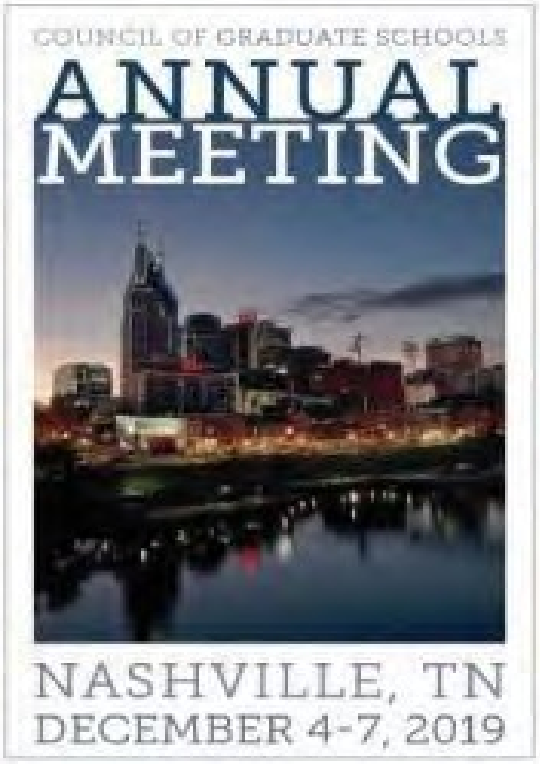
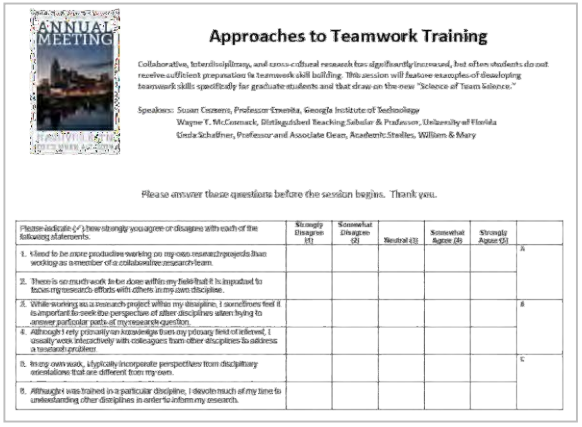


Approaches to Teamwork Training

Susan Cozzens, Georgia Institute of Technology
Wayne T. McCormack, University of Florida
Linda Schaffner, William & Mary



Approaches to Teamwork Training

Collaborative, interdisciplinary, and cross-cultural research has significantly increased, but often students do not receive sufficient preparation in teamwork skill building. This session will feature examples of developing teamwork skills specifically for graduate students and that draw on the new "Science of Team Science."

Speakers: Susan Cozzens, Professor Emerita, Georgia Institute of Technology
Wayne T. McCormack, Distinguished Teaching Scholar & Professor, University of Florida
Linda Schaffner, Professor and Associate Dean, Academic Studies, William & Mary

Please answer these questions before the session begins. Thank you.

Please indicate (✓) how strongly you agree or disagree with each of the following statements.	Strongly Disagree (1)	Somewhat Disagree (2)	Neutral (3)	Somewhat Agree (4)	Strongly Agree (5)	
1. I tend to be more productive working on my own research projects than working as a member of a collaborative research team.						A
2. There is so much work to be done within my field that it is impaired to focus my research efforts with others in my own discipline.						
3. While working as a research project within my discipline, I sometimes feel it is important to seek the perspective of other disciplines when trying to answer particular parts of my research question.						B
4. Although I rely primarily on knowledge from my primary field of interest, I usually work interactively with colleagues from other disciplines to address a research problem.						
5. In my own work, I typically incorporate perspectives from disciplinary orientations that are different from my own.						C
6. Although I was trained in a particular discipline, I devote much of my time to understanding other disciplines in order to inform my research.						

Welcome! If you consider yourself to be a researcher, please answer the six questions on a handout before the session begins. (Don't worry about the other side!)

Teamwork Training for Graduate Students

Susan E. Cozzens

Georgia Institute of Technology

Council of Graduate Schools, December 6, 2019

We gratefully acknowledge the support of the National Science Foundation under Grant 1735017 under the Innovations in Graduate Education Program.

Our team

- Susan Cozzens
- Meltem Alemdar
- Angus Wilkinson
- Mary Lynn Realff
- Kata Dósa
- Chris Cappelli

Outline

- Motivation for the project
  - Science of Team Science
  - Why graduate students?
- The project
  - Graduate student focus groups
  - Scope, focus
  - Settings
  - Assessment
- The modules

Science of Team Science (SciTS)

- Team science = interdisciplinary collaborative research
  - Often problem driven
  - Brings complementary skills together
  - Integrates knowledge
  - Growing across all disciplines
- SciTS = research on team science
  - What are its dimensions?
  - What are its consequences for quality and careers?
  - What makes it work well or not?
- Field is institutionalizing

INSciTS | Building the knowledge base for effective team science

International Network for the Science of Team Science

Georgia Tech

CREATING THE NEXT

Why graduate students?

