Team Science Primer
Paul Estabrooks, PhD
Science of Team Science Journal Supplement 2008

Team Approaches to Science, Practice, and Policy in Health 2012

Collaboration Science and Translational Medicine 2014

Applying the Science of Teams to inform Policy and Research on Team Science NSF 2010

National Academies Press 2015

Adapted from Hall 2014
WHAT IS “TEAM SCIENCE”?

• Team science – research conducted by more than one individual in an interdependent fashion, including research conducted by small teams and larger scientific groups.

• Science teams: 2 to 10 individuals (most team science is conducted by groups of this size)—and likely reflective of scholars and most pilot study recipients.
What is “Team Science”? 

• Larger scientific groups: More than 10 individuals who conduct team science as larger groups and are typically composed of many smaller science teams can include 100s of scientists.

• CENTRIC should likely be considered a larger scientific group.

• Large scientific groups typically possess a differentiated division of labor and an integrated structure to coordinate and support the smaller science teams.
What is “Effective Team Science”?

• A scientific team or large scientific group’s capacity to achieve its goals and objectives.
  • Improved member outcomes (e.g., team member satisfaction and cohesion—ICE measure areas)
  • Improved team outcomes (publications, new funding… scientific breakthroughs!)

National Academies Press, Enhancing the Effectiveness of Team Science 2015
Considering broader context in effective team science

Intrapersonal
- Attitudes toward network and ability to devote substantial time and effort
- Preparation and patience for the complexities and tensions involved in initiating and sustaining a new network and transdisciplinary, translational research

Interpersonal
- Participatory and empowering leadership
- Social cohesiveness
- Diversity of perspectives
- Ability to adapt to changing task requirements and demands
- Effective communication to develop common ground and shared goals
- Climate of mutual respect among team members

Organizational
- Organizational incentives to support collaborative teamwork
- Non-hierarchical organizational structures to facilitate team autonomy
- Breadth of disciplinary and translational perspectives represented within the network
- Climate of cooperation
- Frequent opportunities for face-to-face communication and informal information exchange

Physical Environmental
- Spatial or technologically supported proximity to encourage frequent contact and informal communication
- Access to comfortable meeting areas (including virtual meeting rooms) for brainstorming
- Access to research resources, KCAs

Societal/Political
- Cooperative partner policies that facilitate collaboration
- Local health priorities & processes to facilitate cross-sectoral and organizational collaboration in research and training
- Policies and protocols to support successful transdisciplinary collaborations

Technological
- Infrastructure readiness
- Support across science teams and KCAs
- Steering committee and members' technological awareness and readiness
- Ability to access and use high level data within security and privacy regulations.

Adapted from Stokols et al. 2008
TEAM SCIENCE AND THE FOCUS ON DISCIPLINARY INTEGRATION

Transdisciplinary (TD)
Researchers from different disciplines work jointly to develop and use a shared conceptual framework that synthesizes and extends discipline-specific theories, concepts, and methods, to create new approaches to address a common problem.

Multidisciplinary (MD)
Researchers from different disciplines work sequentially, with a goal of eventually combining results to address a common problem.

Interdisciplinary (ID)
Researchers from different disciplines work jointly to address a common problem. Some integration of perspectives occurs, but contributions remain anchored in their own disciplines.

Unidisciplinary (UD)
Researchers from a single discipline work together to address a common problem.

Adapted from Hall 2014
Some early descriptive research

- Multidisciplinary projects superior to unidisciplinary projects in producing innovation and scientific tools
- Important findings for the CENTRIC:
  - The projects with more coordination opportunities and infrastructure had more successful outcomes
    - Direct supervision and reporting of objective achievement
    - Opportunities for face-to-face meetings on a regular basis
  - Projects with less coordination resulted in fewer training experiences and outreach activities.
  - Greater number of universities involved in a collaboration predicted fewer coordination activities and fewer project outcomes

Cummings & Kiesler, 2005, 2007
Team Science Data from NCI
(Shout out to Dr. Kara Hall for the following Slides)

Transdisciplinary Research on Energetics and Cancer Centers (TREC) U54 - $74,811,868

Centers of Excellence in Cancer Communication Research (CECCR) P50 & P20 - $83,880,445

Centers for Population Health and Health Disparities (CPHHD) P50 - $66,298,321

Transdisciplinary Tobacco Use Research Centers (TTURC) P50 - $68,995,753
Similar to CENTRIC? Replace Transdisciplinary Focus with chronic disease focus

Goal: Foster transdisciplinary collaborations to produce science that contributes to reducing the cancer burden

Strategies include:

- Funding that emphasized transdisciplinary research
- Multiple linked projects/centers with facilitated integration
- Cores/Coordination Center to provide administrative support, maximize diverse collaboration, and bridging mechanisms
- A steering Committee to provide consistent messaging and reinforce transdisciplinary goals
- Developmental pilot project funds
- Semi-annual meetings to foster new collaborations
- Training to address needed transdisciplinary competencies for investigators at multiple career stages
- Evaluation
Cross-Center Network Ties Before and After CPHHD Funding

Prior to Funding

Subsequent to Funding

- Increase in collaboration between investigators across centers
- Endorsement of ID/TD = brokers

Key
- Red=OSU  Gray=Tufts  Green=UTMB
- Blue=UPenn  Pink=UC  Yellow = Rand
- Turquoise=Wayne State  Orange=UIC
- Dots in upper left corner of the “prior” network represent researchers with no ties to others in the network

Gray & Ren, 2007
TD center publications have longer start up period compared to R01s but become more productive over time.

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

**Key Finding:** TTURC investigators start with fewer publications, and outpaced CG by mid-end; similar trend for impact factor.

**Method:** Comparison of TTURC and R01 investigators’ citations rates from *entire corpus of publications* 1996-2010.
The Team Science Toolkit is an interactive website that provides resources to help users support, engage in, and study team-based research.
Developing skills for team science