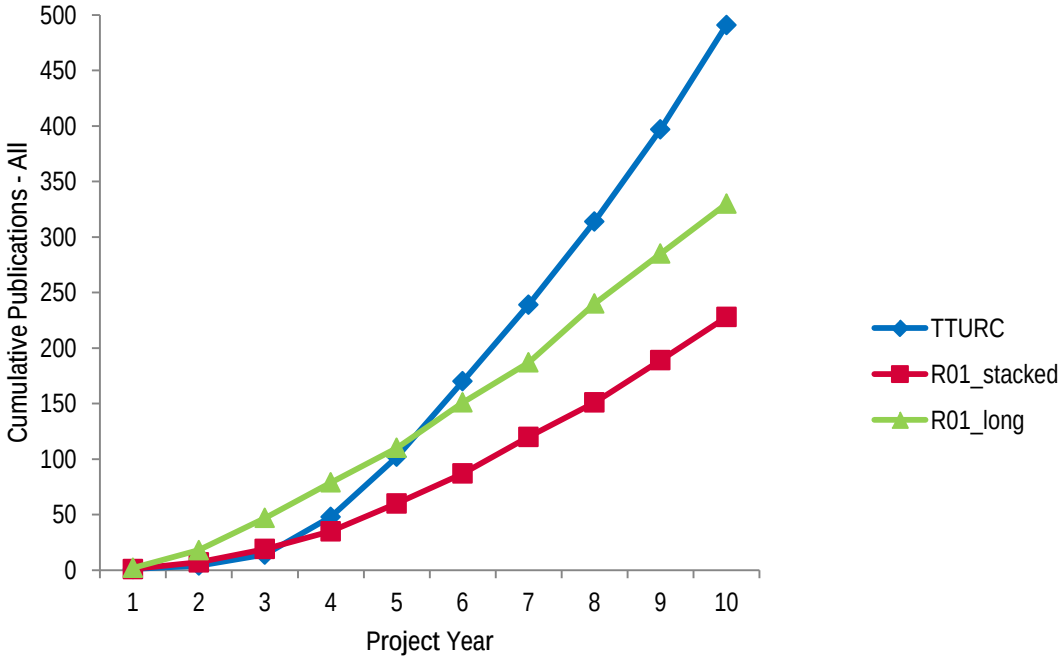
Visualize Collaborative Relationships



Frey, B.B., Lohmeier, J.H., Lee, S.W., and Tollefson, N. (2006). Measuring collaboration among grant partners. American Journal of Evaluation *27, 383-392.*

Funding for Team Science

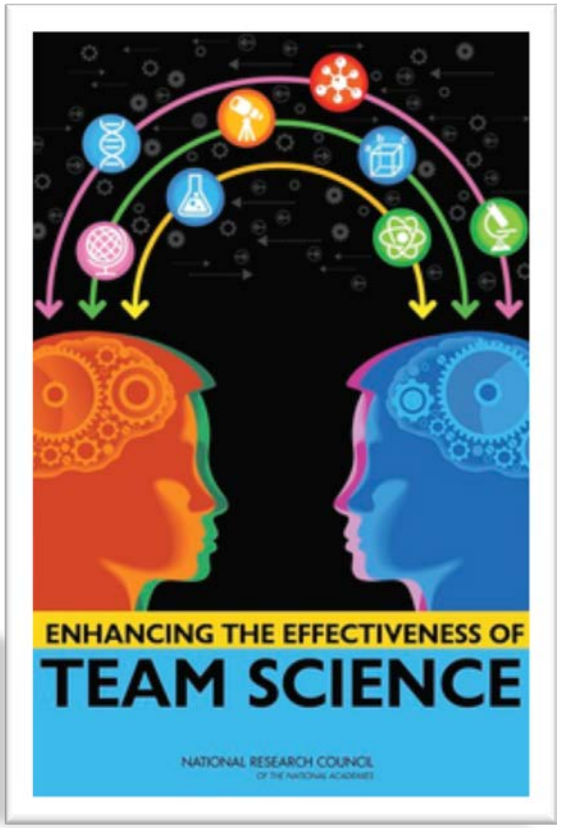
Comparing (cumulative) number of publications of TD initiative with matched R01 projects from the tobacco field over 10-year period



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

Hall, K.L., Stokols, D., Stipelman, B.A., Vogel, A.L., Feng, A., Masimore, B., Morgan, G., Moser, R.P., Marcus, S.E., and Berrigan, D. (2012). Assessing the Value of Team Science: A Study Comparing Center- and Investigator-Initiated Grants. American Journal of Preventive Medicine *42*, 157-163.