- Science of Team Science has not paid specific attention to their roles.
- Distinctive characteristics
  - Power relationship with PI/advisor
  - Many are international, first time in the U.S.
  - Perceived gap in expertise
  - Relationships within the team may be uncharted
  - Rolling team membership

Listening to graduate experiences

- Advisors/PIs and research groups
- Contributor roles
- Student leadership roles
- Frequently mentioned points of conflict:
  - Authorship
  - Data access
  - Equipment and space sharing

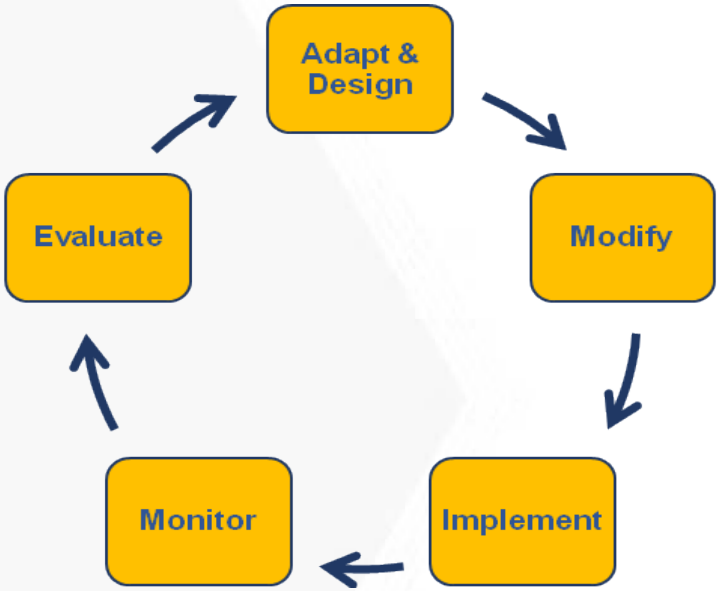
We turned these into scenarios to use in the modules.

The NSF-supported project

- Scope: STEM programs
- Focus: Transportable skills
- Settings
  - Workshop
  - Classroom
- Would like to move on to…
  - In situ teams

Georgia Tech
CREATING THE NEXT

Assessment



Curriculum development cycle for team science training materials.

- Pre-Post/Follow UpGraduate Student Surveys
  - Barriers to Team Science
  - Collaboration Readiness
  - Team Competency
  - Feedback/Satisfaction
- Focus Groups

Main messages:

- **More research, please.**
- **Give us takeaways.**
- **Get us ready to talk to our advisors.**

Preliminary Results

Have you engaged in the following activities following your participation in the iCOGS team workshop?	Yes	No
Conducted research1h ah int erdiscipl i ha ty tearn se tt lhg.	**85.7%**	**14.3%**
Discussed int er-d i scip linary research with faculty at Georgia Tech.	85.7%	LU%
Successfully preserved team relatioh hips when conflicts have arisen.	!:)0.5%	9.5%
Constructed a plan *for* work on a team that ehables team member's to make Uhique cohtributions to the team.	81.0%	19.0%
Formulat ed solutions to communication challenges when they have arisen.	**95.2%**	**4,8%**
Constructed a plan to effectively address team cohfli ct.	66.7%	33.3%
Adapted your communication strategywhen necessilry rn a tearn environment .	100.0%	0%
Constructed a plan that integrates various patterns of behalii or to tnaxitnize teatn functioning.	61.9%	38.1%

To w hat exte nt clo you agree with each of the fo ll ow ng stateme nts?	Agree	Neither Agree nor Disagree	Disagree
Working with researchers from otherdisciplines may have a positive influence on my ownresearch.	80.0%	20.0%	
I believe that my own expertise can help researchers in other fields improve t hei r work.	61.9%	38.1%	
I am able to navigate the environment of working on an interd tsciplinary team.	57.1%	**42.9%**	
I understand my own personal weaknesses that may inh ibit effective team collaboration.	33.3%	57. 1%	4.8%	4.8%
I am c-0mfortable collaboratingwith researchers ih a diverse team emtirohment.	57.1%	42.9%	

Georgia Tech

CREATING THE NEXT

Innovation and creativity

By the end of this module, you will be able to…

1. Identify factors that contribute to the growing prevalence and importance of interdisciplinary research teams
2. Describe the ways in which working in a team can either help or hinder idea generation
3. Describe the relationship between collaboration and team productivity over time
4. Acknowledge and identify some challenges researchers experience when working in an interdisciplinary team

