

TEAMSCIENCE.NET

AN UPDATE ON THE SCIENCE OF TEAM SCIENCE

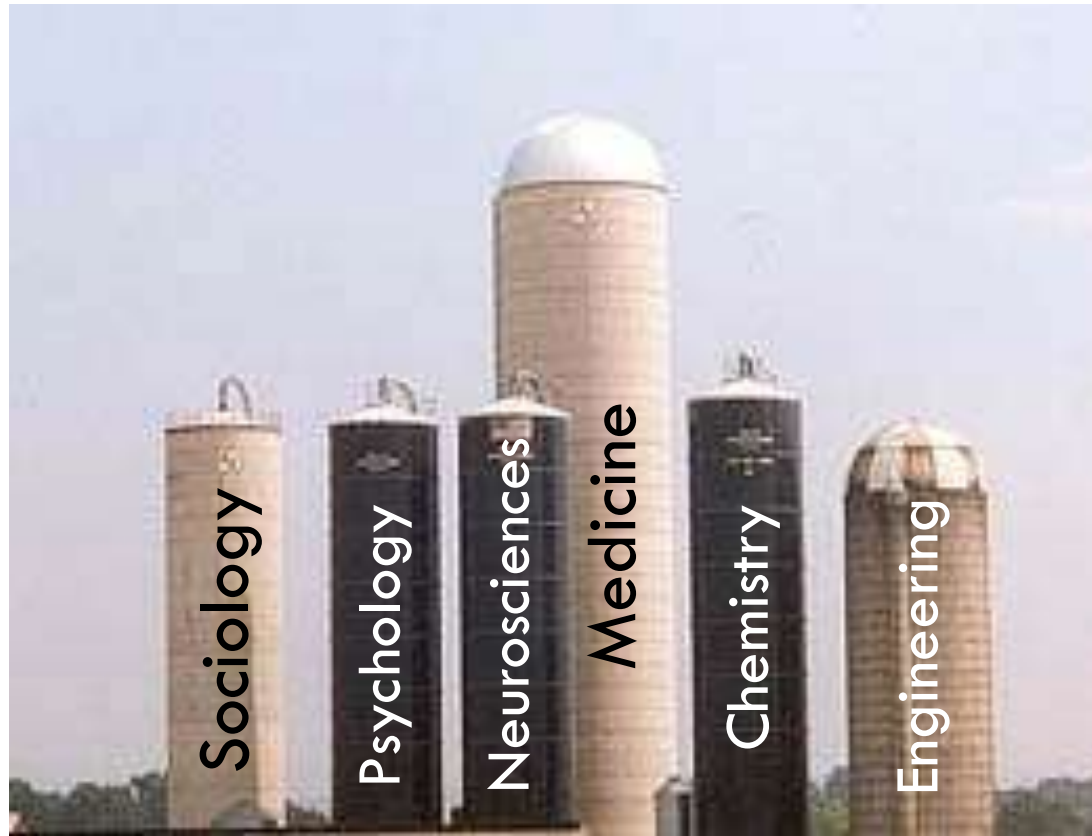
Bonnie Spring, PhD, ABBP
Northwestern University

2011 APA Education Leadership Conference:
Interdisciplinary and Interprofessional Teaching, Research and Practice
Washington DC Sunday, September 11, 2011

Team Science Online Learning Tools

Introduction to the Science of TS (SciTS)

- Volume of scientific knowledge has ↑ over time, making it increasingly difficult to have deep expertise in all needed areas
 - Solving complex problems (eg., global warming, poverty, cancer) requires integration of specialized knowledge bases. Needs collaboration with more people from different specialties
 - Emerging “**science of team science**” reflects insights to facilitate multi-, inter-, and transdisciplinary scientific progress
-
- Stokols D, Hall KL, Taylor BK, Moser RP. The science of team science: overview of the field and introduction to the supplement. *Am J Prevent Med*. 2008;35(2 Suppl):S77-S89.
 - Whitfield J. Group theory. *Nature*. 2008;455:720-723.

