

TOOLS YOU CAN USE:

Practical Team Science Guidance

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Vice President, Strategic Alliances, Global Academic Relations

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



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)*



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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)



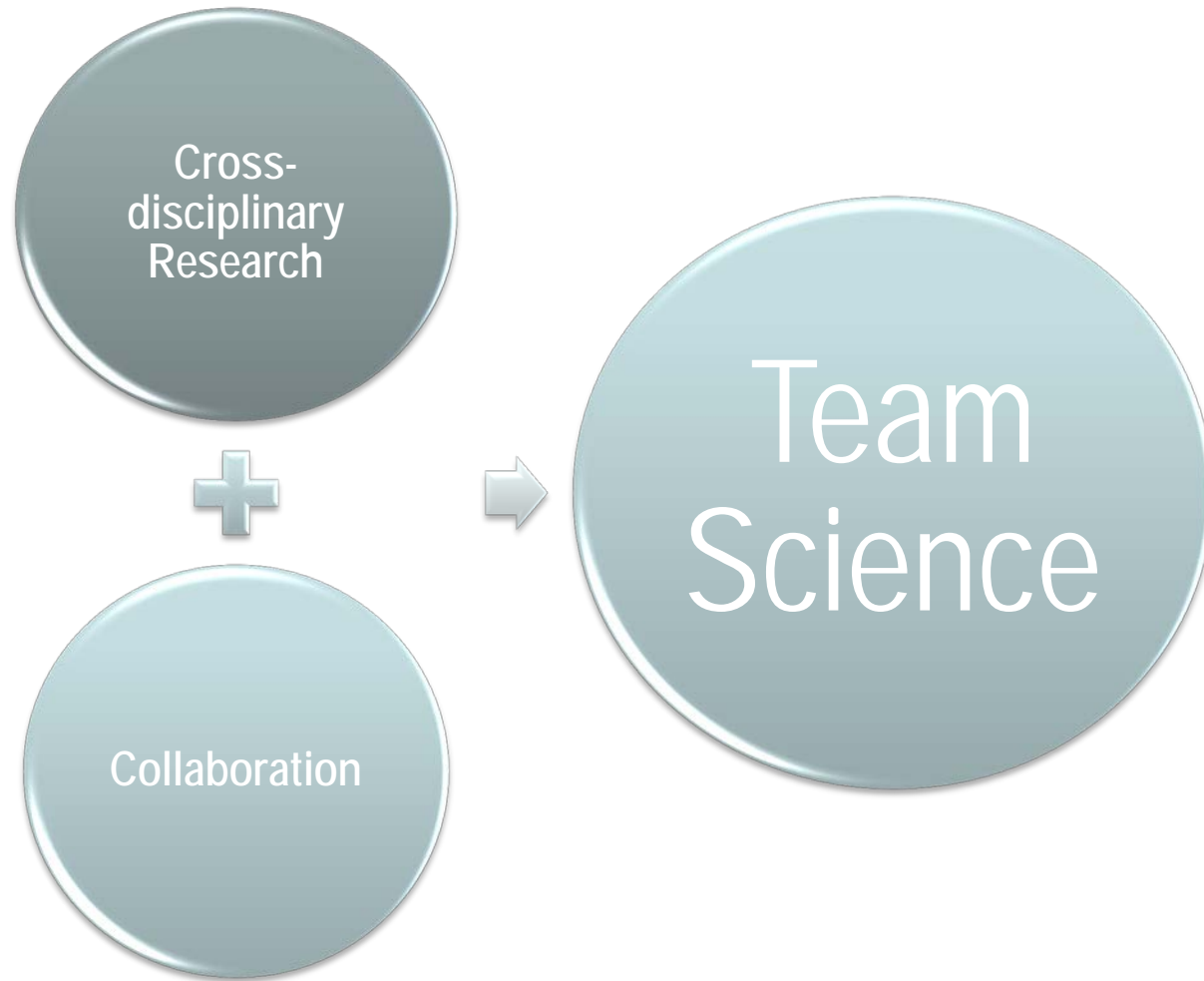
Team Science Experience

- 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



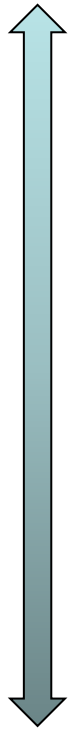
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What is Team Science?