Diversity for better teams

By the end of this module, you will be able to…

1. Reflect on what dimensions of diversity are salient to yourself and others
2. Explain the relationship between team diversity and team performance
3. Reflect on and articulate aspects of your patterns of thought/behavior on teams
4. Construct a plan to integrate all patterns of thought/behavior and maximize team functioning

Effective communication

- By the end of this module, you will be able to…

- Describe some possible ways communication challenges arise in interdisciplinary teams
- Analyze communication challenges in research teams
- Formulate solutions to communication challenges
- Identify language unique to your discipline that might be misunderstood outside the discipline

Leveraging and managing conflict

By the end of this module, you will be able to…

1. Choose appropriate conflict management strategies for a given conflict situation
2. Construct a plan to address a major conflict
3. Preserve working relationships during crucial conversations by employing empathetic listening

Materials available

- For the four modules
  - Slides
  - Student workbook
    - Includes takeaway tools
  - Facilitator guide
- Would love to collaborate on delivery of the workshop on your campus.
- Contact me to talk about a time to do this.
  - scozzens@gatech.edu

Thank you for your attention.

Susan Cozzens
scozzens@gatech.edu

Team Science Training for Graduate Education

Wayne T. McCormack, PhD

Distinguished Teaching Scholar & Professor, UF College of Medicine

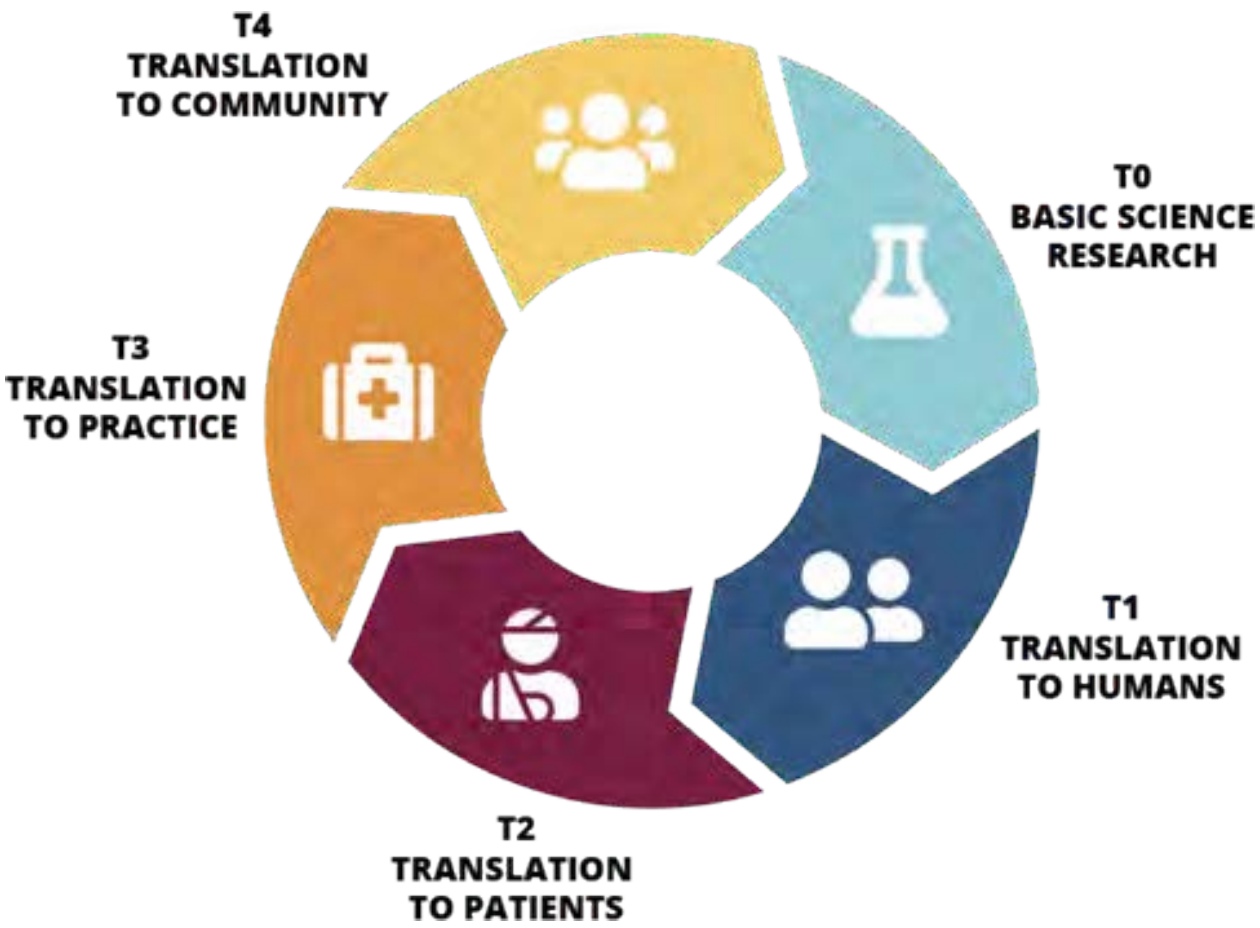
TL1 Principal Investigator, UF Clinical & Translational Science Institute