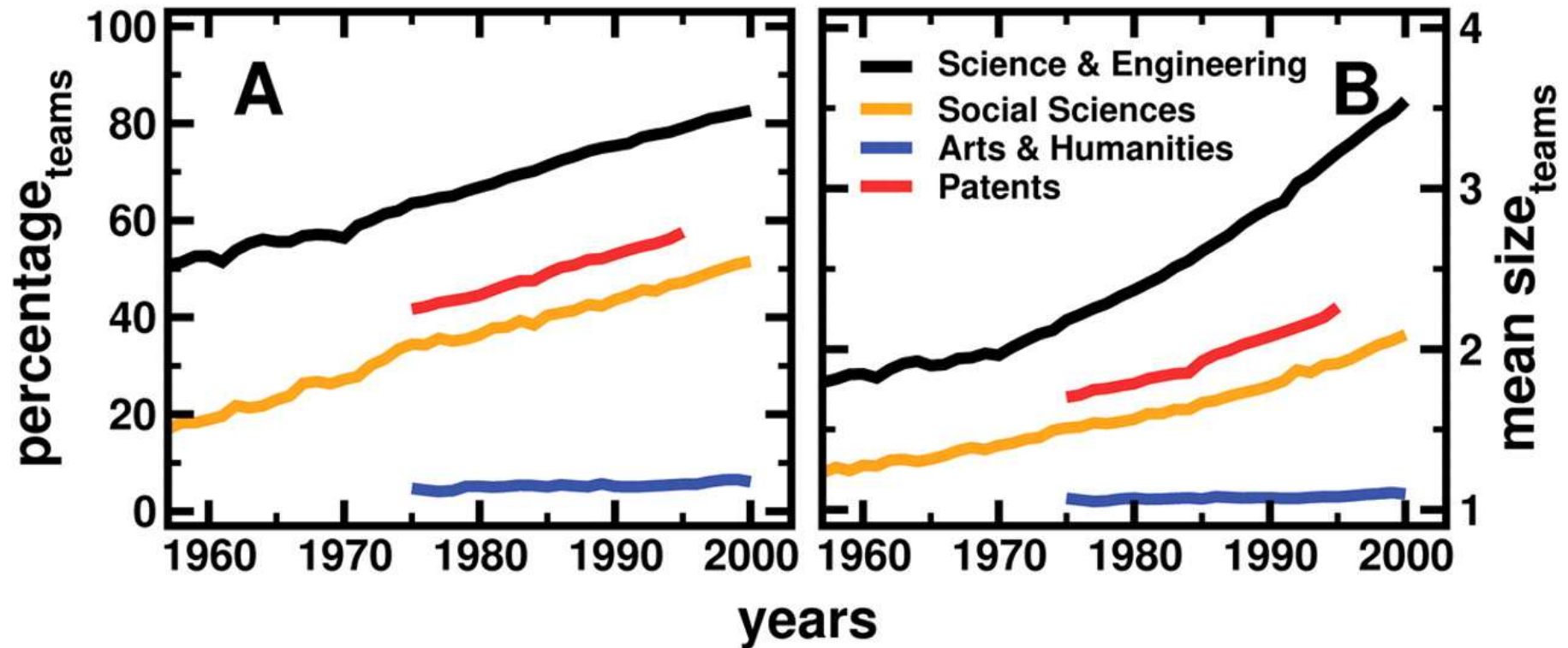


Siloed Science



Silo Busting

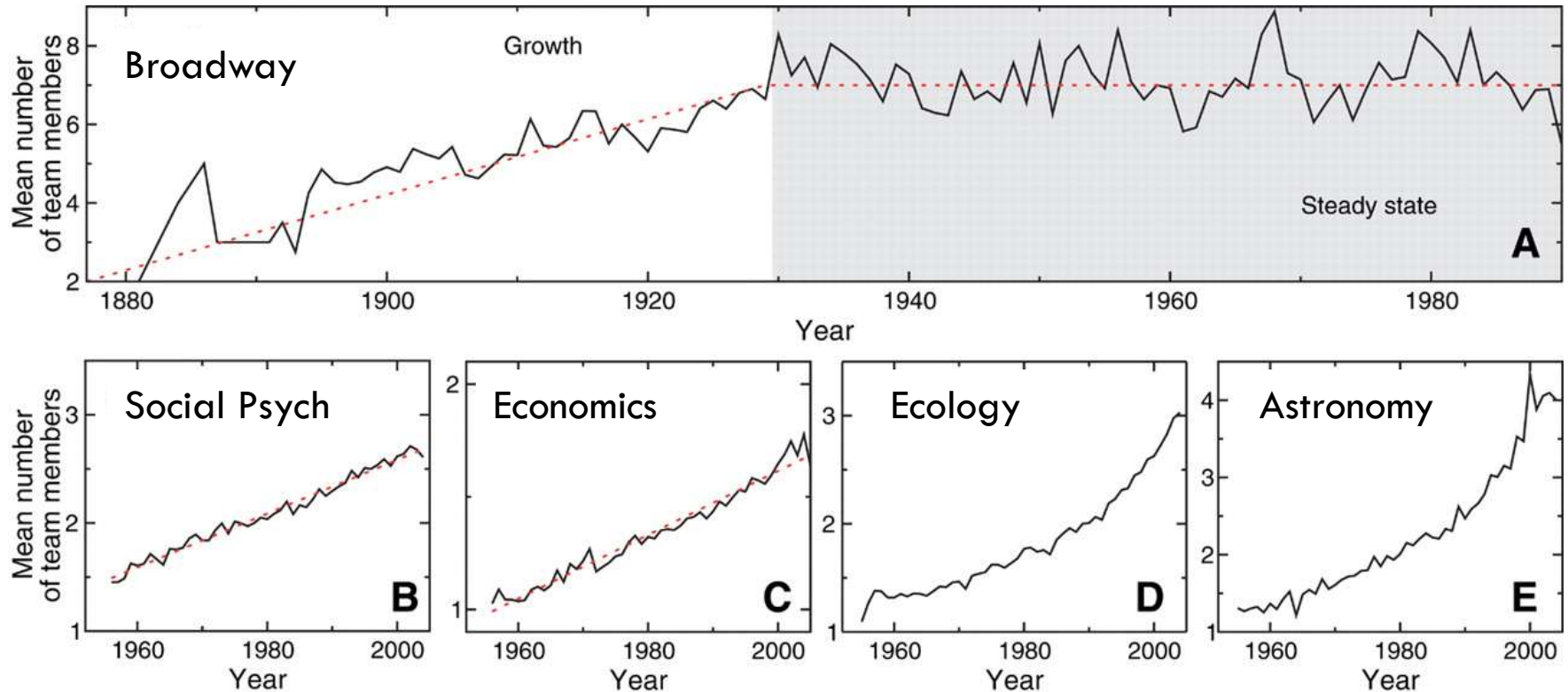
Research increasingly done in teams



Over the last 50 years, the proportion of social science publications authored by teams (vs. solo authorship) has more than doubled.

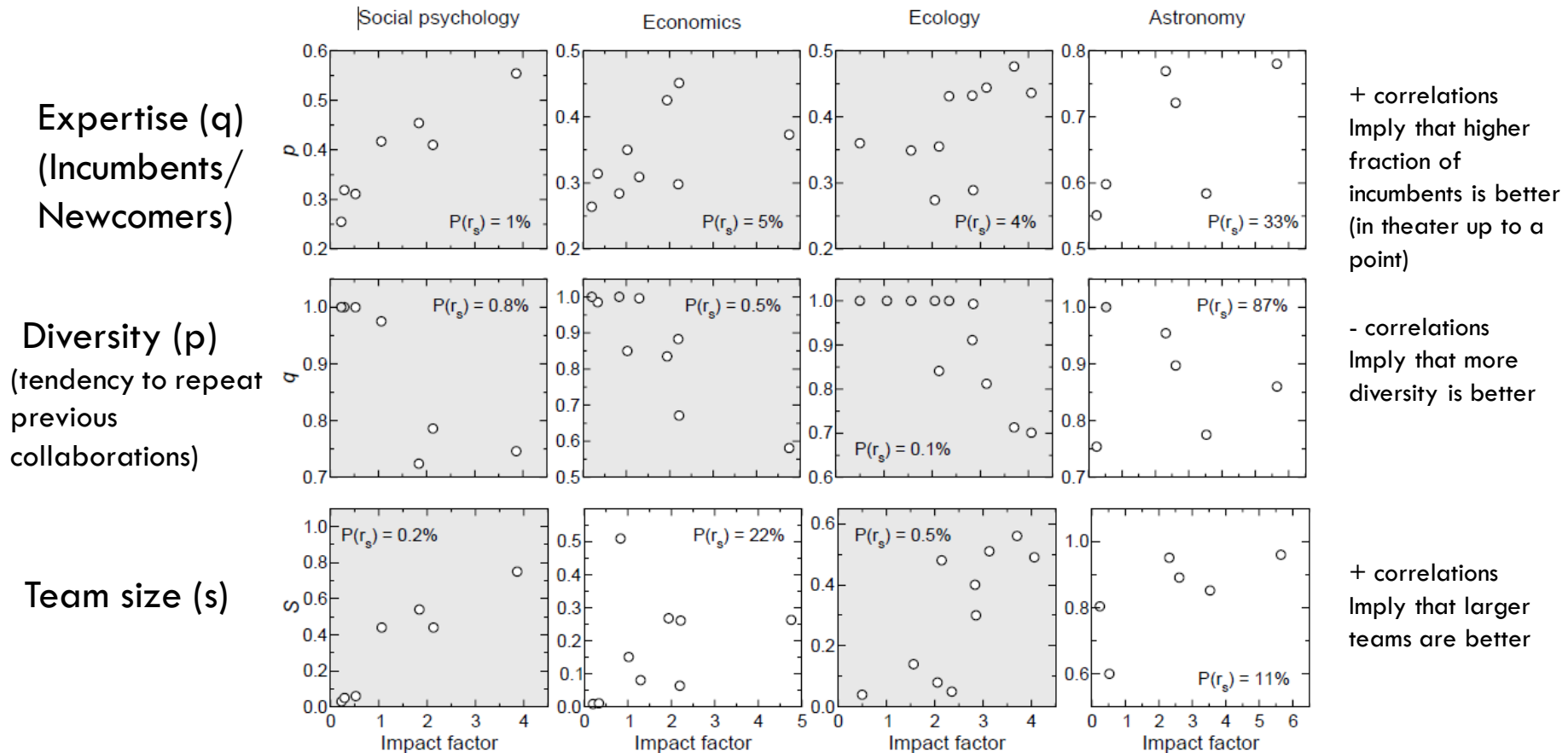
*Wuchty S, Jones BF, Uzzi B. (2007). The increasing dominance of teams in production of knowledge. *Science*.

