Bringing it all together for successful convergence research

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Accelerating Engineering Research Center Preparedness

October 2, 2018

Scientific Review Panel: *Team Science Expert*

- Identifying Team members
- Building, forming, and sustaining the team
- Effectively leading a team
- Interdisciplinary/Transdisciplinary/Convergent Research
- Engaging the community
- Communicating (logistics, scientific, process, etc..)
- Managing the Team

Research Proposal Requirements…

- Acknowledgement of the complex nature of the scientific challenge
  - Intro, background, research plan, etc…
- Providing information that enables the reviewers to understand:
  - the work that has gone into forming the team
  - how the team will work together
  - the advantage the various perspectives will bring
  - how will the team communicate (internally? with external partners/stakeholders?)
  - how disagreements will be resolved successfully
  - how information, reagents, data will shared/managed within and beyond the group
  - the philosophy for training and mentoring in an era of team science

Note: together this information could establish a collaboration plan/agreement*

Scientific Review: Team Science Expert

- Team member identification
  - Scientific background/expertise
  - Interests/motivations/"fit"
- Team building and management
  - Establishing Trust
  - Setting Expectations
  - Team development
- Effective leadership
  - Shared Vision
  - Research Plan
  - Collaboration Plan
- Interdisciplinary/Transdisciplinary /Convergent
  - Disciplinary backgrounds relevant to complexity of the problem
- Engagement of community
  - Authentic?
- Communication skills
  - Internal/external
  - Managing conflict and promoting disagreement

Team Formation: Descriptions in Grant Proposal

a) Once I am funded, I will form the team. I will be the leader. I will outline the goals and objectives, and will give the team explicit directions in order to successfully achieve the goals and objectives of this project.

b) The team is well established. We have been working together for years and are very comfortable together.

c) I have reached beyond my comfort zone and identified individuals who are also interested in this complex problem. They represent a variety of disciplines ranging from close to the science, to expertise in the technological methods, to community level responsibilities.

Research Brings Teams Together….

Developing a Shared Vision

- Key to successful leadership
- Sets the course for the team members to travel
- Improves group effectiveness
- Should be revisited regularly with the team –
  - Are we on track?
  - What has changed?

Developing a Shared Vision

Everyone can describe the “big picture”

Each team member can state his/her research goal and how it relates to the “bigger picture”

Have the group discuss each members accomplishments and challenges in achieving the goal – and how they relate to the overall mission

Instill ownership of roles and responsibility for attaining goals

Team accepts responsibility and accountability for both accomplishments and failures – without blaming.