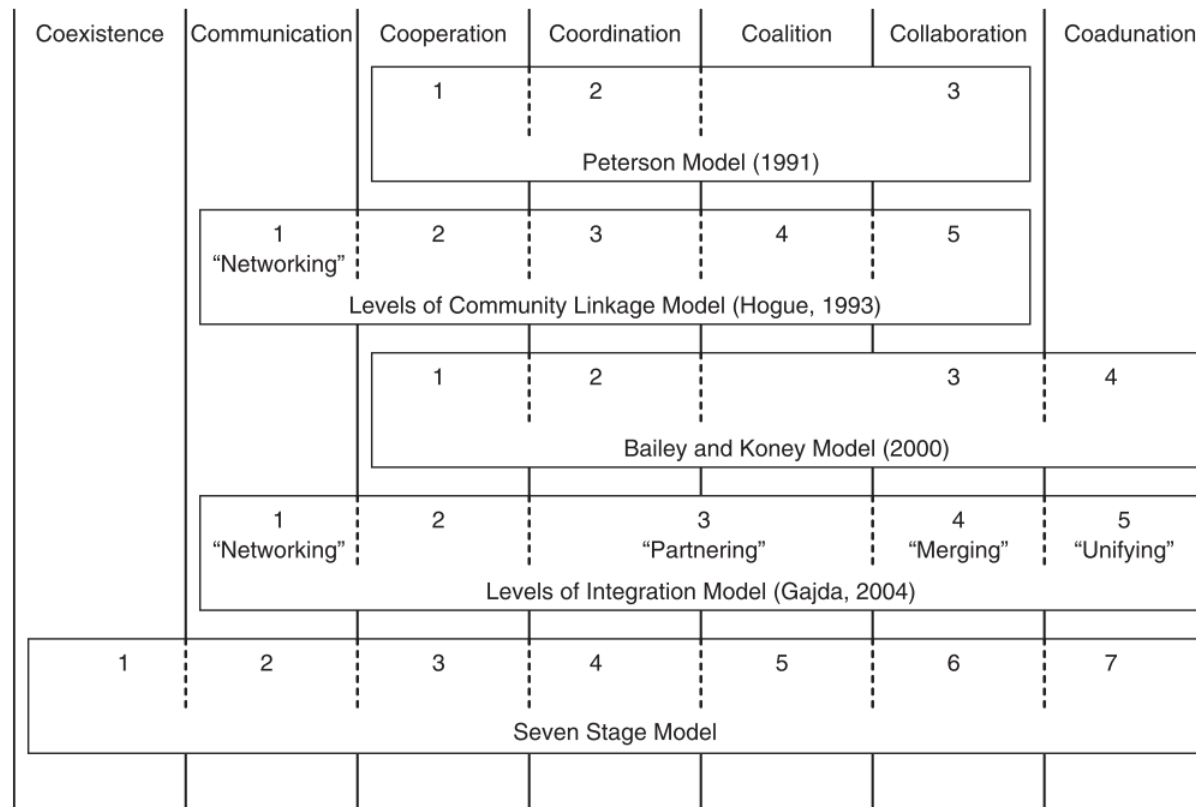
Cross-disciplinarity

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



Collaboration

Figure 1
Stage Models of Collaboration



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



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TeamScience.net

Team Science Online Learning Modules

COALESCE
CTSA Online Assistance for
Leveraging the Science of
Collaborative Effort

TEAMSCIENCE

www.teamscience.net

ABOUT | MODULE DESCRIPTIONS | MESSAGE BOARDS | RESOURCES

Introduction START HERE

The Science of Team Science

Team Science Research Process in Behavioral Science

Team Science Research Process in Basic Biomedical Science

Team Science Research Process in Clinical Medical Science

Please disable your pop-up blockers before launching the modules

To view the Team Science Commercial video, [click here!](#)

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

Like You like Team Science Online Learning Modules Admin

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-UM-6-3512 from the Office of
Behavioral & Social Sciences
Research, (PI: Bonnie Spring)



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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.

¹Eigenbrode, 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.

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



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>

A Field Guide/Partner Agreement

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://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



Team Science Toolkit

 National Cancer Institute

at the National Institutes of Health | www.cancer.gov

Team Science Toolkit


An interactive website to help you [support](#), [conduct](#) and [study](#) team-based research.

[Home](#) | [About Team Science](#) | [About the Toolkit](#) | [Discover](#) | [Contribute](#) | [Connect](#) | [News & Events](#) | [About Us](#)

Discover what resources are available...

"The Toolkit provides a wealth of resources for team scientists, including practical tools to use with your colleagues, such as team assessment guides and training resources."

—Holly Falk-Krzesinski, Vice President,
Global Academic & Research Relations, Elsevier



> **Discover** what resources are available.

OR


[Advanced Search](#)

> **Contribute** new resources to the Toolkit.

Share your knowledge by uploading tools and information about the practice or study of team science.

> **Connect** to colleagues across disciplines.

Join expert discussions on the blog, add your name to the directory, or stay up-to-date on News and Events.

 [What Users Are Saying >](#)

Recently Added Resources

- [New Directions in Assessing Individuals and G...](#)
- [Finding the Needle in the Haystack: A Public ...](#)
- [The Individual and Scholarly Networks -- Virt...](#)

The Toolkit currently includes **523** resources.



[Login](#) | [Register](#)

Resources

- Tools
- Measures
- Bibliography

Connections

- Blog
- Expert Directory
- Listserv


 [Email this page](#)

www.teamsciencetoolkit.cancer.gov

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.



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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.)