Research increasingly done in teams



Over the last 50 years, the # of authors on a team has increased significantly (and consistently across disciplines)

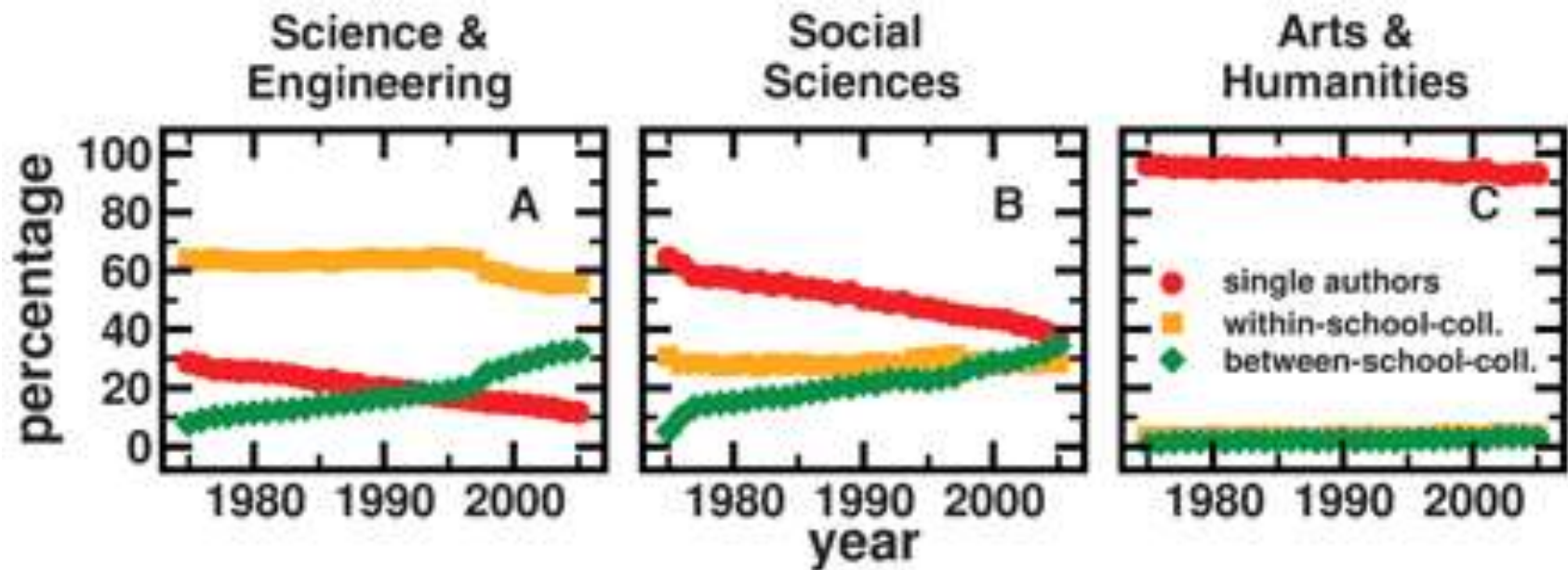
Structure & Composition of Successful Teams



Shaded graphs indicate significantly correlated variables at the 95% confidence level.

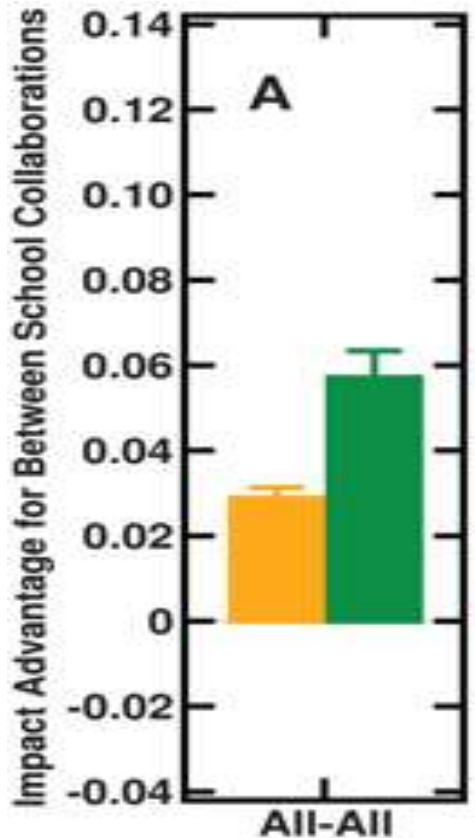
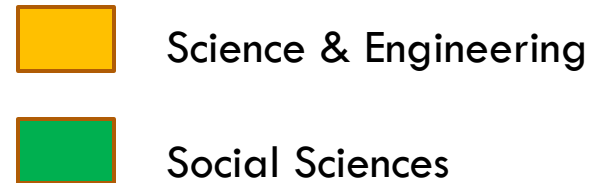
Research increasingly geographically distributed

The rise in multi-university collaboration. By comparing the incidence of papers produced by different authorship structures, we see that the share of multi-university collaborations strongly increases from 1975 to 2005. This rise is especially strong in SE (**A**) and SS (**B**), whereas it appears weakly in AH (**C**), in which collaboration of any kind is rare.



Jones BF, Wuchty S, Uzzi B: Multi-university research teams: shifting impact, geography, and stratification in science. *Science*. 2008;322:1259-1262.