Building Trust

Jože Gal [Public domain], via Wikimedia Commons

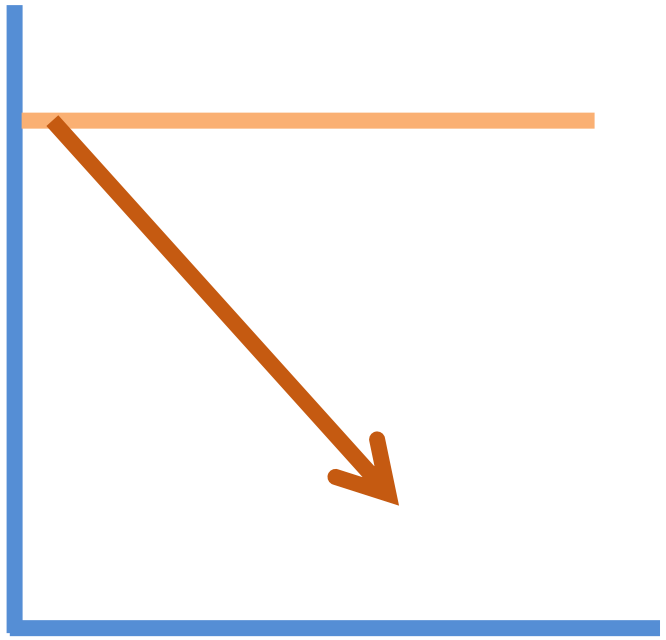
Types of Trust

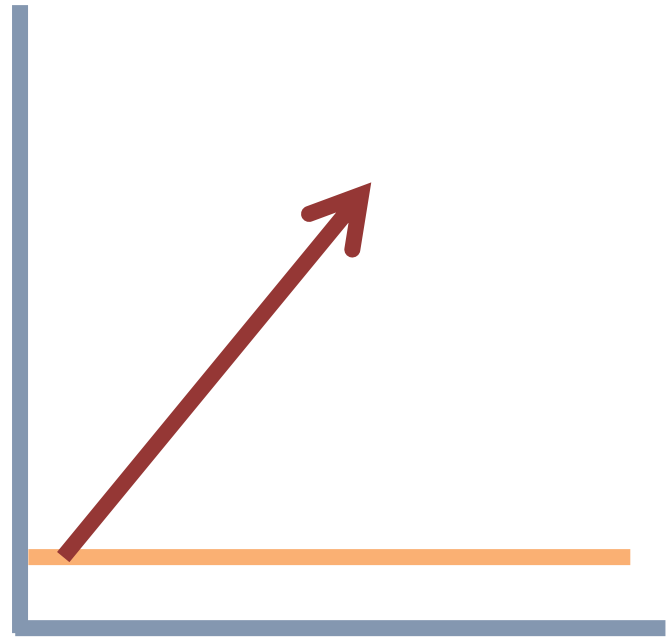
Calculus based trust – built on calculations of the relative rewards for trusting or losses for not trusting

Competence based trust – built on the confidence in people's skills and abilities, allowing them to make decisions and train others

Identity based trust – built on an assumption of perceived compatibility of values, common goals, emotional/intellectual connection