mccormac@ufl.edu

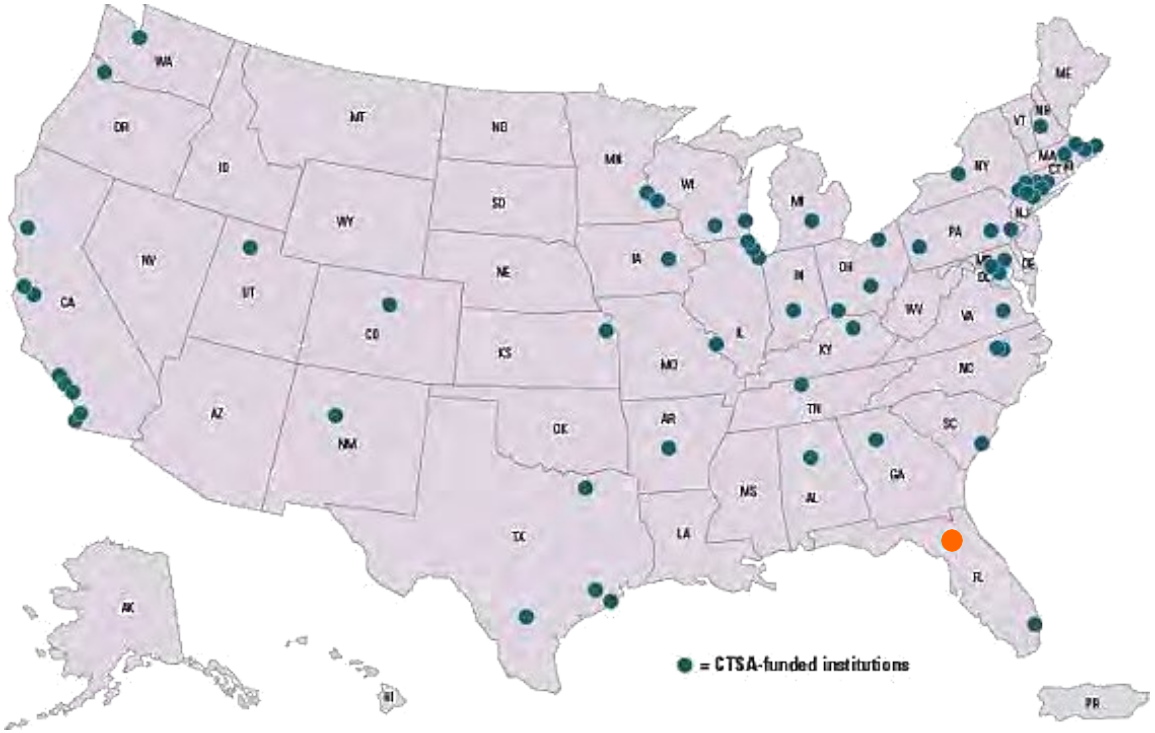
UF Graduate School UNIVERSITY of FLORIDA

UF Clinical and Translational Science Institute UNIVERSITY of FLORIDA

Clinical & Translational Science



CTSA Clinical & Translational Science Awards®



TL1 = Institutional training grant (like a T32) linked to CTSA

Premise

If We Expect Future Researchers To Work in Teams, They Should Be Trained in Teams

"TL1 Teams"

UF Clinical and Translational Science Institute
UNIVERSITY of FLORIDA

Supported by UF CTSA Awards TL1TR001428 and UL1TR001427

How can we best prepare new researchers to USE team science?