National Academies Consensus Report



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Thursday, December 11, 2014

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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

NSF

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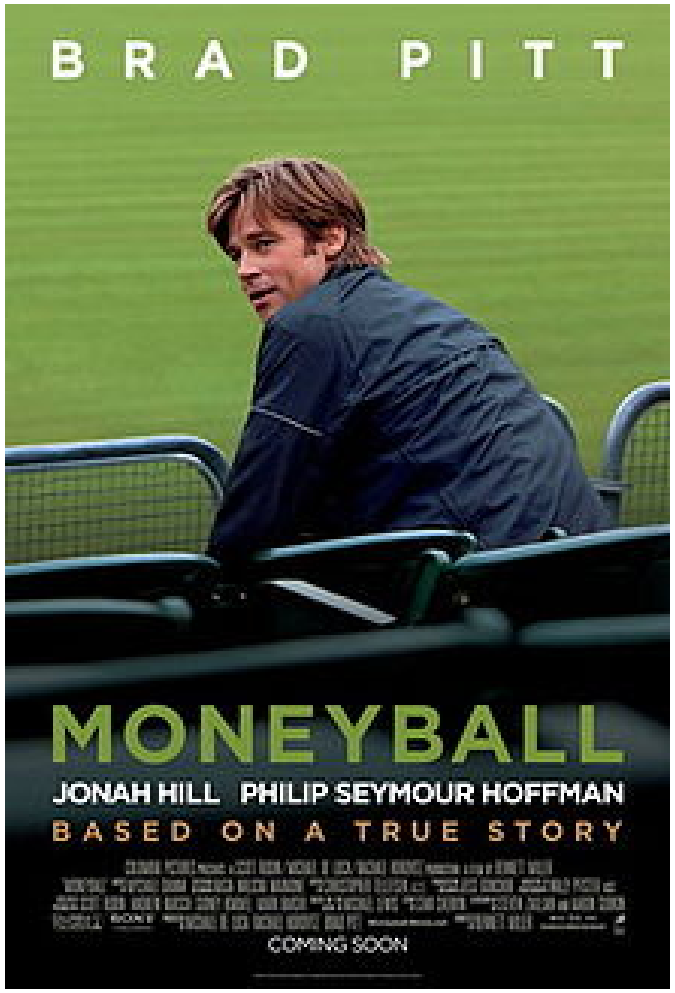
Team Composition



Team of Experts ≠ Expert Team

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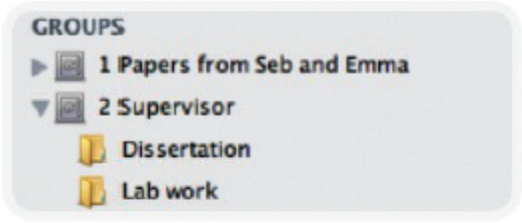
The Winning Model

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

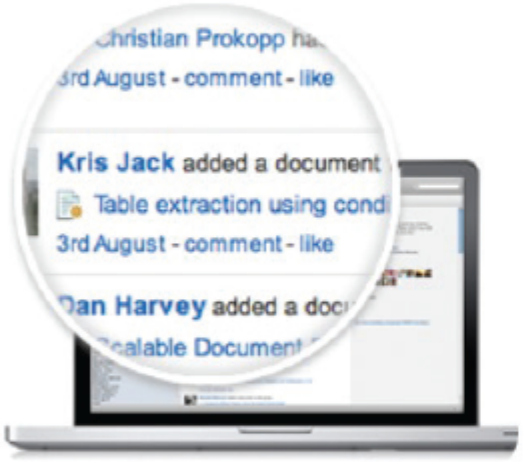
Hackman, J.R. (2011). Collaborative Intelligence: Using Teams to Solve Hard Problems .

Mendeley



Share papers and collaborate

Whether you're a research team, lab, or university class - sharing papers can be a challenge. Simply create public or private groups and start sharing documents instantly.



Communication made easy

Group members can see papers and folders you add to the group on their newsfeed. Keep up-to-date with your collaborators and make working together a walk in the park.

- See when others add documents
- Comment and like to start discussion
- Watch projects progress over time

All your ideas in real-time

Reviewing an article with your colleagues? When a group member adds a note, highlight or summary to a group document, the edit is visible to all the members of the group.