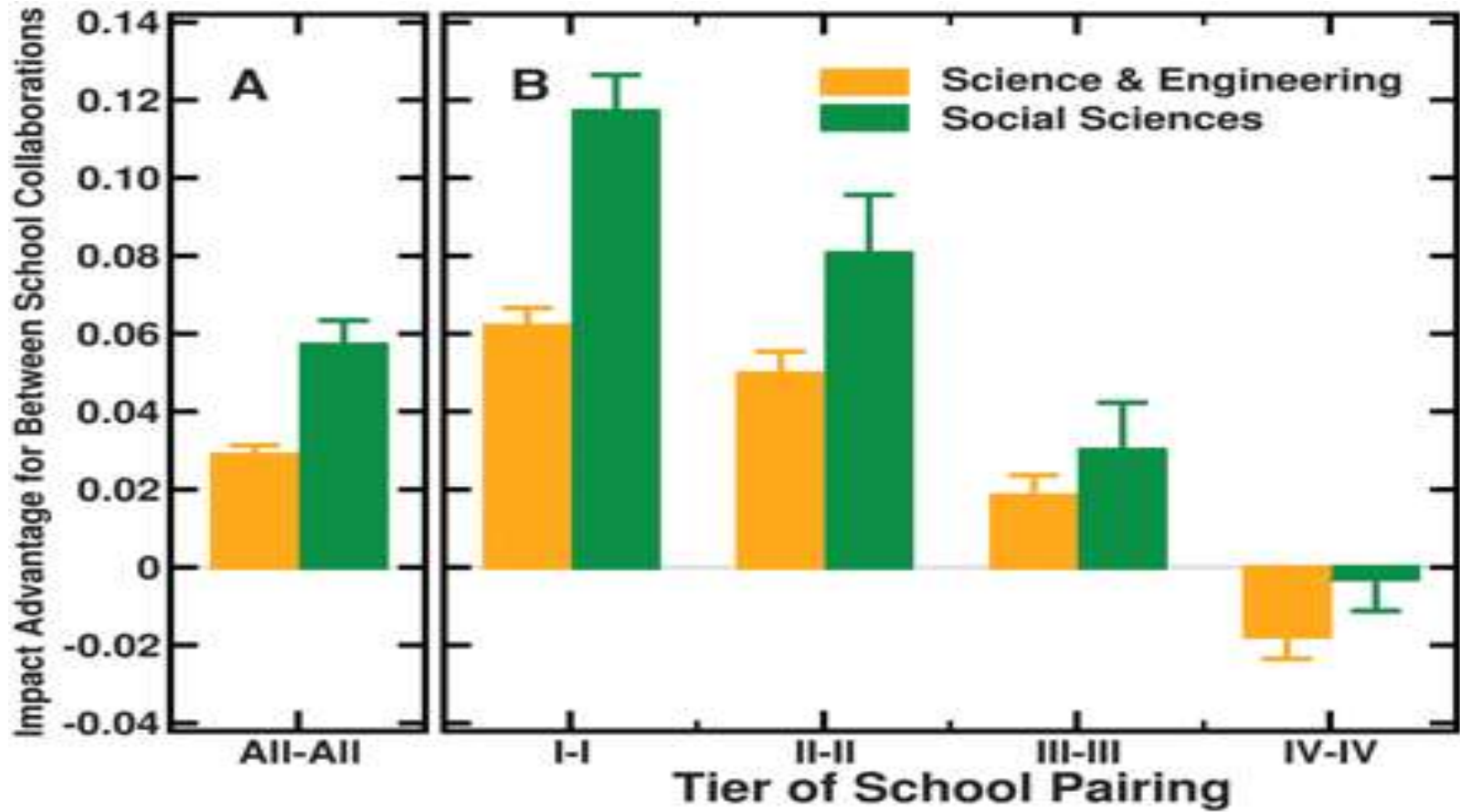
The impact advantage



Between-school collaboration publications tend to be higher impact than single school or solo author publications

Jones BF, Wuchty S, Uzzi B: Multi-university research teams: shifting impact, geography, and stratification in science. *Science*. 2008;322:1259-1262.

The impact advantage

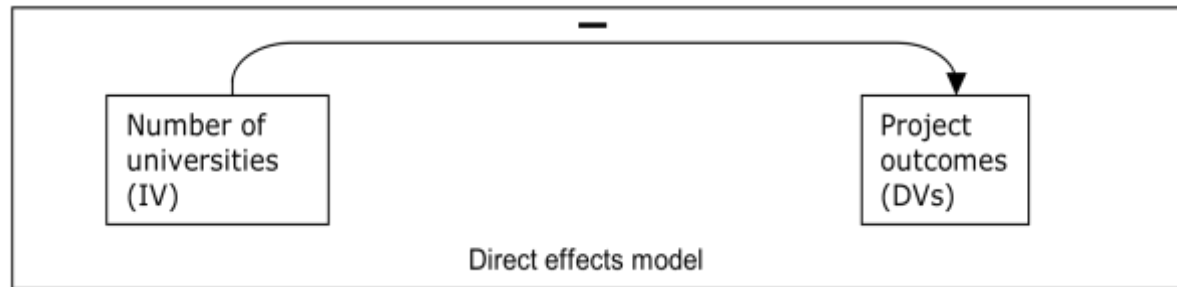


Jones BF, Wuchty S, Uzzi B: Multi-university research teams: shifting impact, geography, and stratification in science. *Science*. 2008;322:1259-1262.

Risks associated with team science

Cummings & Kiesler (2007) 491 NSF funded collaborations.

Result: Having more universities involved in a collaboration associated with having fewer project outcomes (patents, awards, and publications)

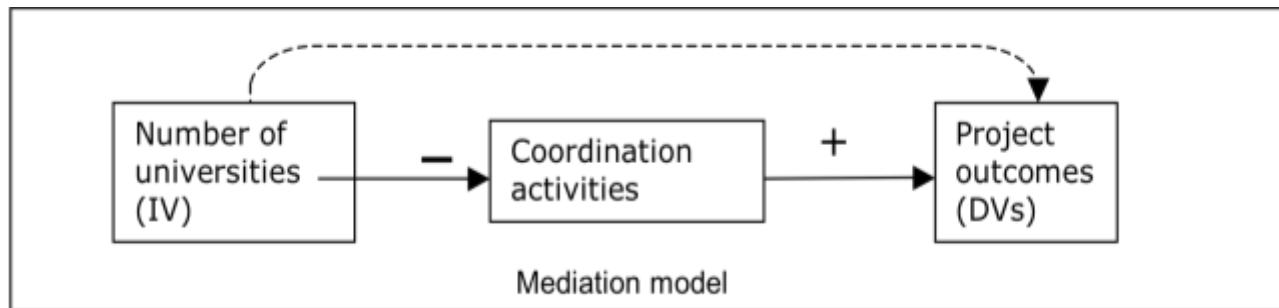


High Risk.
But why?