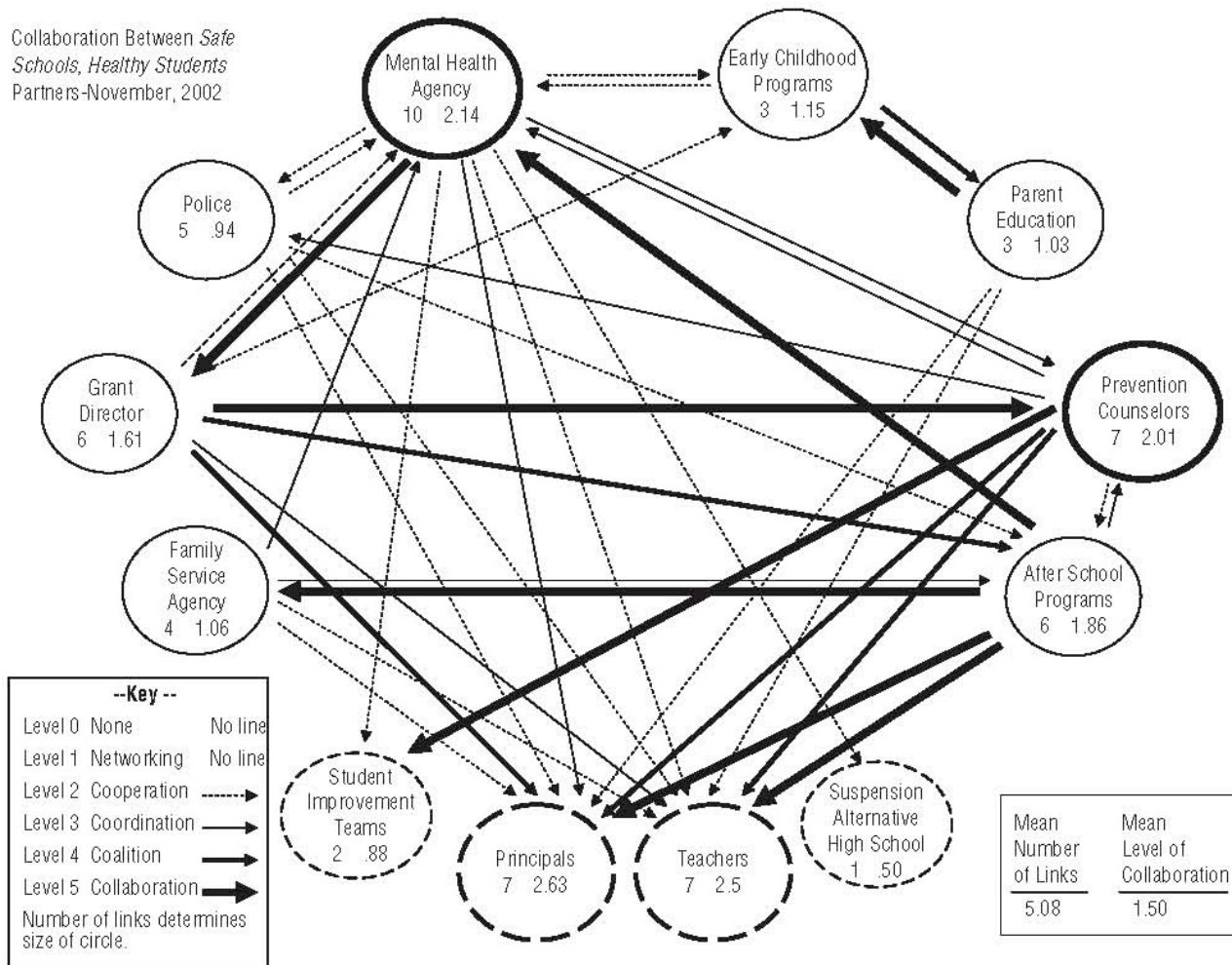
Relationship Characteristics	Five Levels of Collaboration and Their Characteristics					
	Networking 1	Cooperation 2	Coordination 3	Coalition 4	Collaboration 5	
	-Aware of organization -Loosely defined roles -Little communication -All decisions are made independently	-Provide information to each other -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	
<i>Safe Schools, Healthy Students</i> 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