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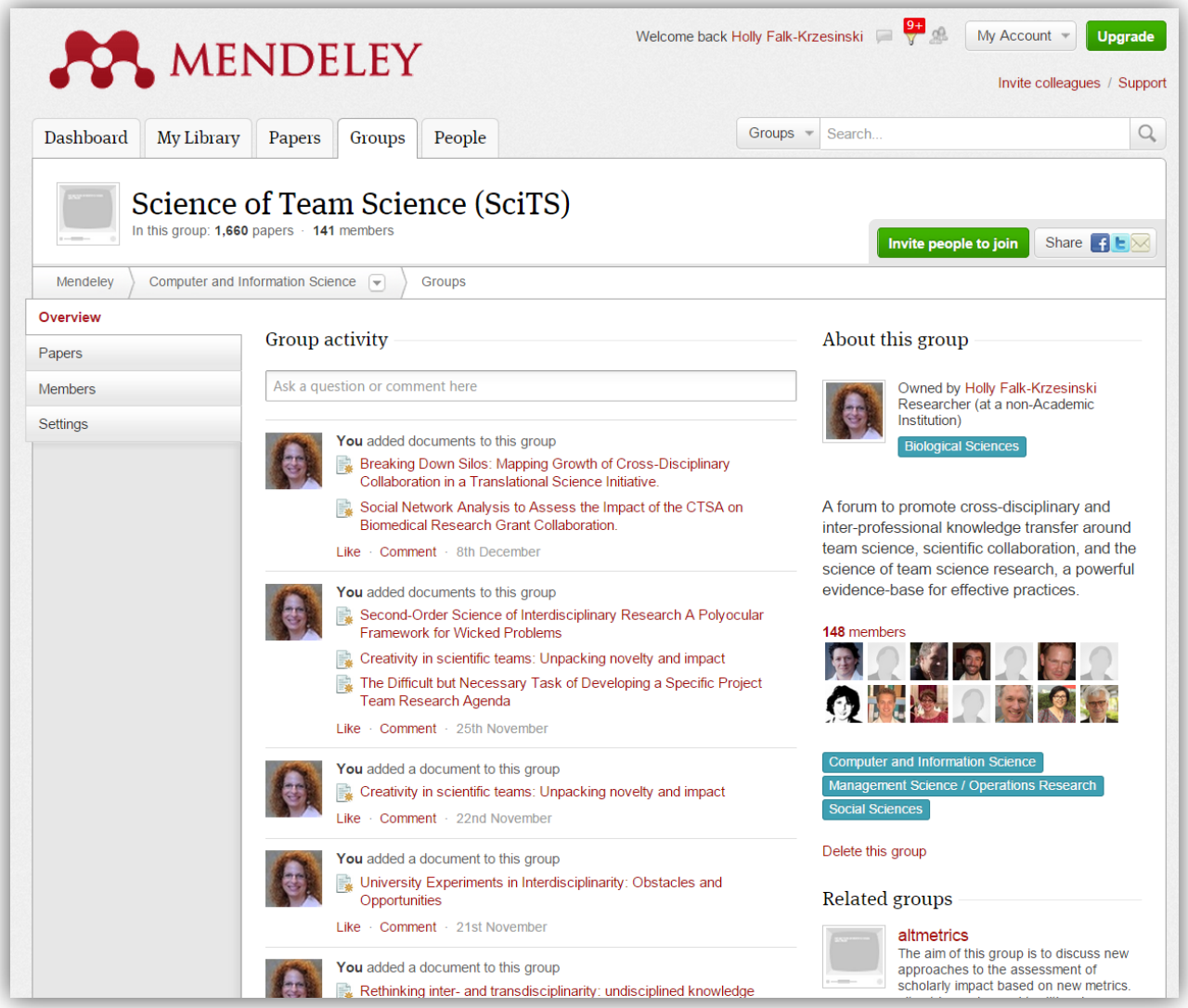
Mendeley SciTS Group