- Cummings JN, Kiesler S. Coordination costs and project outcomes in multi-university collaborations. *Res Policy*. 2007 ;36: 1620-1634.
- Rhoten D, Parker A. Risks and rewards of an interdisciplinary research path. *Science*. 2004;306:2046-2046.

Mitigating Risk: Coordinating Activities

Inverse relation between # of universities and project outcomes is mediated by the # of **coordinating activities**: [division of responsibilities, project management tool (e.g. Basecamp), shared papers, student exchanges; in-person meetings] - **Issue: \$\$\$\$**



Allen's Law: collaboration effectiveness declines when co-workers >30 m apart

Facilitates Interdisciplinary Team Science

- **Regular interactions focused on science** (Cummings & Kiesler, 2005; Rowe, 2008; Stokols et al., 2005)
- **Common language/constructs** (Maasen et al., 2006; Rosenfield & Kessel, 2008)
Stephen Crowley, Idaho Toolbox – Scientific worldviews, scales, habits
- **Mutual respect among scientists** (Rowe, 2008; Stokols et al., 2005)
- **Cultural norms, institutional leadership, & funding that support interdisciplinary TS** (Cohen & Siegel, 2005; Gray, 2008; Klein, 2005; NAS, 2004; Rowe, 2008; Rosenfield & Kessel, 2008; Seaman, 2008; Sellers et al., 2006; Zerhouni, 2006)

SciTS isn't One Size Fits All

Collaboration Readiness Scale:

e.g. item 1: “There is so much work to be done within my field that I feel it is important to focus my research efforts with others in my own discipline.”

(uni-disciplinary research orientation item)

e.g., item 2: “Although I was trained in a particular discipline, I devote much of my time to understanding other disciplines in order to inform my research.”

(inter/trans-disciplinary item)

- Hall et al., (2008). The Collaboration Readiness of Transdisciplinary Research Teams and Centers: Findings from the NCI's TREDC Year-One Evaluation Study. *American Journal of Preventive Medicine*.
- Stipelman B, Feng A, Hall K, et al. (2010). The relationship between collaborative readiness and scientific productivity in the Transdisciplinary Research on Energetics and Cancer (TREC) centers. *Ann Behav Med*. 2010;39:S143.

Also Facilitates Interdisciplinary TS

- **Training programs in team science** (Morgan et al., 2003; Nash et al., 2003; Sellers et al., 2006)
- **Mentoring in interdisciplinary team science** (Meaney, 2008; Seaman, 2008)

The TeamScience.Net Goal



- Create, evaluate, and disseminate, new durable, readily accessible on-line learning resources to enhance team-based research.
- Tools designed to address the needs of a wide and diverse audience, in an engaging, even entertaining way

eLearning

□ **Why?** E-learning offers:

- 1) easy, free, access by a wide audience
- 2) convenient scheduling for busy researchers
- 3) adult learning principles: active exploration, interactive problem-solving, ask experts, experiment & make mistakes in safe environment.
 - known to facilitate deeper learning & retention
- 4) complements classroom learning (when available)

• **How?** With the help of award winning NogginLabs, Inc.



Access the modules and download interactive activities from

<http://teamscience.net>



We have developed and launched four, interactive learning modules on
<http://teamscience.net>:

What resources are available:

A Suite of 4 e-Learning Modules

1. The Science of Team Science ← **Instructional (key findings)**

2. Team Science Research Process in Behavioral Science

3. Team Science Research Process in Basic Medical Science

4. Team Science Research Process in Clinical Medical Science



What resources are available:

A Suite of 4 e-Learning Modules

1. The Science of Team Science ← **Instructional (key findings)**

2. Team Science Research Process in Behavioral Science

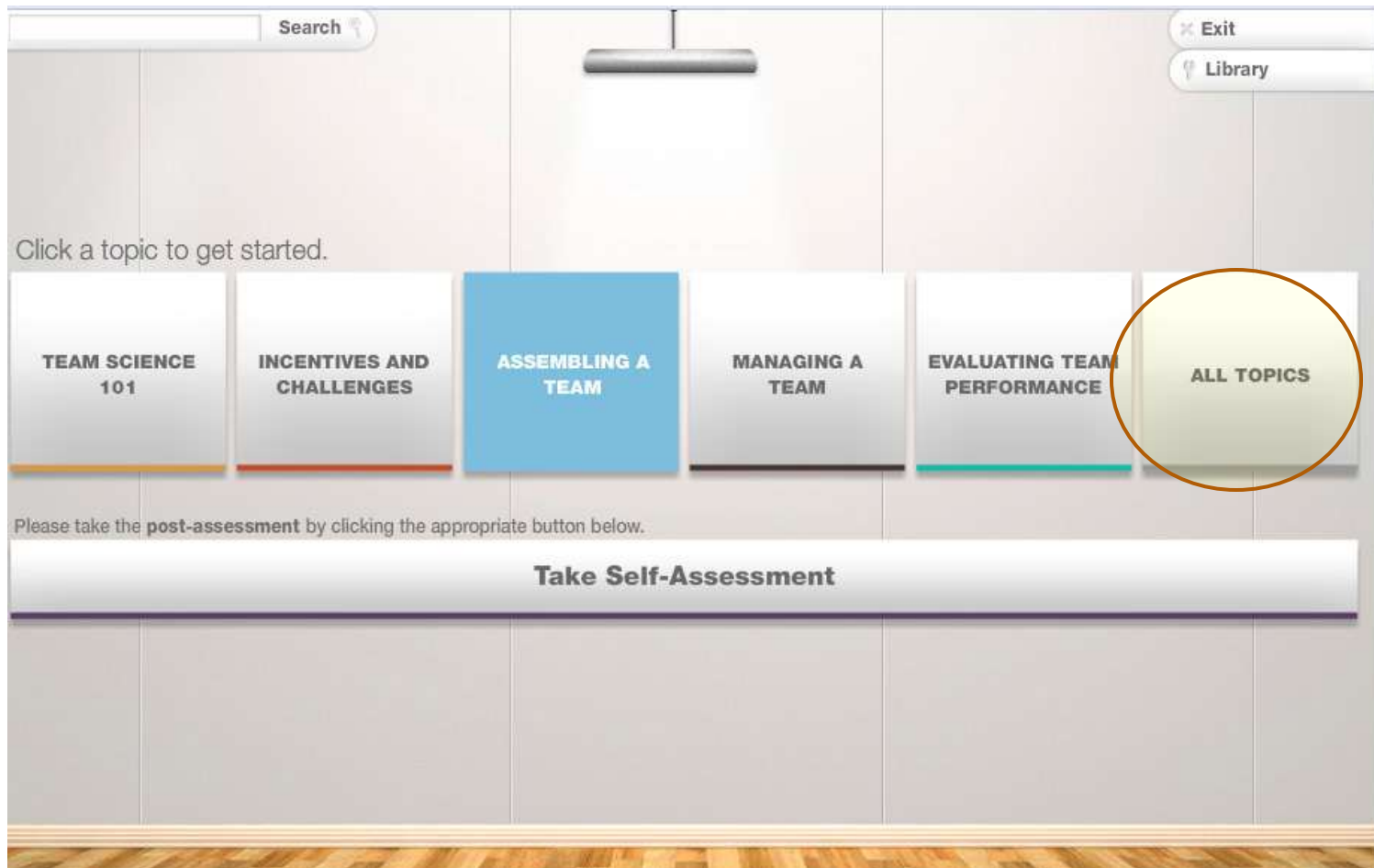
3. Team Science Research Process in Basic Medical Science