- Use the “Science of Team Science” in our training programs
  - We know a *LOT* about how research teams work
- Support for team training
  - *Didactic:* curriculum
  - *Practical:* give trainees experience with collaboration

INSciTS Building the knowledge base for effective team science
International Network for the Science of Team Science

Clinical & Translational Science PhD Co-Major

Year 1 – Fall

- Translational Research & Therapeutics: Bench, Bedside, Community, & Policy (3)
- Team Science (1)

Year 1 – Spring

- Responsible Conduct of Biomedical Research (1)

Year 2 – Fall

- CTS Journal Club (1)
- CTS Seminar (2)

At any time

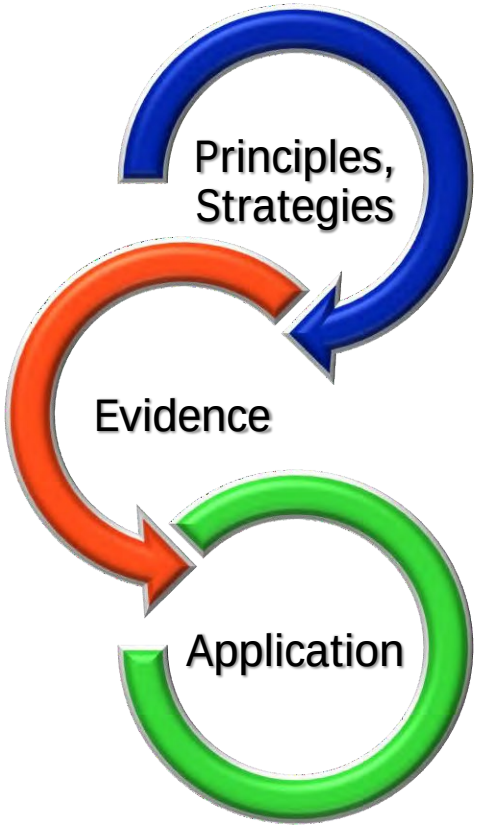
Electives (6)

Experimental Design
Quantitative Skills
Professional Development

Didactic:

Team Science (GMS 6945)

- Intro to Team Science
- Preparing for Team Science
- Team Leadership
- Building a Research Team
- Writing a Collaboration Plan
- Managing Research Teams
- Conflict Management
- Team Monitoring
- Team Evaluation



Didactic & Practical:
Team Science (GMS 6945)

- Intro to Team Science
- Preparing for Team Science
- Team Leadership
- Building a Research Team
- Writing a Collaboration Plan
- Managing Research Teams
- Conflict Management
- Team Monitoring
- Team Evaluation

Behavioral Self-Assessment (DISC)

Vision/Mission/Values

Collaboration Plan

Authorship Agreement

Team Dimensional Training

Practical:
TL1 Teams

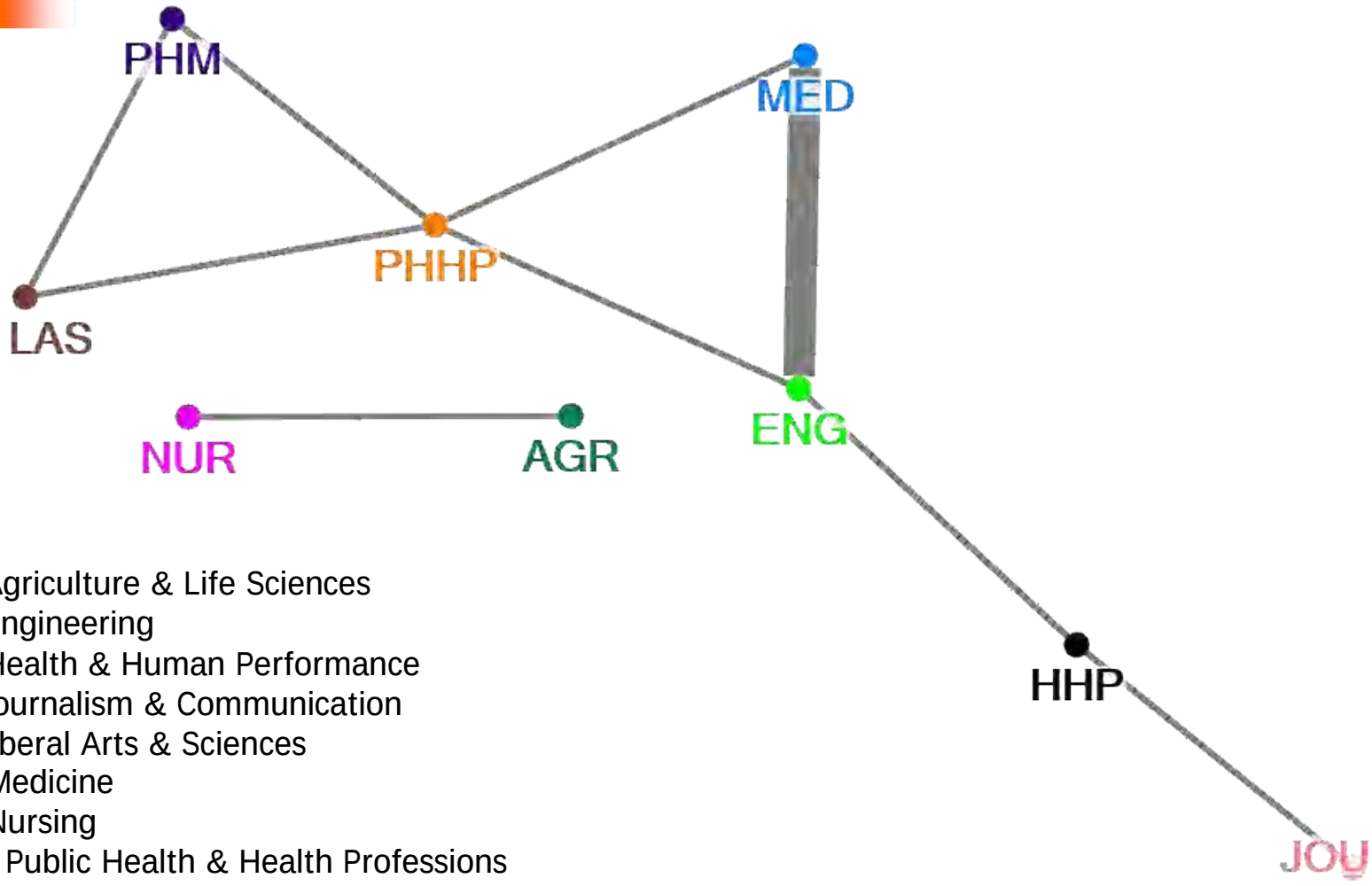
- Two PhD and/or dual degree students in different PhD programs in different colleges
- Apply before dissertation proposal approved
- TL1 Co-Mentors
- Extent of collaboration
  - Team specific aim(s)
    - ✓ Overcome barrier to progress or expand scope
    - ✓ Synergy between individual projects
    - ✓ Level of interdependence
  - Embed into individual dissertation research projects