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

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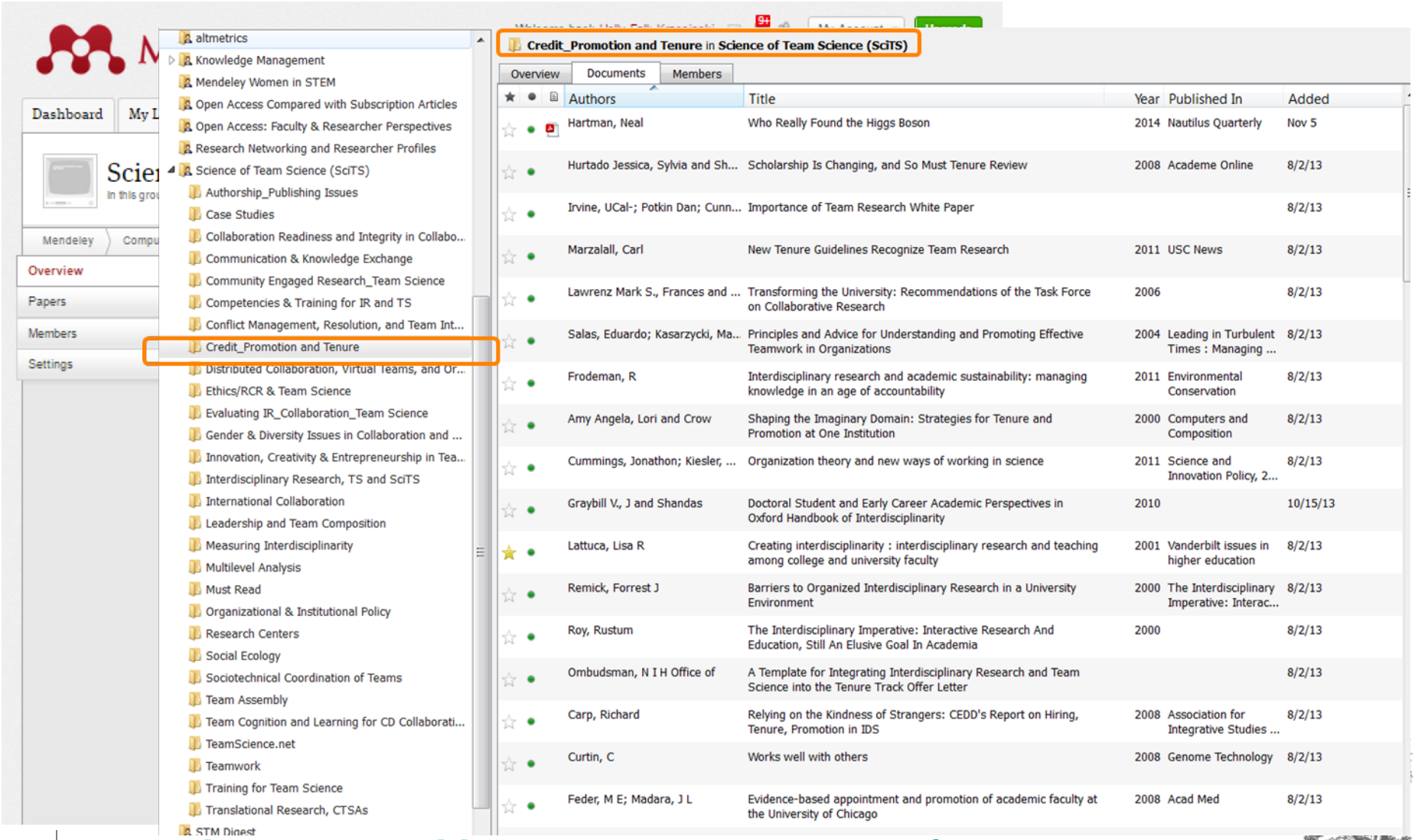
Science of Team Science (SciTS) Library