Trust





Leaders Set Clear Expectations

Scaffold for deeper trust

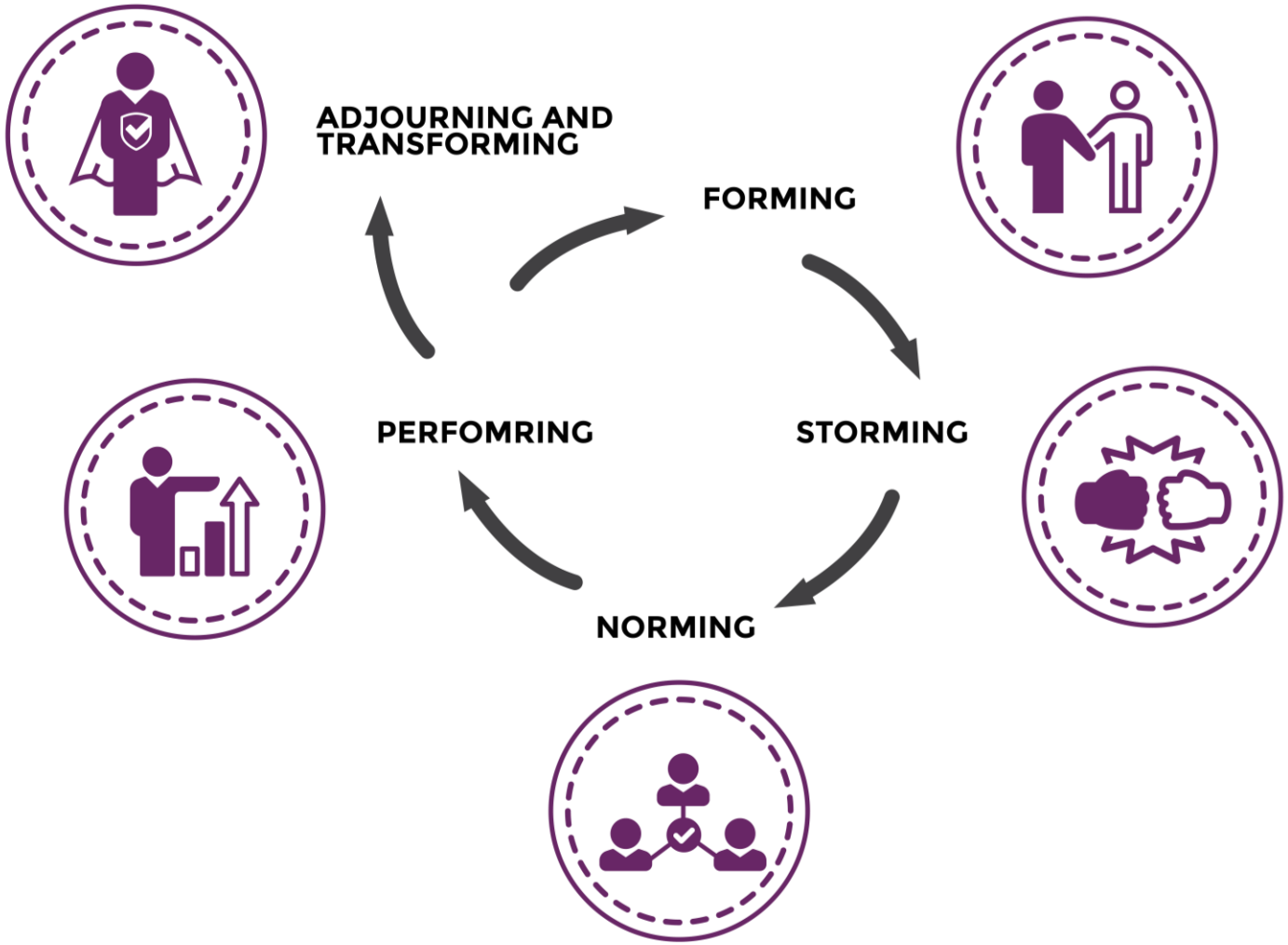
No secrets or surprises

- Communication
- Regular Meetings with Clear Agendas
- Authorship
- Conduct of Investigation, Research…
- Technical Support
- Career Development
- Evaluation Criteria, etc.…

Tools for Setting Expectations

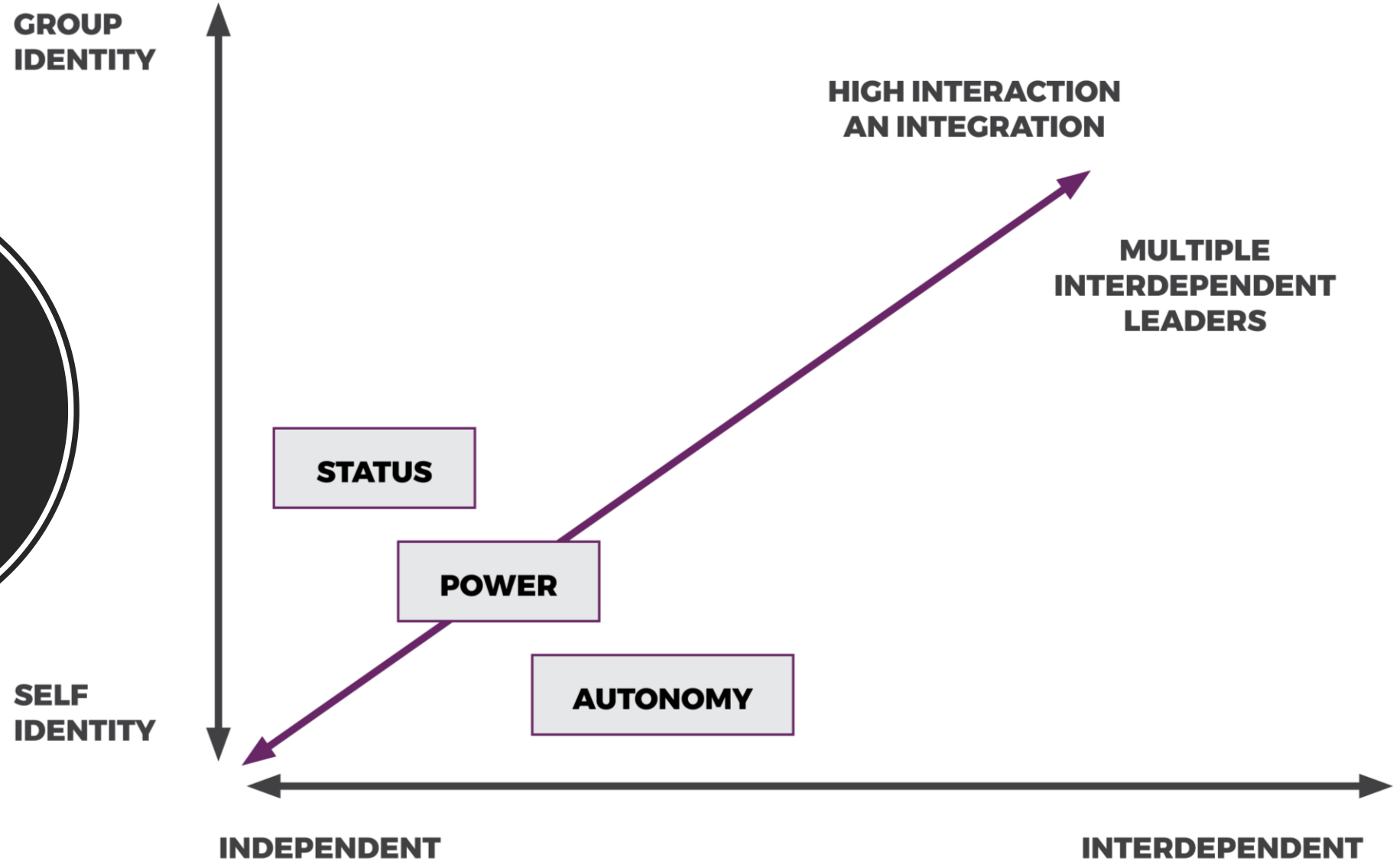
Collaborative Agreement	• Jointly created agreement among collaborators: can be formal or informal in its creation
"Welcome Letter"	• Provides a scaffold for building deeper trust including: what you can expect of me, what I expect of you, what to do if we disagree
Institutional Agreements	• Offer letters, pre-tenure agreements, joint appointment letters, etc… • All ways of putting on paper how one will be recognized and rewarded in the context of their collaborative work