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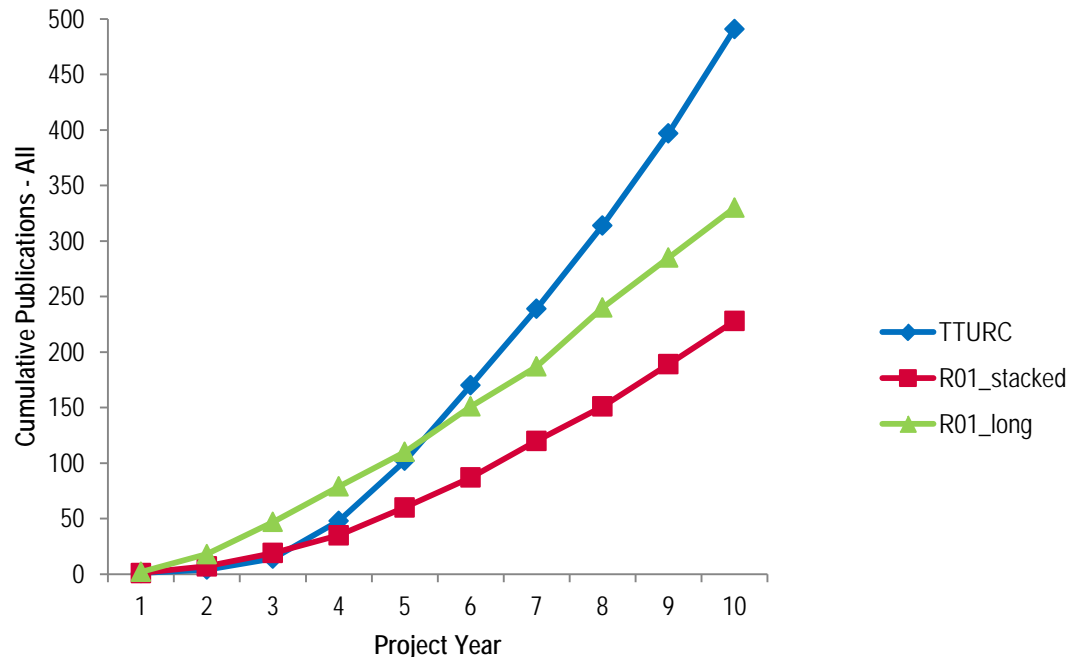
Visualize Collaborative Relationships

Collaboration Between *Safe Schools, Healthy Students* Partners-November, 2002



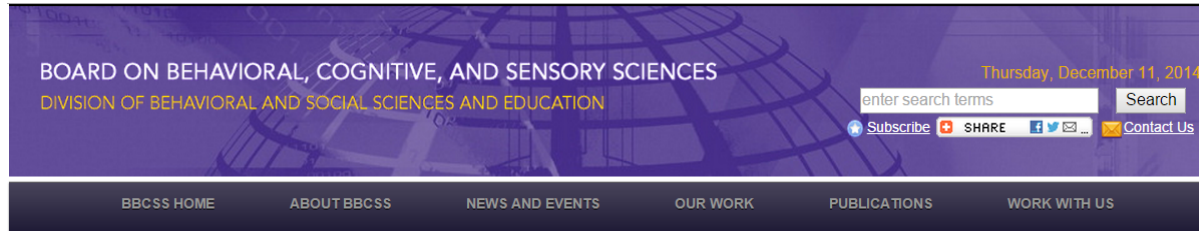
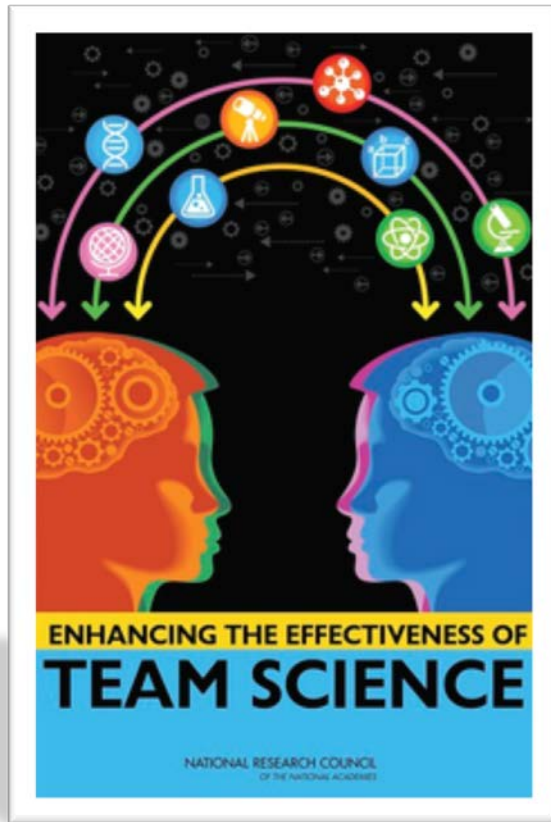
Funding for Team Science

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.

National Academies Consensus Report



BBCSS - TOPICS

- ▶ Cognitive Sciences and Learning
- ▶ Health and Aging
- ▶ National Security and Intelligence
- ▶ Research and Evaluation

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?