Practical:
TL1 Teams

- Information sessions
- Interest list
- Advice from trainees:
  - Talk to your mentor
- Networking session
  - Elevator speeches
  - Strategic Doing workshop

FINDING A TL1 TEAM PARTNER

TL1 Team Trainee Home Colleges



AGR = Agriculture & Life Sciences
ENG = Engineering
HHP = Health & Human Performance
JOU = Journalism & Communication
LAS = Liberal Arts & Sciences
MED = Medicine
NUR = Nursing
PHHP = Public Health & Health Professions
PHM = Pharmacy

Program Assessment

- Novel metrics
  - Modest gains in cross-disciplinary activities (CDCA) and perspective (ROS)
  - Significant increase in self-efficacy for clinical research (CRAI)
- Items from additional measures focusing on team skills are being tested
- Qualitative
  - Trainees value interdisciplinary interactions for new ways of thinking about experimental design and conduct, new skillsets, and methodological insight

Team Science Training for Graduate Eduction

A Coastal Resilience Challenge as a Framework for Graduate Student Team Science Training

CGS Winter Meeting

December 6, 2019

Project Leadership

Troy Hartley, PI, Virginia Sea Grant (Collaborative Governance in Marine Resource Management, Marine Policy, Professional Development for Graduate and Post-Graduate Students)

Linda Schaffner, Co-PI, Virginia Institute of Marine Science, William & Mary School of Marine Science (Marine Science, Graduate Education and Student Professional Development)

Karen McGlathery, Co-PI, University of Virginia (Marine Science, Environmental Change and Resilience)

Deborah DiazGranados, Co-Investigator, Virginia Commonwealth University (Organizational Science, Science of Team Science)

Steve Fiore, Co-investigator, University of Central Florida (Cognitive Science, Science of Team Science)

NSF NRT-IGE 1735301 Team Science Training for Coastal Ocean & Estuarine STEM Graduate Students

Grand Challenges of the Coastal Zone:
How do we prepare today's graduate students to address them?

Source: Inside Climate News

Source: Google Earth

Source: NASA

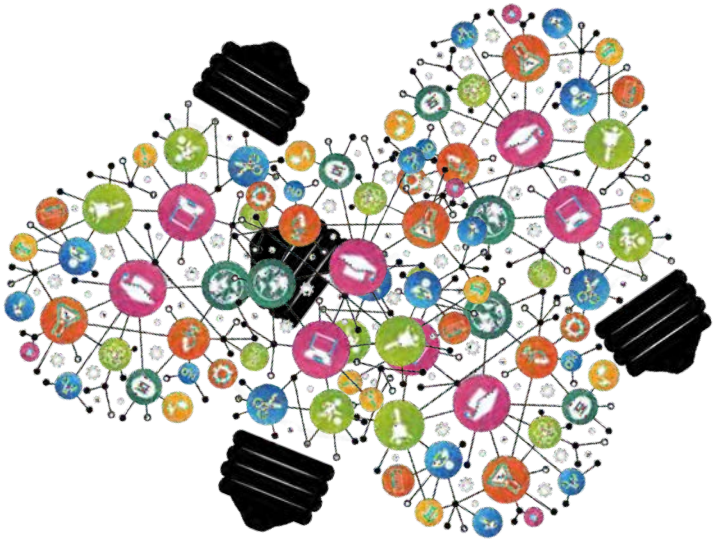
Source: NOAA

Source: VIMS

Addressing today's grand societal challenges [of the coastal zone] demands research and problem-solving that produces integrated breakthroughs and solutions that transcend individual disciplines.