Model of Team Development



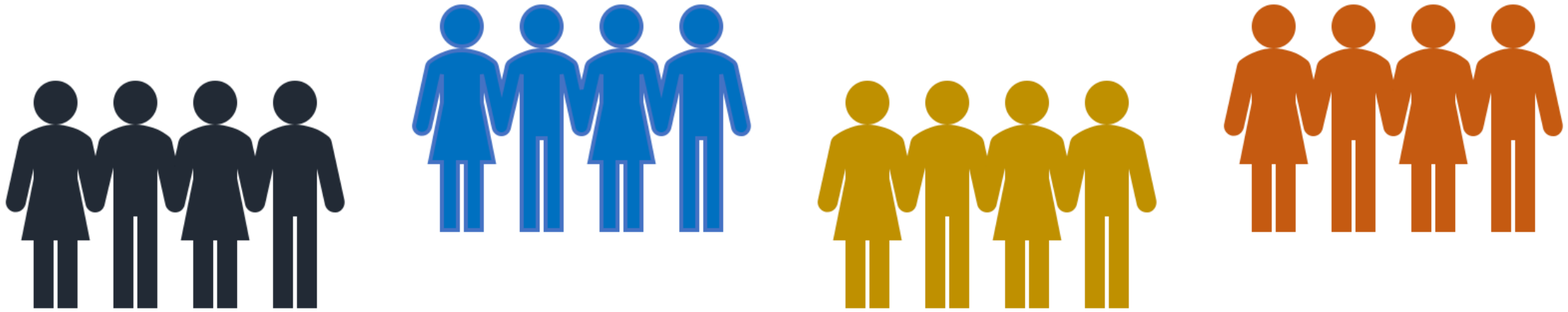
Bruce Tuckman, 1965, 1977

Collaboration Introduces Threats



“The greater the proportion of experts a team had, the more likely it was to disintegrate into nonproductive conflict or stalemate.”