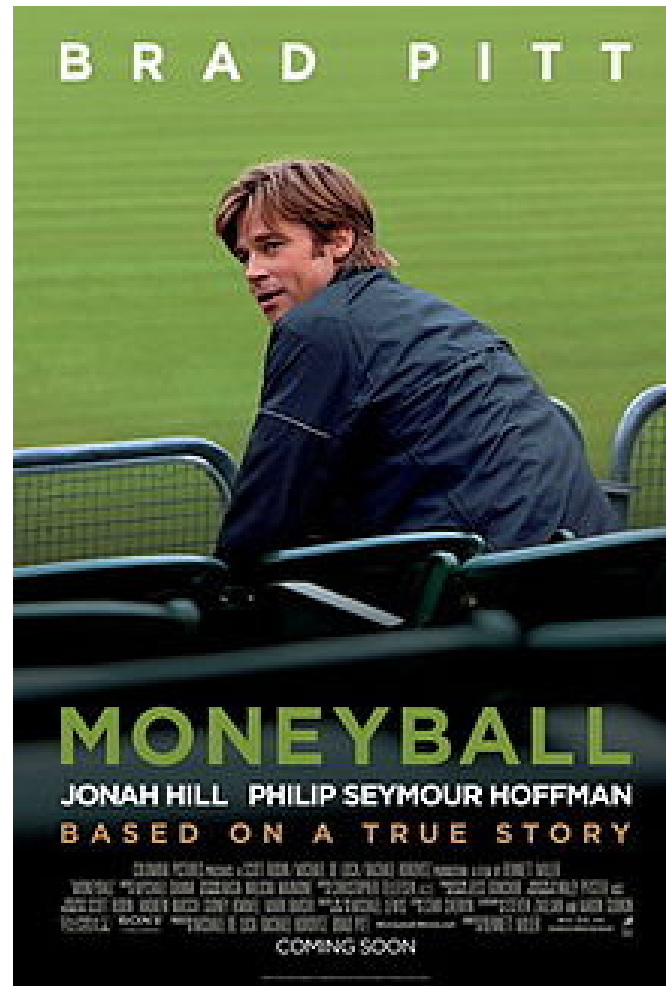
Sponsored by the National Science Foundation and Elsevier, the project began in October, 2012. A report will be issued in late 2014 or early 2015.

Members

Dr. Nancy J. Cooke, *Chair*, Arizona State University

Dr. Roger Blandford, Department of Physics, Stanford University

Team Composition



Team of Experts \neq Expert Team

The Winning Model

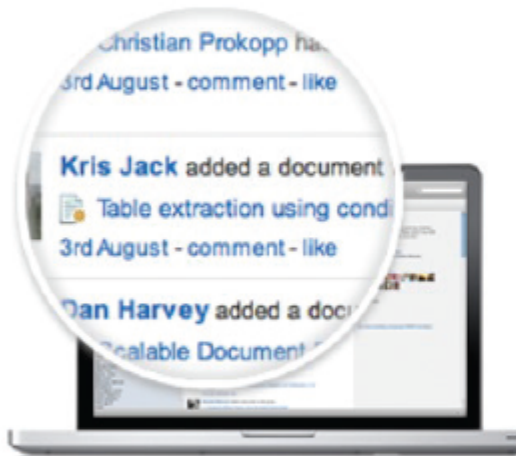
- Right mix of expertise and team-players
- Intervention/coaching to help use the collective expertise well



Mendeley

GROUPS

- ▶ 1 Papers from Seb and Emma
- ▼ 2 Supervisor
 - Dissertation
 - Lab work



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.

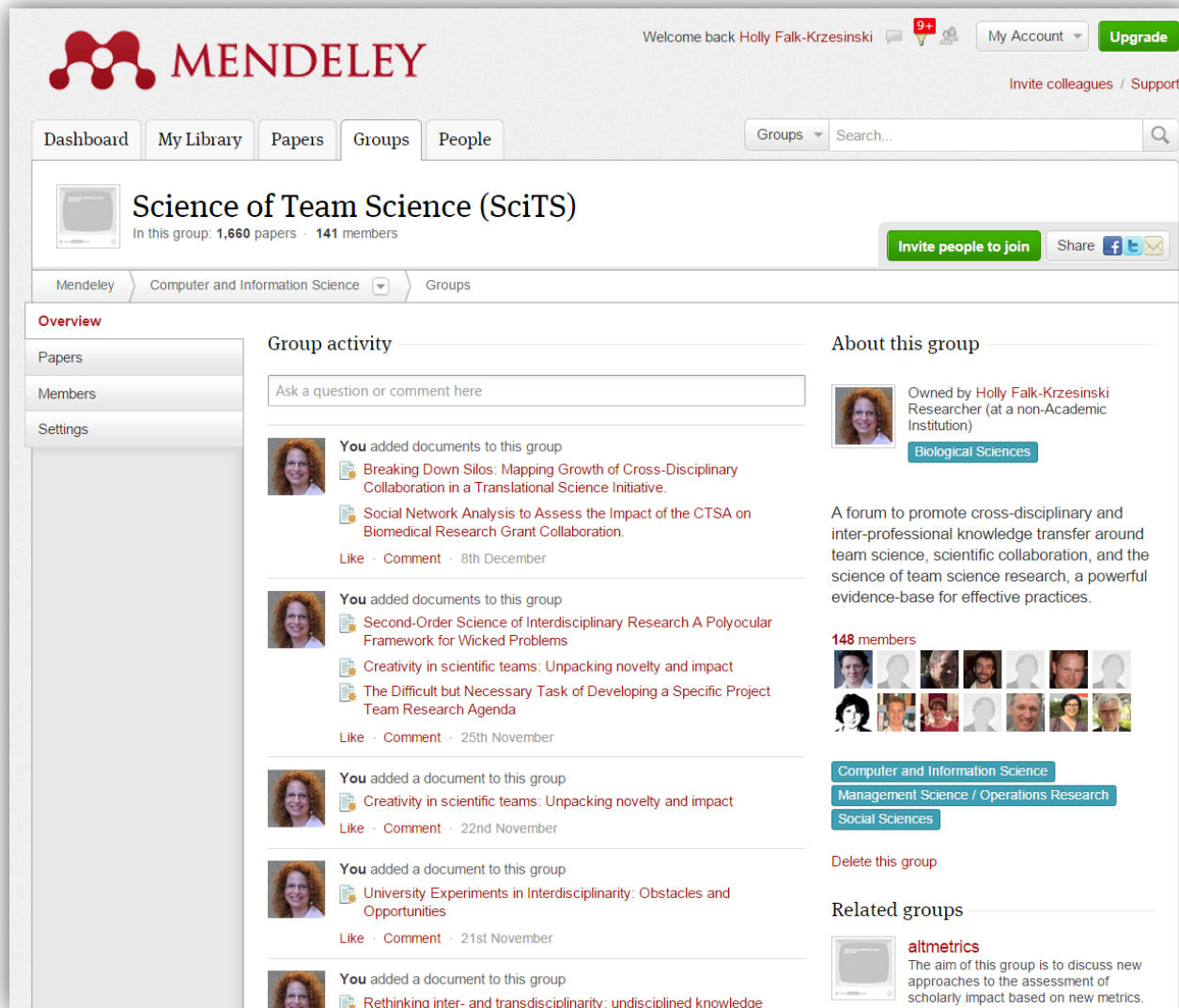
- See when others add documents
- Comment and like to start discussion
- Watch projects progress over time