New kinds of intellectual partnerships are needed (Schaffner et al. 2016)

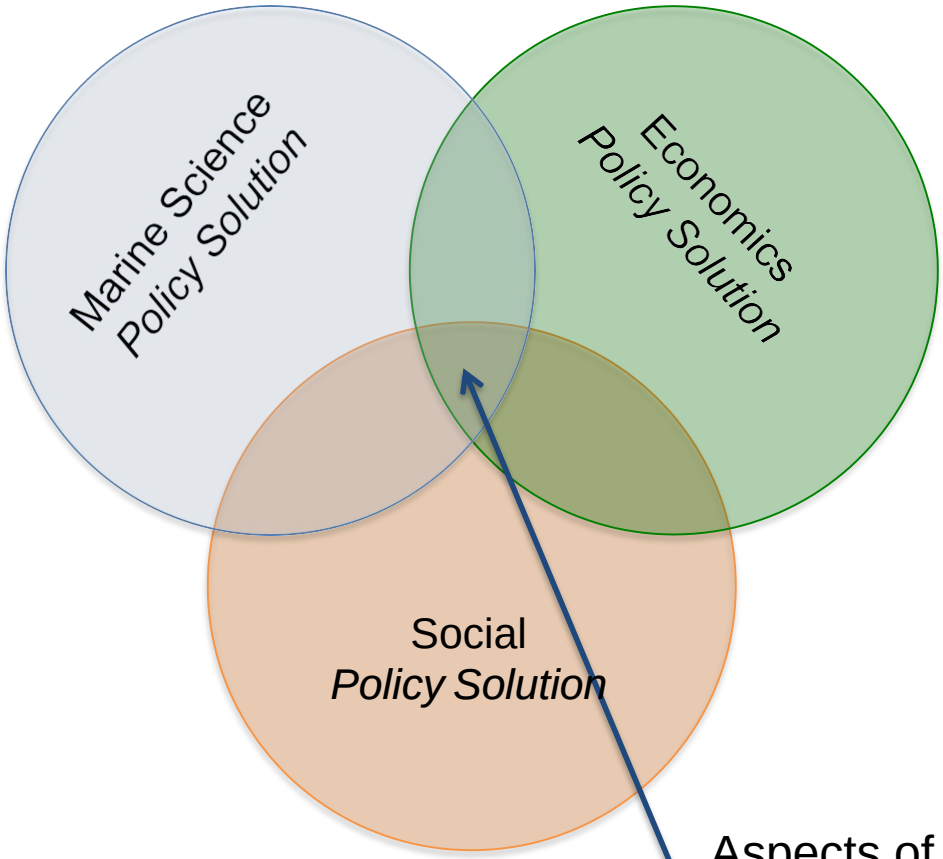
…collaboration and communication skills are needed to pursue truly transformative science (Ciannelli et al. 2014)



Deeper levels of knowledge integration are needed

Ciannelli et al. 2014. Transdisciplinary graduate education in marine resource science and management. ICES Journal of Marine Science (2014), 71(5), 1047–1051
Schaffner, L.C., T.W. Hartley, and J.G. Sanders. 2016. Moving forward: 21st century pathways to strengthen the ocean science workforce through graduate education and professional development. Oceanography 29(1):36–43