Gratton and Erickson, HBR, November 2007
https://hbr.org/2007/11/eight-ways-to-build-collaborative-teams

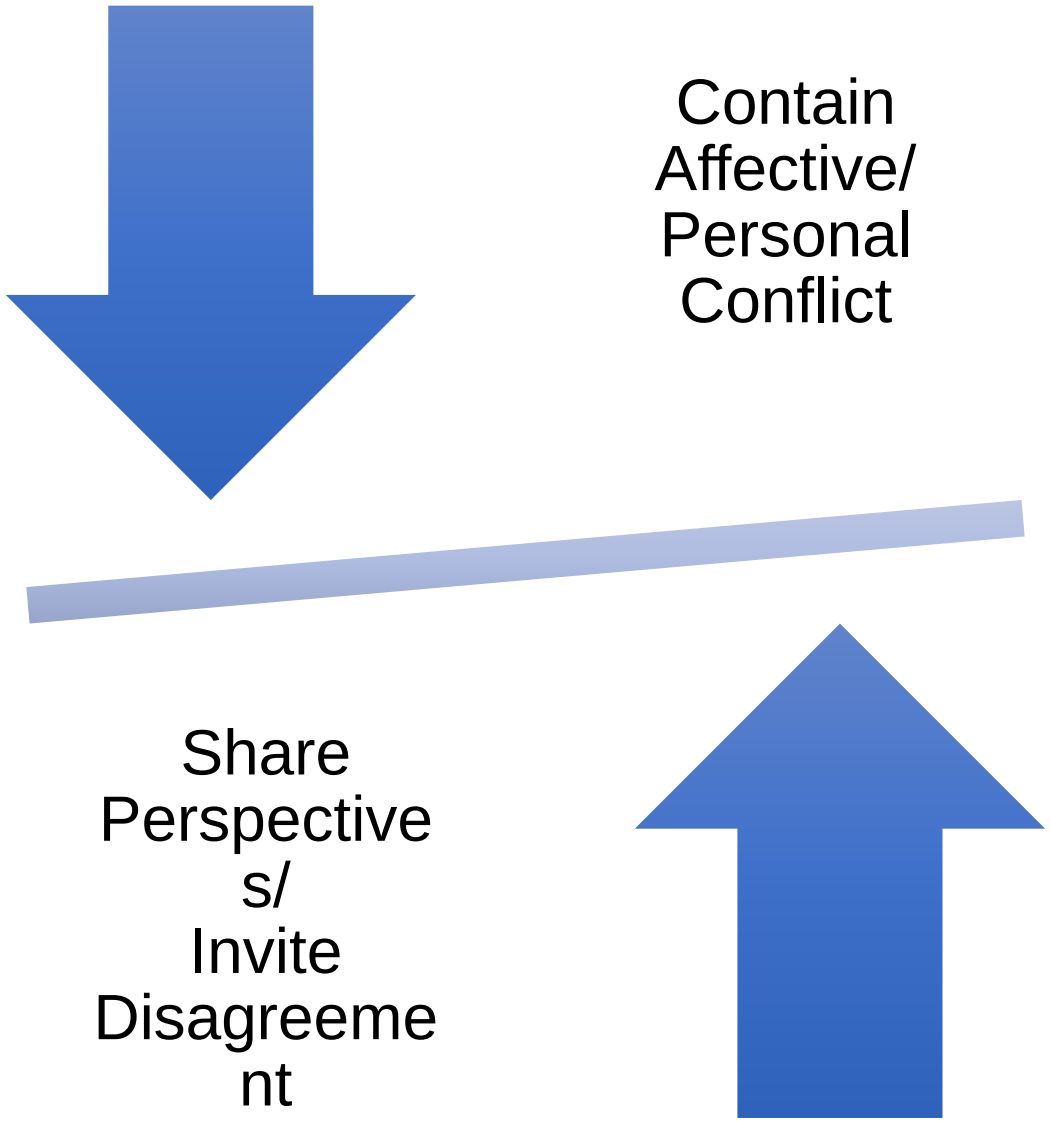


What about diversity?

Team Science is an Exercise in Diversity

- Different perspectives
- Varied experiences
- Range of expertise
- Challenging methodologies/approaches
- Questioning interpretations, results, etc…

Productive Collision



Problem Solving

- A diverse group is more effective at solving problems than a homogenous group
- Random selection of intelligent participants from a diverse group results in teams that can outperform a team of the “best”-performers

- Identity diverse teams are more likely to run into challenges with communication, have more conflict, and take longer to build trust

Hong and Page (2004) PNAS Vol 101: 16385

A Team of Experts ≠ An Expert Team

More Women: Smarter Teams

"There is little correlation between a group's collective intelligence and the IQs of its individual members. But if a group includes more women, its collective intelligence rises."