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.

Mendeley SciTS Group



The screenshot shows the Mendeley web interface for the 'Science of Team Science (SciTS)' group. At the top, the Mendeley logo is on the left, and a welcome message 'Welcome back Holly Falk-Krzesinski' is on the right, along with links for 'My Account' and 'Upgrade'. Below the header is a navigation bar with tabs for 'Dashboard', 'My Library', 'Papers', 'Groups', and 'People'. A search bar is also present. The main content area is titled 'Science of Team Science (SciTS)' and indicates '1,660 papers' and '141 members'. A sidebar on the left contains links for 'Overview', 'Papers', 'Members', and 'Settings'. The 'Overview' section is active, showing 'Group activity' with a list of recent document additions. Each entry includes a user profile picture, a 'You added documents to this group' message, a list of document titles, and a date. The 'About this group' section on the right describes the group's purpose: 'A forum to promote cross-disciplinary and inter-professional knowledge transfer around team science, scientific collaboration, and the science of team science research, a powerful evidence-base for effective practices.' It also lists '148 members' with a grid of profile pictures and shows the group's focus areas: 'Computer and Information Science', 'Management Science / Operations Research', and 'Social Sciences'. A 'Delete this group' link is visible. At the bottom right, there is a 'Related groups' section featuring 'altmetrics' with a brief description of its aim.

MENDELEY

Welcome back Holly Falk-Krzesinski 9+ My Account Upgrade

[Invite colleagues](#) / [Support](#)

[Dashboard](#) [My Library](#) [Papers](#) [Groups](#) [People](#) Groups

Science of Team Science (SciTS)
In this group: 1,660 papers · 141 members

[Invite people to join](#) [Share](#) [f](#) [t](#) [e](#)

[Mendeley](#) [Computer and Information Science](#) [Groups](#)

Overview

[Papers](#)

[Members](#)

[Settings](#)

Group activity

Ask a question or comment here

You added documents to this group

Breaking Down Silos: Mapping Growth of Cross-Disciplinary Collaboration in a Translational Science Initiative.

Social Network Analysis to Assess the Impact of the CTSA on Biomedical Research Grant Collaboration.

[Like](#) · [Comment](#) · 8th December

You added documents to this group

Second-Order Science of Interdisciplinary Research A Polyocular Framework for Wicked Problems

Creativity in scientific teams: Unpacking novelty and impact

The Difficult but Necessary Task of Developing a Specific Project Team Research Agenda

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Creativity in scientific teams: Unpacking novelty and impact

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University Experiments in Interdisciplinarity: Obstacles and Opportunities

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Rethinking inter- and transdisciplinarity: undisciplined knowledge

About this group

Owned by **Holly Falk-Krzesinski**
Researcher (at a non-Academic Institution)

[Biological Sciences](#)

A forum to promote cross-disciplinary and inter-professional knowledge transfer around team science, scientific collaboration, and the science of team science research, a powerful evidence-base for effective practices.

