The Development of a Competency-Based Team Science Training Program: A Case Study of TeamMAPPS

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Today's Purpose

- To describe the development on an evidence-based team science competency training program – TeamMAPPS (Team Methods to Advance Processes and Performance in Scientific Teams)
- To describe how it will be developed and expanded long term
- To describe how it will be field tested and disseminated

Content Experts

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Current Status: Team Science Education and Training

- There is insufficient training in team science (Börner et al., 2010; Cummings & Kiesler, 2005; Fiore, 2008; Stokols, Hall, Taylor, & Moser, 2008; Spring, Moller, Falk-Krzesinski, & Hall, 2012)
- Training models and curriculum are needed (Hall, Feng, Moser, Stokols, & Taylor, 2008; Stokols, Misra, Moser, Hall, & Taylor, 2008)
- Some scholars (Fiore, 2008; Nash, 2008) have argued that only through team training might interdisciplinary and transdisciplinary team science improve
- Training for team science is a growth area that there are only two empirical studies related to team science training (Hall, 2018)

Team Competencies – Available Models

- Team competency frameworks have been developed:
  - General team competencies have been well established (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995)
  - Virtual team competencies have been depicted (Hartel, Kondradt, & Voss, 2006)
  - Core components of teamwork have been proposed (Salas, Sims, & Burke, 2005)
  - Models of team behavior have been developed (Rousseau, Aube, & Savoie, 2006)

TeamMAPPS Overview

- TeamMAPPS is a highly specific competency model for team science which:
  - Addresses known issues in team science
  - Is evidence based
  - Describes needed behaviors
- We developed the model on the basis of:
  - Previously developed competencies and team models
  - Applicability to team science and the scientific enterprise

Purpose of TeamMAPPS Training Program

- To develop diagnostic abilities to detect the appropriateness of certain behavioral skills important to leading and participating in scientific teams

- To refine specific skills to:
  - Facilitate awareness and exchange
  - Promote psychological safety within or across teams
  - Promote team self-correction

- To increase confidence in addressing the challenges, issues, and opportunities inherent in the conduct of team science

TeamMAPPS Is Designed for

- Graduate students, trainees, and post-docs
- Early career investigators
- Experienced investigators and PIs

Delivery Modalities

- Individual web-based learner – asynchronously (separate modules or total)
- Classroom (separate modules or total)
- Whole team (separate modules or total)

Framework of TeamMAPPS

Based on a comprehensive literature review of existing evidence, TeamMAPPS is comprised of three broad “competency sets.”

Overall TeamMAPPS Model
Three Competency Sets

Components of the Model

- **Awareness & Exchange:** A set of competencies relating to the facilitation of team members’ perspective seeking, reframing and integrating alternative cognitive views
- **Psychological Safety:** A set of competencies that provide team members a safe environment, including participant acknowledgement, issue identification, and conflict resolution
- **Adaptation:** A set of competencies that result in team members being able to extend challenges, monitor the team, and improve its performance over time

Framework of TeamMAPPS (cont.)

Components of Team Science Competencies: Nine Specific Competencies

Evidence Base for TeamMAPPS

Theme	Competencies	Exemplary Behavioral Markers	Relevant Citations
Facilitating Awareness & Exchange	Sharing unique information/ promotive voice	• Team members share information and perspectives stemming from their expertise • Team members share vision of team purpose • Team members build on others' ideas, but from their own perspective	Liang, Fahr, & Fahr, 2012; Salazar, Lant, Salas, & Fiore, 2012
	Inquiring/probing	• Team members inquire to gain information about who knows what in the team • Team members actively probe to create understanding that reflects inputs of all members	Huber & Lewis, 2010; Marks, Mathieu, & Zacarro, 2001
	Reframing & integration	• Team members report having been influenced by inputs of others • Team members report mutual understanding that reflects inputs of all members	Van Der Vegt & Bunderson (2005); Klein, 2005

Awareness and Exchange in Action

S	Seek perspective
E	Exchange information
A	Ask for clarification
K	Know who knows what

Evidence Base for TeamMAPPS

Theme	Competencies	Exemplary Behavioral Markers	Relevant Citations
Promoting Psychological/ Emotional safety	Perspective seeking	• Team members ask one another questions regarding their background • Team members provide vivid description(s) of events that occurred • During team conversations, team members ask one another follow-up questions regarding their statements	Edmondson (1999), Grant & Barry (2011)
	Acknowledging and including	• Upon hearing a new idea or opinion, team members rephrase the suggestion and acknowledge receipt of the message • New ideas are not criticized • Team members ask one another to step in during a task when their skillset aligns with what needs to be completed	Edmondson (1999)
	Addressing issues and resolving conflict	• Errors and mistakes are openly discussed between team members • Interpersonal conflict is minimized during group discussions (e.g., yelling, undermining does not occur) • Team members are not criticized for making a mistake	Edmondson (1999)

Psychological Safety in Action

S	Show understanding
A	Appear confident, yet flexible
F	Facilitate inclusiveness in decision making and interpersonal settings
E	Engage in the team's work

Evidence Base for TeamMAPPS

Theme	Competencies	Exemplary Behavioral Markers	Relevant Citations
Self-Correction/ Adaptation	Monitoring/ Debriefing	• Team members adjust tasking to accommodate other team member's needs • Team members discuss performance episodes upon completion • Incidents are documented	LePine (2003), Tannenbaum and Cerasoli (2013)
	Reflecting/ Analyzing	• Documented incidents are reviewed and discussed by all team members • The team receives 360 degree feedback reports on performance • Team strengths and weaknesses are discussed among team members	Tannenbaum and Cerasoli (2013)
	Creating Change/ Development pPans	• Goals are discussed with and explained to all team members • Changes in work are completed without hesitation • Team members relearn procedures as necessary	LePine (2003)