4. Team Science Research Process in Clinical Medical Science

**Experiential Learning
(role playing)**

Module 1: The Science of Team Science

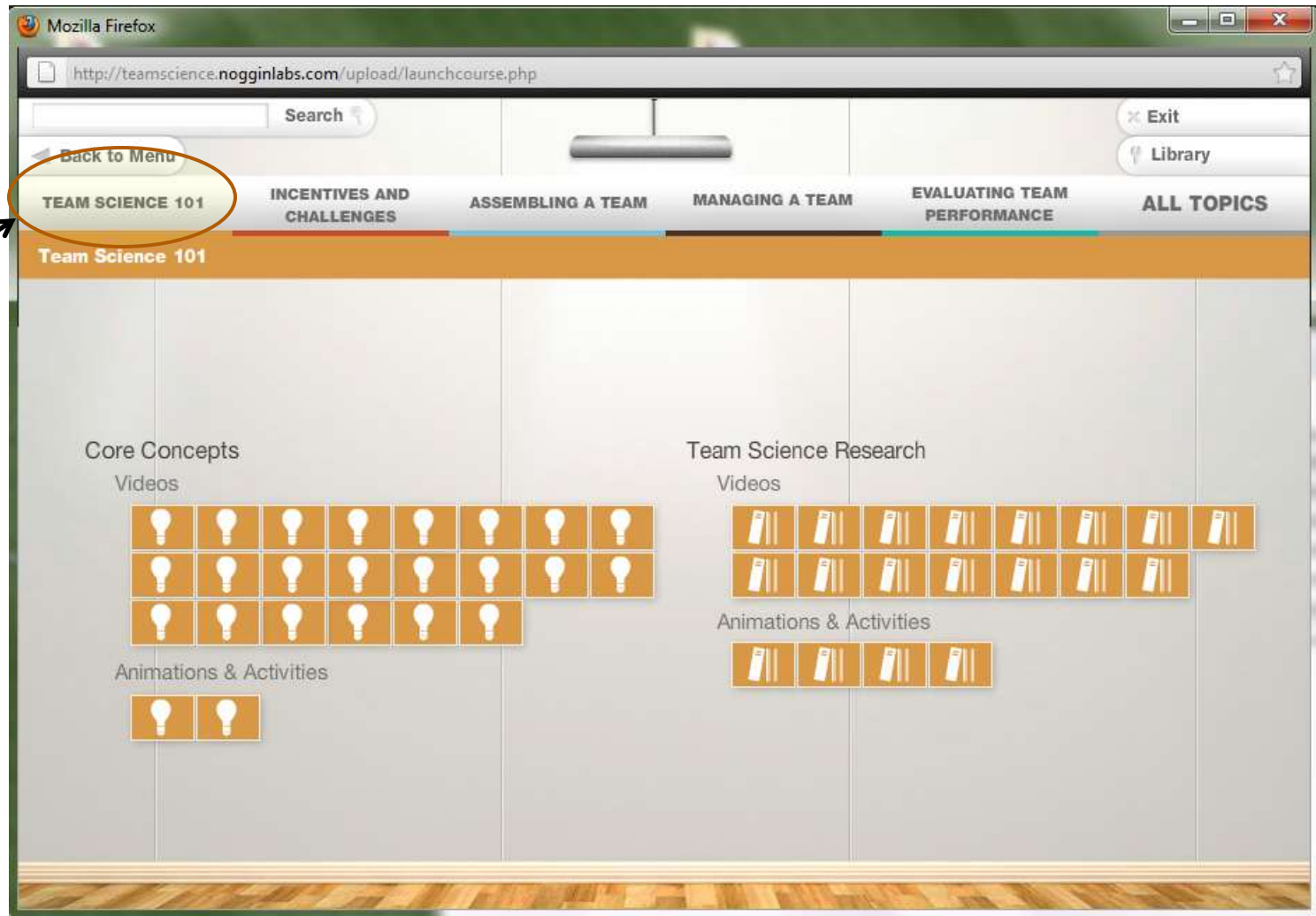
Module 1



Answers from experts: Sorting by content category

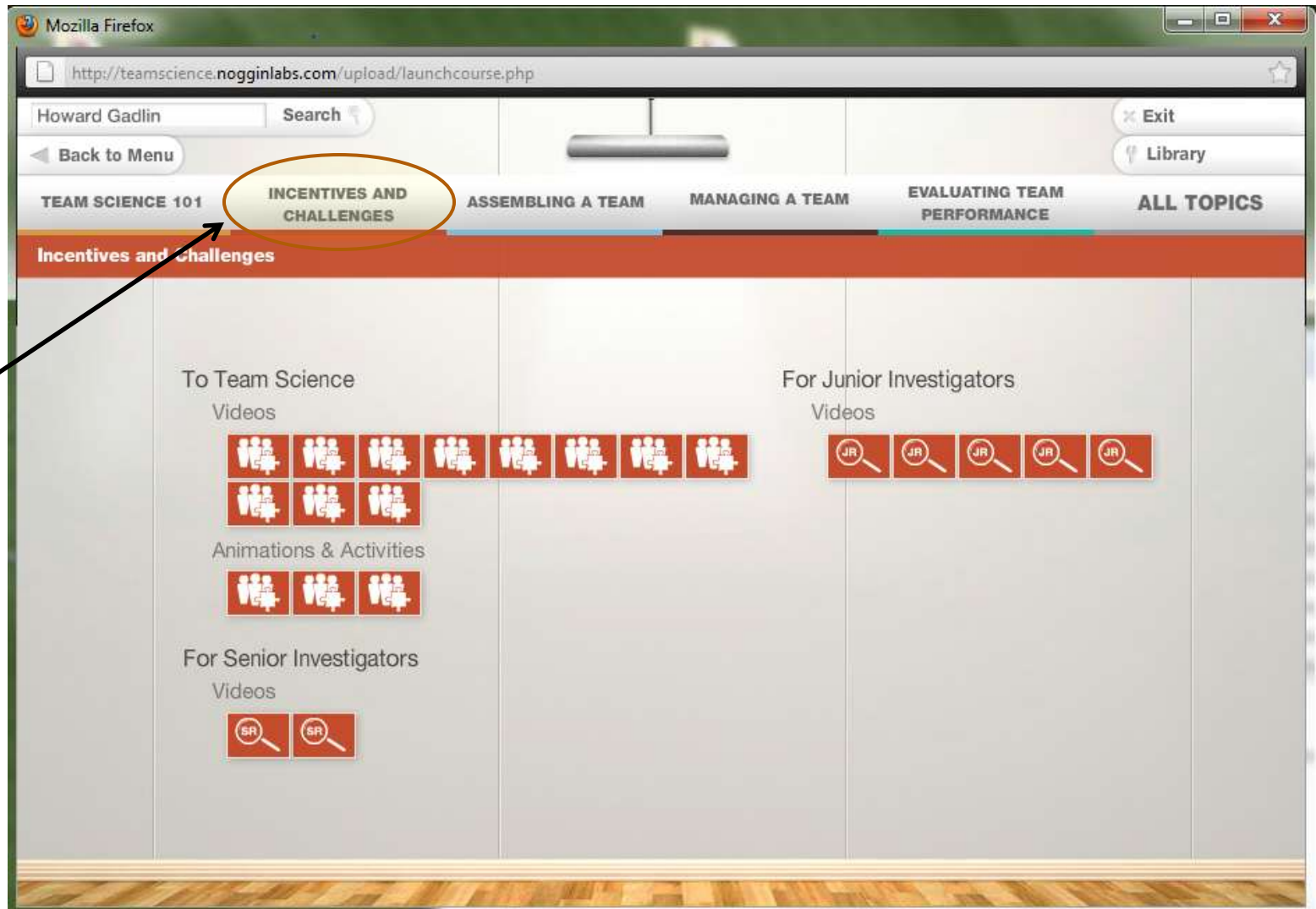
Module 1

Viewing only the 37 videos & 6 animations/activities in the "Team Science 101" category



Answers from experts: Sorting by content category

Module 1



Viewing only the
19 videos &
3 animations /
activities on
"Incentives &
Challenges"

Answers from experts:

Howard Gadlin answering a question on conflict

Related Questions

Module 1

Is conflict bad for a team?

Some forms of conflict can actually improve the team.

Howard Gadlin, PhD – National Institutes of Health: Ombudsman and Director of the Center for Cooperative Resolution; Authoring *Team Science Field Guide* with Michelle Bennett

Meet Howard Gadlin

Related Questions

Mouse over the squares below to view questions you also might find of interest.

Videos

Animations & Activities

KEY

Is conflict bad for a team?

Informational Activities

Module 1

Search

Exit

Library

Back to Menu

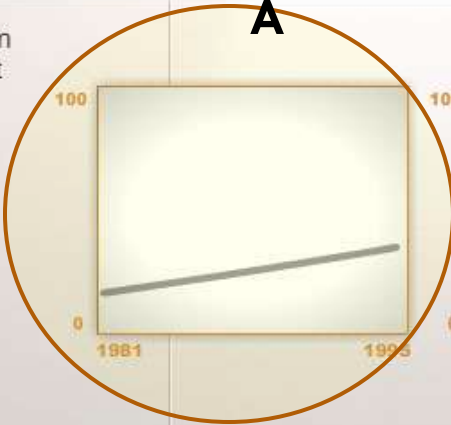
Back to Topic

According to bibliometric data, has collaboration been increasing or decreasing?

Research looks at what bibliometric data indicates about the amount of collaborations that are currently occurring in scientific fields.

In *Structure of Collaborations*, Shrum looked at bibliometric data and what it suggested about co-authorship patterns from 1981 to 1995.

Choose a graph with the line that represents the linear slope of co-authorship. Once you're satisfied with your choice, click Submit. If you prefer not to guess, simply click Skip to continue.

A

B

C

Reference: Shrum, W., Genuth, J., & Chompalov, I. (2007). Structures of scientific collaboration. Cambridge, MA: Massachusetts Institute of Technology Press.

Skip

Submit

Related Questions

Mouse over the squares below to view questions you might also find of interest.

Videos



KEY

Modules 2-4: Experiential learning / Role playing

Module 2

Behavioral Team Science Wing

Menu Dossier Exit

Behavioral Team Science Wing Introduction: Your Role

Hello!
Welcome to the
Behavioral Team Science