Anita Woolley and Thomas Malone, HBR, June 2011

BUSINESS | MANAGEMENT | MANAGEMENT & CAREERS

California Becomes First State to Mandate Female Board Directors

Law could run into legal challenges; opponents say legislation runs afoul of constitutional principles

By Vanessa Fuhrmans

Updated Sept. 30, 2018 6:13 p.m. ET

California became the first state to require companies based within its borders to put female directors on their boards, adding to pressure on boardrooms across the country to give more women a seat at the table.

California Gov. Jerry Brown on Sunday signed a bill mandating that all publicly traded companies with headquarters in the state have at least one woman on their boards by the end of next year. By 2021, companies with at least five directors would need to have two or

Mixed Gender Scientific Teams

- Produced research articles considered to be of higher impact than those comprised of a single gender
  - Mixed gender teams received 34% more citations than publications produced by single gender teams
- Promoting diversity:
  - Enhances inclusion and fairness
  - May also lead to increased quality science

Campbell, Mehtani, Dozier, Rinehart (2013) PLoS One

Diversity and a Tech Team

- Diverse perspectives are critical
- If tech teams aren’t diverse, innovation is at risk
- Technology development is for everyone
- Diversifying tech teams makes stronger products as well as strategies to recruit diverse techies
- Consider HP’s fiasco with regard to its facial recognition software

Facial Recogntion and HP

Mouse

Communicating Effectively Across our Disciplinary Languages

You can’t listen if people won’t speak up

- Case Study: Adopting a new technology in a clinical procedure room

Mutual Learning Approach

Values

- Transparency
- Curiosity
- Informed Choice
- Accountability
- Compassion

Assumptions

- I have information, so do other people
- Each of us sees things others don't
- People may disagree with me & have pure motives
- Differences are opportunities for learning
- I may be contributing to the problem

Based on work by Roger Schwarz and Associates

What do Gift Giving and Team Science have in Common?

Ideas as Gifts

- When someone shares an idea, they are sharing a gift
- Idea = gift/present for you
- What can be done with that gift?