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

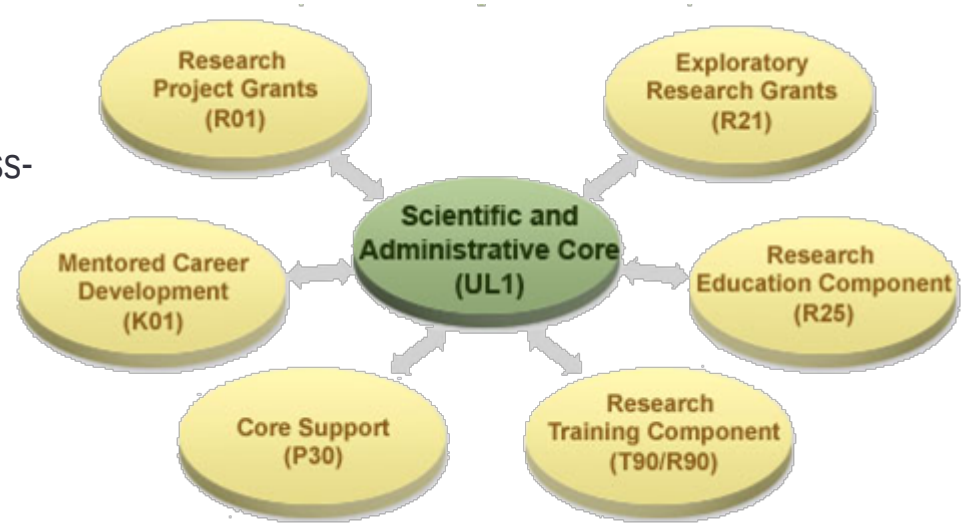
TEAM SCIENCE GRANTSMANSHIP

"Most of the work still to be done in science and the useful arts is precisely that which needs knowledge and cooperation of many scientists and disciplines. That is why it is necessary for scientists and technologists in different disciplines to meet and work together, even those in branches of knowledge which seem to have least relation and connection with one another."

- *French chemist Antoine Lavoisier, 1793 (see Macrina, F.L. 2005. Scientific Integrity : Text and Cases in Responsible Conduct of Research, 3rd ed, Washington, D.C., ASM Press)*

Team Science Proposal Development

- Complex Initiatives
  - Central organizing scientific theme or problem that can be addressed by science
  - Several collaborating investigators
  - Multiple projects closely related conducted through a coordinated, collaborative, and cross-disciplinary approach
  - Dispersed
- Multiple Components
  - Administration
  - Research
  - Pilot Projects
  - Capital Equipment
  - Cores
  - Education/Training
  - Clinical /Industrial Translation
  - Community Health
  - Outreach



NIH Common Fund Interdisciplinary Research Consortia
http://commonfund.nih.gov/interdisciplinary/

- Capacity Building Opportunities!

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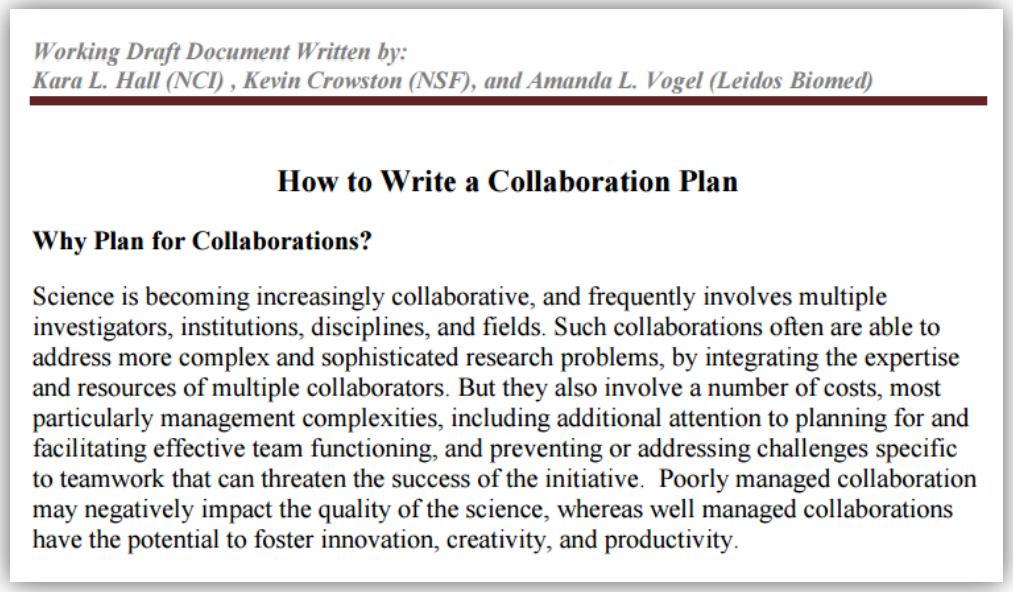
Collaboration Planning

1. Rationale for Team Approach & Configuration
2. Collaboration Readiness
3. Technological Readiness
4. Team Functioning
5. Communication & Coordination
6. Leadership, Management, & Administration
7. Conflict Prevention & Management
8. Training
9. Quality Improvement Activities
10. Budget & Resource Allocation



Working Draft Document Written by:
Kara L. Hall (NCI) , Kevin Crowston (NSF), and Amanda L. Vogel (Leidos Biomed)

How to Write a Collaboration Plan

Why Plan for Collaborations?