148 members

[Computer and Information Science](#)

[Management Science / Operations Research](#)

[Social Sciences](#)

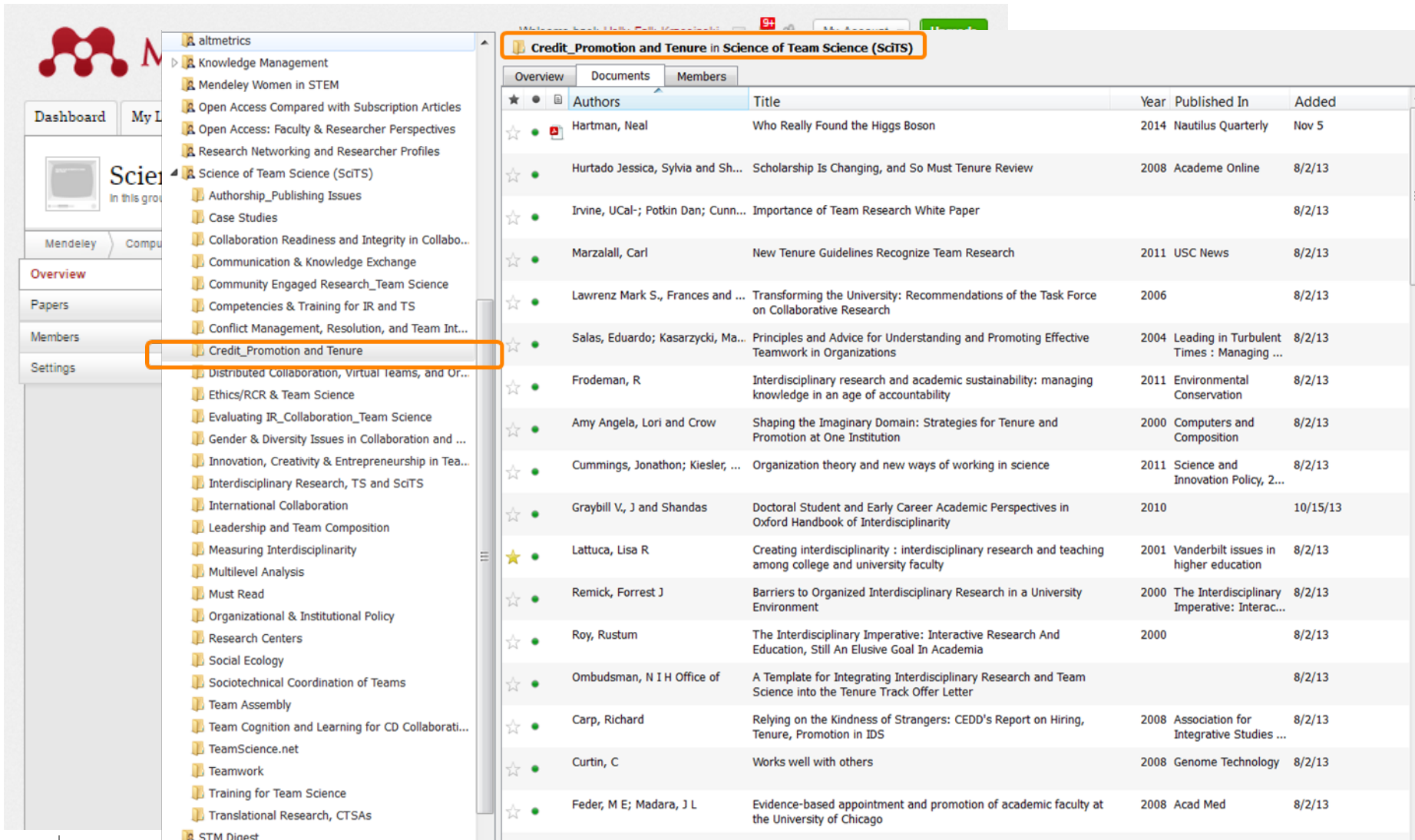
[Delete this group](#)

Related groups

altmetrics
The aim of this group is to discuss new approaches to the assessment of scholarly impact based on new metrics.

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

Science of Team Science (SciTS) Library



Credit_Promotion and Tenure in Science of Team Science (SciTS)

Authors	Title	Year	Published In	Added
Hartman, Neal	Who Really Found the Higgs Boson	2014	Nautilus Quarterly	Nov 5
Hurtado Jessica, Sylvia and Sh...	Scholarship Is Changing, and So Must Tenure Review	2008	Academe Online	8/2/13
Irvine, UCal-; Potkin Dan; Cunn...	Importance of Team Research White Paper			8/2/13
Marzalall, Carl	New Tenure Guidelines Recognize Team Research	2011	USC News	8/2/13
Lawrenz Mark S., Frances and ...	Transforming the University: Recommendations of the Task Force on Collaborative Research	2006		8/2/13
Salas, Eduardo; Kasarzycki, Ma...	Principles and Advice for Understanding and Promoting Effective Teamwork in Organizations	2004	Leading in Turbulent Times : Managing ...	8/2/13
Frodeman, R	Interdisciplinary research and academic sustainability: managing knowledge in an age of accountability	2011	Environmental Conservation	8/2/13
Amy Angela, Lori and Crow	Shaping the Imaginary Domain: Strategies for Tenure and Promotion at One Institution	2000	Computers and Composition	8/2/13
Cummings, Jonathon; Kiesler, ...	Organization theory and new ways of working in science	2011	Science and Innovation Policy, 2...	8/2/13
Graybill V., J and Shandas	Doctoral Student and Early Career Academic Perspectives in Oxford Handbook of Interdisciplinarity	2010		10/15/13
Lattuca, Lisa R	Creating interdisciplinarity : interdisciplinary research and teaching among college and university faculty	2001	Vanderbilt issues in higher education	8/2/13
Remick, Forrest J	Barriers to Organized Interdisciplinary Research in a University Environment	2000	The Interdisciplinary Imperative: Interac...	8/2/13
Roy, Rustum	The Interdisciplinary Imperative: Interactive Research And Education, Still An Elusive Goal In Academia	2000		8/2/13
Ombudsman, N I H Office of	A Template for Integrating Interdisciplinary Research and Team Science into the Tenure Track Offer Letter			8/2/13
Carp, Richard	Relying on the Kindness of Strangers: CEDD's Report on Hiring, Tenure, Promotion in IDS	2008	Association for Integrative Studies ...	8/2/13
Curtin, C	Works well with others	2008	Genome Technology	8/2/13
Feder, M E; Madara, J L	Evidence-based appointment and promotion of academic faculty at the University of Chicago	2008	Acad Med	8/2/13