Wing



|| ↺ Next

The image shows a virtual reality interface for a module titled 'Behavioral Team Science Wing'. The main display area is split into two panels. The left panel shows a modern office interior with white chairs and a large screen displaying the text 'Hello! Welcome to the Behavioral Team Science Wing'. The right panel shows a woman in a business suit standing in front of a large screen. The screen displays a man pointing at a network diagram and a group of people's hands reaching together. The interface includes a top navigation bar with 'Menu', 'Dossier', and 'Exit' buttons, and a bottom navigation bar with a play/pause button, a reset button, and a 'Next' button.

Move through a series of real-world exercises

Module 2

Behavioral Team Science Wing

Menu  Dossier  Exit 

Identifying the Funding Opportunity

[Learn More !\[\]\(47b8cc79b05c7855d46af8a2b26f2df4_img.jpg\)](#)

Click each funding opportunity to view additional information. Then, click **Choose** to select the funding opportunity best suited for the research your team would like to conduct. (Remember, you can view your Dossier at any time for a refresher on project specifics.)


NIH P01: Program Project Grant


Collaborative NSF Grant


W. M. Keck Foundation Grant

Collaborative NSF Grant

Choose

NSF does not normally support research with disease- or health-related goals, including work on the etiology, diagnosis or treatment of physical or mental disease, abnormality, or malfunction in human beings or animals. Animal models of diseases or the development or testing of drugs or other procedures for their treatment also are not eligible for support.

However, research in bioengineering, with diagnosis- or treatment-related goals, that applies engineering principles to problems in biology and medicine while advancing engineering knowledge is eligible for



Allocate funds to a team project's budget

Module 3

Biomedical Team Science Wing

Menu

Dossier

Exit

Drafting Budget

You worked with the PI to allocate reasonable amounts of the \$22.5 million dollar maximum available funding to create this draft budget.

Click on the highlighted portions in the draft budget to view guidelines and best practices for this stage in proposal development.