Science is becoming increasingly collaborative, and frequently involves multiple investigators, institutions, disciplines, and fields. Such collaborations often are able to address more complex and sophisticated research problems, by integrating the expertise and resources of multiple collaborators. But they also involve a number of costs, most particularly management complexities, including additional attention to planning for and facilitating effective team functioning, and preventing or addressing challenges specific to teamwork that can threaten the success of the initiative. Poorly managed collaboration may negatively impact the quality of the science, whereas well managed collaborations have the potential to foster innovation, creativity, and productivity.

https://www.teamsciencetoolkit.cancer.gov/Public/TSResourceBiblio.aspx?tid=3&rid=3119;
http://www.teamsciencetoolkit.cancer.gov/public/TSResourceBiblio.aspx?tid=3&rid=3261

Grant Proposal Fodder

Team Development Activities

- Beyond the NIH Leadership or NSF Management Plan
- 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

ENHANCING COLLABORATION

"If more work is being done in teams and that work is of greater impact, then surely locating the right members for any team is more important than ever."

- *Carey, J. (2011). Faculty of 1000 and VIVO: Invisible Colleges and Team Science. In Issues in Science and Technology Librarianship.*

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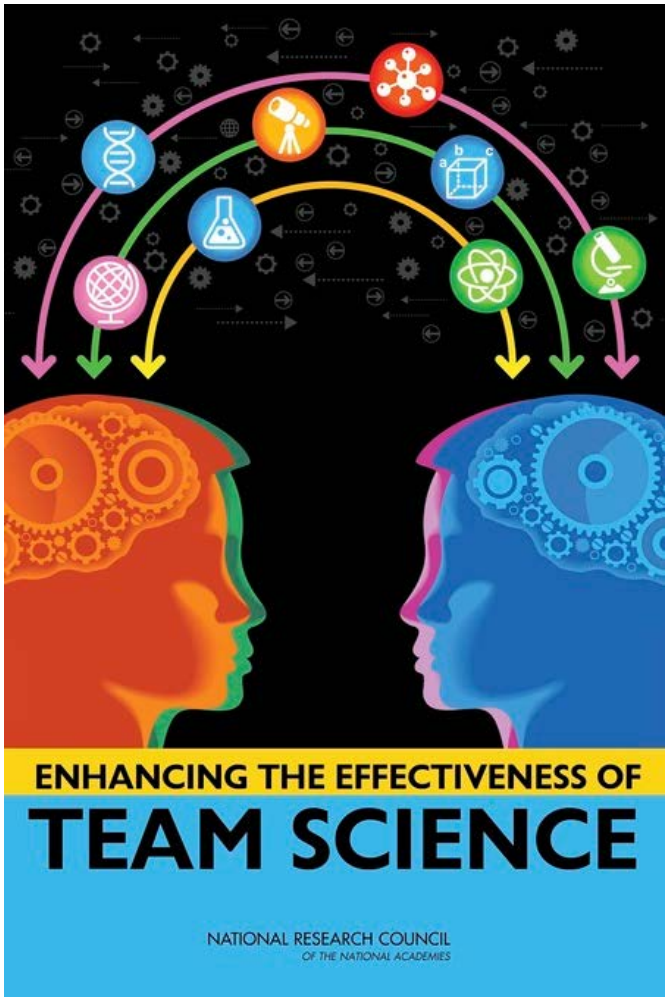
Supporter of Team Science

- National Reports
  - NRC Science of Team Science consensus study and report
  - UK and Canadian Team Science initiatives
  - Canadian Team Science Initiative
- Conferences
  - Annual Science of Team Science (SciTS) Conference
  - University of California system annual Team Science Retreat (Elsevier Foundation)



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Fostering Collaboration

https://www.elsevier.com/research-intelligence/resource-library/ERI-Collaboration_Brochure

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Elsevier Research Intelligence Portfolio

The rich functionality of the **Elsevier Research Intelligence** (ERI) portfolio helps institutions quickly identify expert collaborators from across disciplines and institutions, facilitating more effective and productive partnerships.

- SciVal
- Pure Experts Portal
- Analytical Services

Powered by data from **Scopus®** and the semantic **Elsevier Fingerprint Engine™**, the ERI portfolio allows institutions to:

- **Identify** current and **discover** potential **collaborators**
- Provide data-driven analysis of **collaborative behavior** and impact
- Deliver insight into how institutions can facilitate **more powerful collaborations**

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