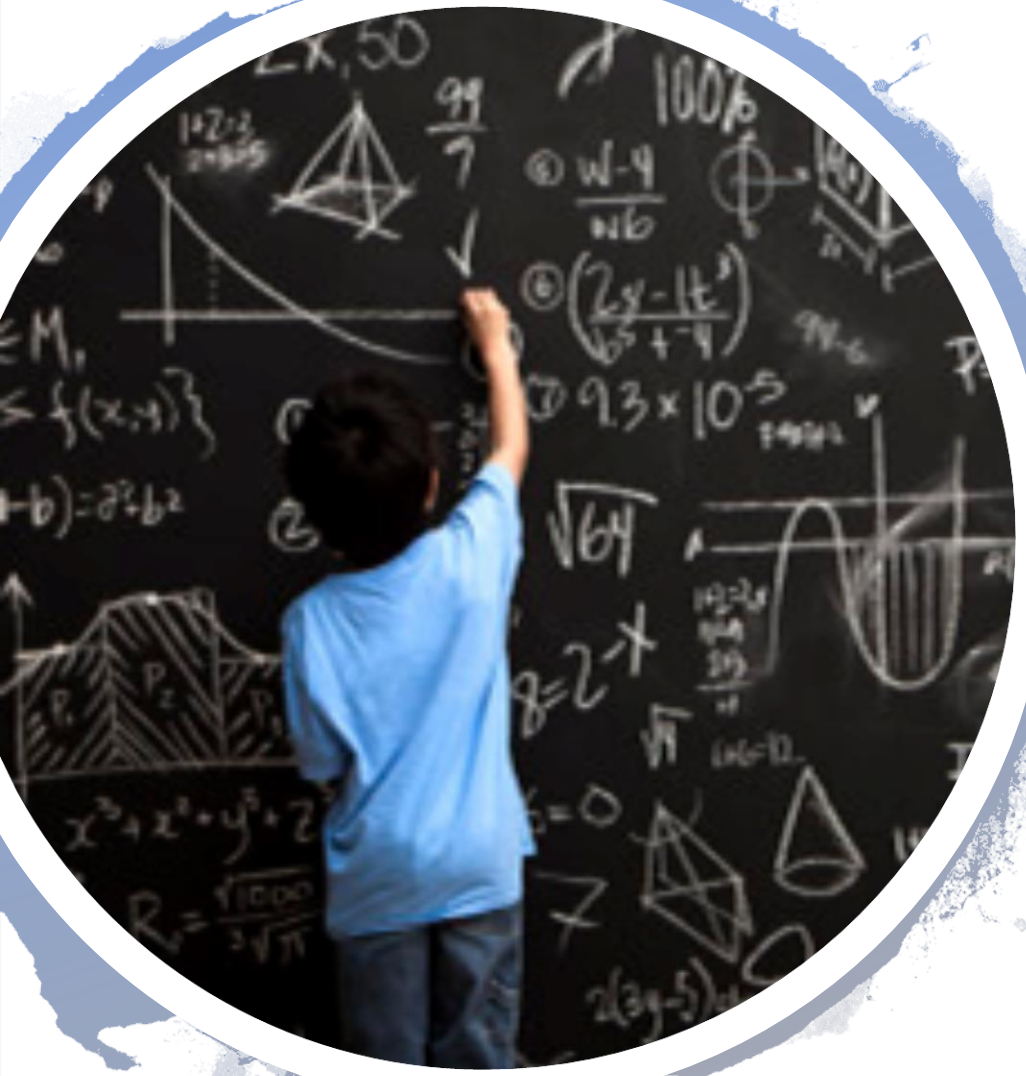
Possible Reactions

- “That’s a bad idea.”
- “How are you going to do that?”
- “Sure/that’s interesting, BUT …. “
  - I have a better idea; it will never work; the group won’t like it; etc…
  - *However...* Is a fancy BUT
- Thank-you, AND….
  - Terrific, let me build on that idea …

Thank-you, *AND….*

- Thank-you, and…. Is at the foundation of creativity and innovation
- Requires trust
- Provides a bridge from a *not so good* idea → to a *better* idea → to a *great* one
- Helps sustain, maintain, and strengthen teams

- *Ideas **do not** require action – they **do require** an opportunity to be acted upon*



Effective Leadership: There is No Formula

- Self-awareness
- Awareness about that around you
- Shared responsibility for success
- Accountability for issues and problems
- Mentoring others
- Managing up and across
- Creating a safe environment
- Difficult conversations
- Speaking up, challenging ideas
- Giving your best everyday
- Serving as a role model

“The most productive, innovative teams were led by people who were both task- and relationship-oriented. What’s more, these leaders changed their style during the project.”

Gratton and Erickson, HBR, November 2007
https://hbr.org/2007/11/eight-ways-to-build-collaborative-teams

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Team Composition/Bios, Management and Planning

a) Team Members: Ex 1
   a) My postdoc and I are the initial members. Once funded, we'll identify additional team members
   b) I've worked in teams before, so I know what to do and how to manage a team

b) Team Members: Ex 2
   a) Chemical Engineer, Environmental Engineers (2), and Materials Science Engineers (2)
   b) Each of the PIs will head a team, the teams will work toward an aspect of the shared goal. The PIs will meet once a month to talk and compare notes

c) Team Members: Ex 3
   a) Biomedical scientist, physicist, economist, agricultural engineer, president of the Organic Farmers Association, organizational/team consultant*
   b) We worked over the last year to develop our vision for this project. Moving forward here is the plan for how we will: communicate, share data/results, resolve conflict, set expectations, bring on new team members, engage the community, …

Sharing Credit

- Howard Gadlin
- Christophe Marchand
- Samantha Levine-Finley

- Feedback:
- LMBennett@nih.gov

teamscience.nih.gov

PI/Co-PI Activity (~25 min)

- **Each PI team should articulate:**
  - 1) their mission statement;
  - 2) its linkage to social innovation/value;
  - 3) disciplinary/sector categories of team composition and multi-level stakeholders;
  - 4) mechanisms to facilitate effective transdisciplinarity

- **Discussion/Questions**