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)



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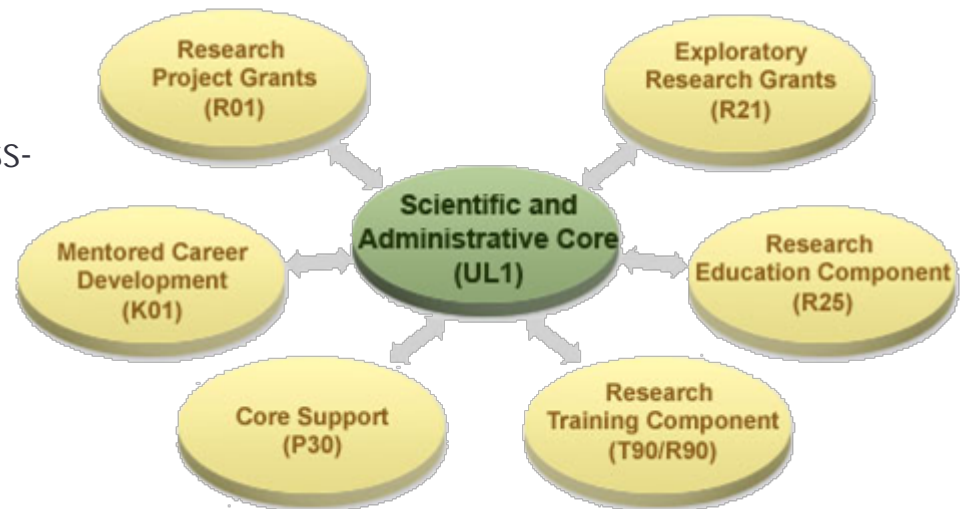
Team Science Proposal Development

- **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!



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>



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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



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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.”

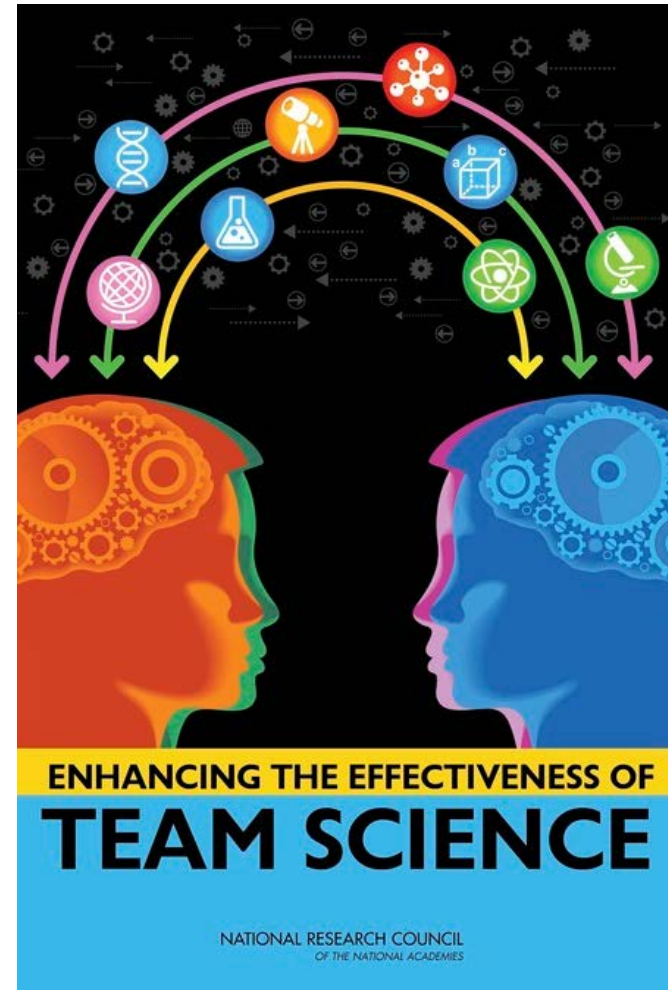
- Carey, J. (2011). *Faculty of 1000 and VIVO: Invisible Colleges and Team Science. In Issues in Science and Technology Librarianship.*



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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

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**



CONNECT WITH ME

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Global Academic Relations ♦ Elsevier ♦ Chicago, IL, USA



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