Additional budget information is available in the **Learn More** button on this screen.

Once you've selected each highlighted cell, click **Next** to continue.

0/7 Viewed

Learn More

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Administrative Care	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$2,250,000
Tissue Engineering Core	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$1,500,000
National Physicians Cooperative Care	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$1,500,000
Training and Education Core	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$1,500,000
Resources	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$500,000
Travel	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000
Subproject A	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject B	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject C	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject D	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject E	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject F	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject G	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject H	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject I	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
Subproject J	\$303,000	\$303,000	\$303,000	\$303,000	\$303,000	\$1,515,000
TOTAL	\$4,500,000	\$4,500,000	\$4,500,000	\$4,500,000	\$4,500,000	\$22,500,000

And practice dealing with team conflicts

Module 3

Biomedical Team Science Wing

Menu  Dossier  Exit 

Facilitating Communication



As a Research Development Officer, facilitating collaboration among the team is crucial. How can you facilitate collaboration effectively?

Talk to PI and other collaborators:

- Have the team **set up standing, hour-long weekly meetings**
- The RDO sets these meeting agendas in partnership with the PI

Be aware of warning signs such as missed meetings and frequent schedule difficulties:

- If members are regularly missing meetings and scheduling other things, talk with the PI about available options and possibly have a discussion with the collaborator(s) directly to ask about continued involvement. Being proactive will pay off

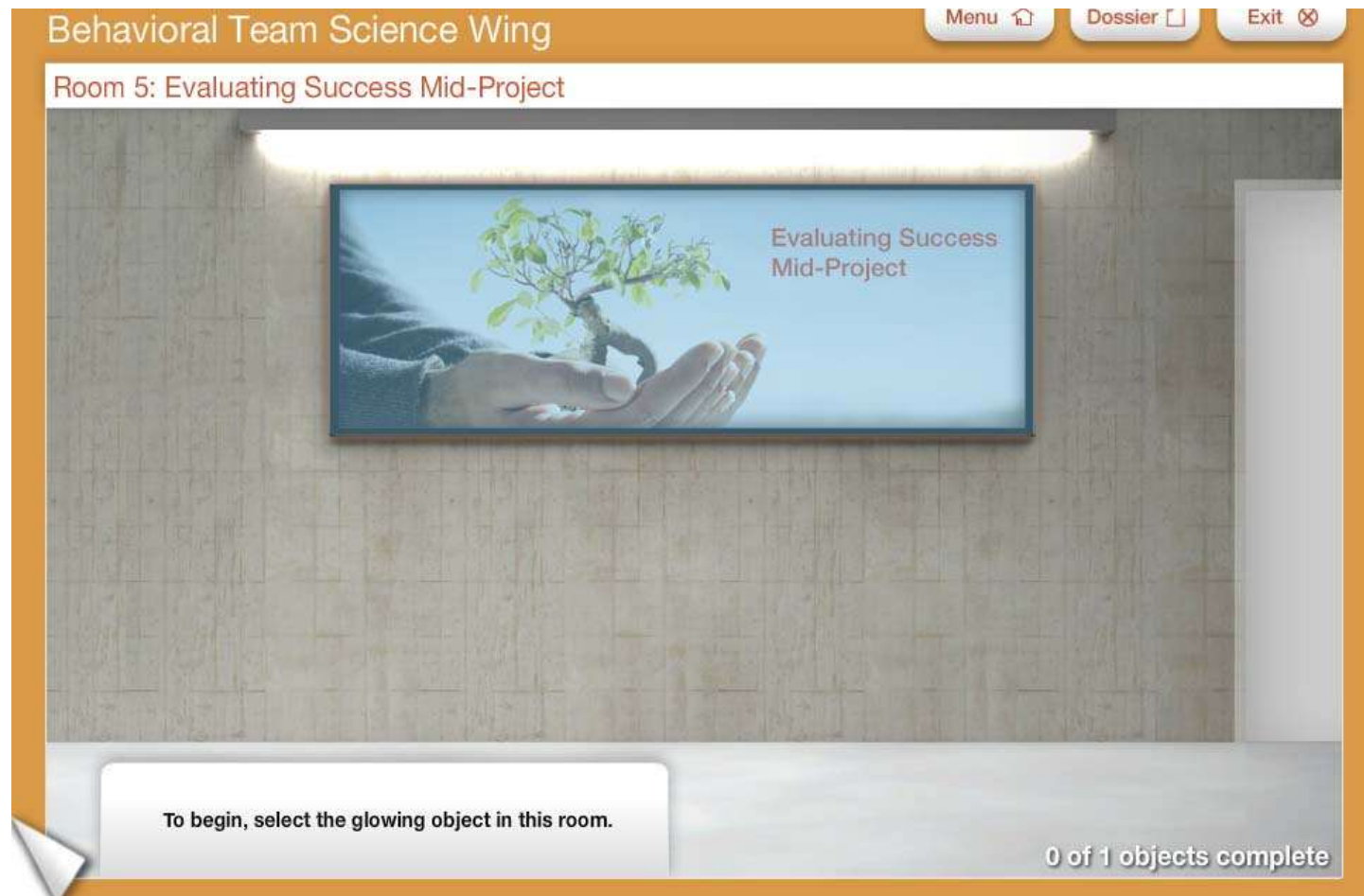
Click the **Next** button to return to the room.



**Next**

Learn strategies for evaluating the project

Module 2



Then find out how much you've learned

Modules 1-4

Pre-Assessment

Self-assessed Skills

Instructions: Please select the number to the right of each item that best describes your level of confidence.

How confident are you in your ability to...	Not At All Confident					Very Confident				
	1	2	3	4	5	1	2	3	4	5
assemble and manage a cross-disciplinary research team?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
find an appropriate funding opportunity for a cross-disciplinary research project?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
head off conflict on a cross-disciplinary research team?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
find help mediating conflicts when collaborating with colleagues in different departments or institutions?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
set up and employ the right communication methods at the right times with cross-disciplinary team members?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
evaluate the success of a collaboration midway through a cross-disciplinary project?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Continue

Reviewing key features // teamscience.net

- Open access (i.e., free) thanks to our funders
- Self-testing at the beginning and end of each module
- Self-pacing / stop & save /
 - exploration (e.g., the “learn more” feature)
 - estimated 45-60 minutes to complete each module
- A library of resources for researchers and instructors
 - articles, team building tools, & syllabi)

We hope you'll use & enjoy them!

Thank you to:

The Coalesce Team:

Arlen Moller

Kat Silverstein

Holly Falk-Krzesinski

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OFFICE OF BEHAVIORAL
AND SOCIAL SCIENCES RESEARCH
NATIONAL INSTITUTES OF HEALTH