Self-Correction and Adaptation in Action

A	Assess team process and outcomes
S	Stop behaviors, practices, routines that are hindering team progress
K	Keep behaviors, practices, and routines that are helping team progress
S	Start behaviors, practices, and routines that will help the team do better

Learning Principles and Strategies Employed

- **Adult Learning Theory.** Use of self-directed learning theory and adult transformational learning principles focusing on personal goals and individual relevance.
- **Gaming Theory.** Gamification principals to allow for generated scenarios based and individual choices to be employed.
- **Behavioral Markers.** Specific behavioral markers (i.e., descriptions of behaviors that can be used to measure) as desired outcomes.

Content Overview to the Three Core Modules

- Covers
  - What it is
  - Why it is important
  - Relevance to team science
  - Specific competencies
  - Behavioral markers
  - Ways to promote
  - Resources and suggested readings
- Practice It Exercise
  - Short cases
  - Checklist exercises to anchor learning
- Diagnosing Team Skill Set
- Video Case with Design Your Own Experience

EXAMPLE: Practice It

Read the following story:

Dr. Joan Long meets with Juan Gutierrez, Susan Wu, Alexi Markov, and Robin Poppin to discuss the development of a proposal for the 22 million dollar NSF grant involving a computer-assisted mobility device, as requested by the University President. The meeting is set up several weeks in advance to assure that all parties could attend. The initial meeting went about an hour and a half, and no real consensus was achieved about next steps, even though Dr. Long several times noted that those present weren't being responsive to the University President's request.

When the meeting started, Dr. Wu asked if there was a meeting agenda, and then acted upset to learn there was no agenda. Dr. Long stated that it was only a preliminary meeting. Dr. Markov repeatedly asked who would assume the role of Principal Investigator, and who was going to be the Bioengineering Center Director. He mentioned that if he was to be neither, that he did not have time, as he had other funded research. Dr. Gutierrez had little to say during the meeting, frequently checked his cell phone for email, and only acknowledged and affirmed Dr. Markov's concerns. Dr. Poppin stopped the meeting at one point and said that she "felt threatened and intimidated" concerning her potential participation, noting she "felt bullied by Dr. Long and the University President to participate."

The meeting ended without an agreement concerning whether or not to pursue the proposed grant.

How could you have avoided this?

What Could You Have Done to Avoid This? (✓ all that apply)

- ❑ Dr. Long could have sent a detailed meeting outline and proposed grant outline, including what each person would be responsible for, timelines, milestones, and budget associated with each
- ☑ Ask each member to articulate their vision of the grant – from their particular area of expertise and perspective
- ☑ Rephrase concerns raised in the meeting and acknowledge the issues raised as legitimate
- ☑ Summarize the meeting with a list of potential goals
- ☑ Act non-defensively and suggest that the meeting was to explore opportunities and surface core issues
- ❑ Take control of the meeting by reminding each participant what is at stake by not addressing the needed grant request – and the University President's desire
- ❑ Act consistently and repeat what you personally believe are the primary goals and methods to be considered
- ☑ Ask each participant what the team's potential strengths and weaknesses might be

Evaluation of the Program

- Module Knowledge Check
- Observational Scales
- Pre and Post Team Science Competency Belief Scale (Efficacy)

Team Science Competency Belief Scale

Please rate how confident you are in each of the following team-based activities.

	Cannot do at all ↓					Moderately certain can do ↓					Highly confident can do ↓
1. Ask team members to share information and perspectives stemming from their expertise	0	10	20	30	40	50	60	70	80	90	100
2. Ask team members to share vision of team purpose	0	10	20	30	40	50	60	70	80	90	100
3. Ask team members to build on others' ideas, but from their own perspective	0	10	20	30	40	50	60	70	80	90	100
4. Make inquires with team members to gain information about who knows what in the team	0	10	20	30	40	50	60	70	80	90	100
5. Actively probe team members to create understanding that reflects inputs of all members	0	10	20	30	40	50	60	70	80	90	100

Train the Trainer for Field Testing

- Late summer to early fall 2019
- NCATS schools participating
  - University of Buffalo
  - University of New Mexico
  - University of Texas Medical School – Southwestern
  - Medical University of South Carolina
  - University of North Carolina
- Field test launch late fall and early 2020

Next Steps of Development

- Use of feedback and new findings for TeamMAPPS 2.0
- 360 degree survey system
- Development of a website for facilitators and supplementary materials
- New module for non-scientific team members (Concannon, et al., 2012; Tebes & Thai, 2018) for community based participatory research (Wallenstein & Duran, 2006; Israel, Schultz, Parker, & Becker, 2011)

Proposed Modules for Community Partners and Patient Constituents Training for Scientific Teams

Module 1: Your Role as a Member of a Scientific Team

Module 2: Sharing Unique Information and Perspectives/Proactive Voice

Module 3: Integrating and Probing

Module 4: Reframing and Integration

Module 5: Perspective Seeking

Module 6: Acknowledging and Including

Module 7: Resolving Conflict

Module 8: Monitoring and Debriefing

Module 9: Reflecting and Analyzing

Module 10: Creating Change and Development Plan

Module 11: Integration and Maximizing Your Effectiveness in Scientific Teams

Questions