Levels of Knowledge Integration



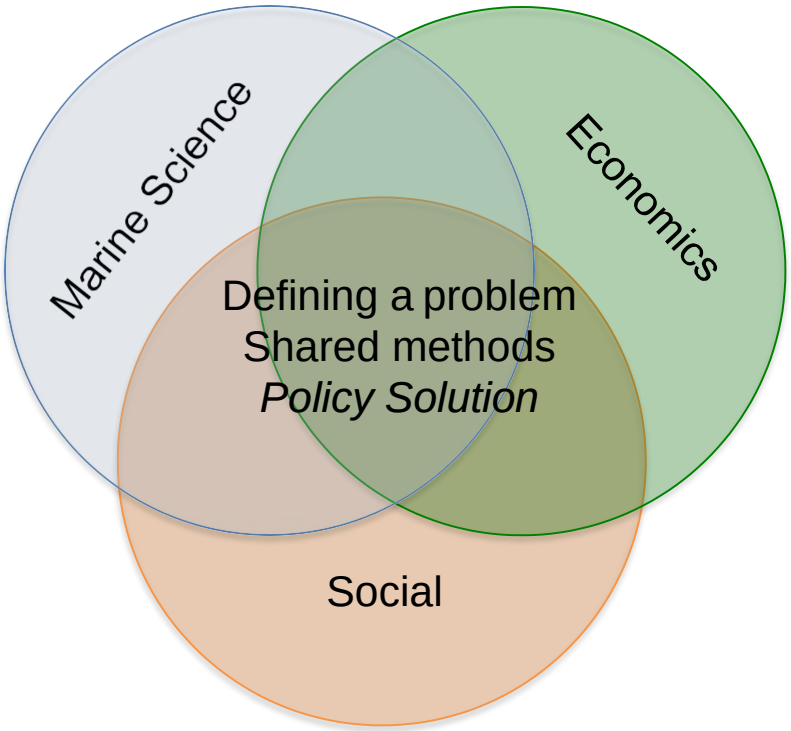
Multidisciplinary - each discipline makes a separate, but additive contribution

Interdisciplinary – methods, data and perspectives from two or more disciplines are somewhat integrated

Aspects of knowledge integration:
Defining a problem
Shared methods

Adapted from: Ciannelli et al. 2014

Levels of Knowledge Integration



Transdisciplinary – teams transcend disciplinary boundaries, generate novel frameworks, theories, hypotheses, models and shared policy solutions

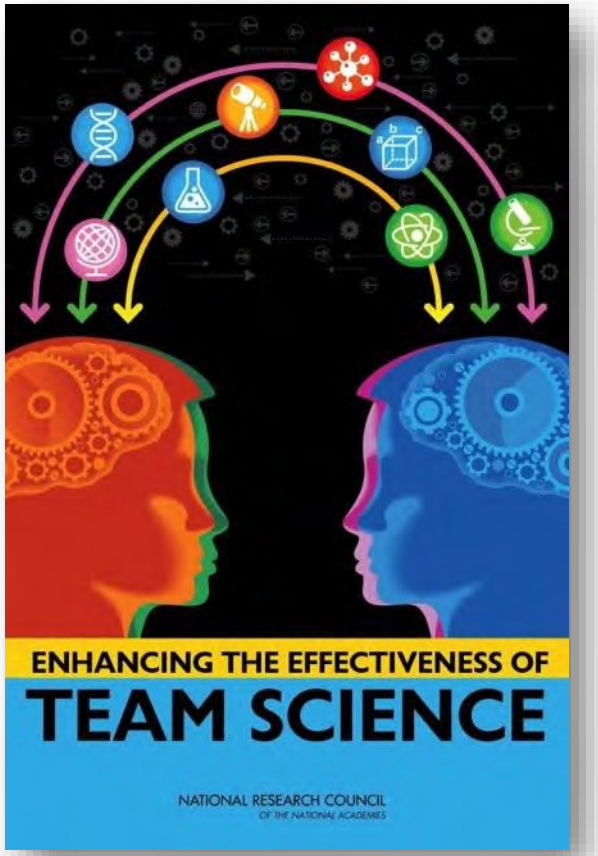
Collaborative intelligence, collective genius (Fiore 2013)

Fiore, S. M. (2013). Scientific genius: In different guises. *Nature, 494(7438),* p. 430.

Project Goals

Design and test a team science professional development training program, following SciTS recommendations for increasing team effectiveness:

- **introduce students to the science of team science, particularly the inter- and intrapersonal competencies needed for effective teamwork**
- **provide opportunities for students to develop and improve self-reflective and team-reflective practices and adaptive capabilities**
- **use real-world (authentic) resilience* challenges to motivate engagement and provide experience with process of knowledge integration**



INSciTS
Building the knowledge base for effective team science
International Network for the Science of Team Science

VIMS | William & Mary
Virginia Institute of Marine Science

*Resilience is defined here as the ability of a system to absorb and adapt to changing conditions before shifting to a less desirable state.

Training Approach

Assemble diverse teams of graduate students and assign each a resilience case study "challenge"

Workshops (2), assignments, coaching and feedback to support:

- **Mastery of basic team science concepts and ongoing development of self-reflective and team-reflective practices for better communication and collaboration**
- **Enhanced appreciation of the factors that facilitate deeper knowledge integration; through the development of a shared conceptual framework and a trans-disciplinary proposal addressing the resilience challenge**

Team deliverables - final presentation, integrated proposal

marine science & policy *environmental engineering* **physical oceanography** landscape architecture **marine ecology** urban & environmental planning *public administration & policy* marine geology & geosciences ***fisheries science*** **law** **chemistry** **climatology**





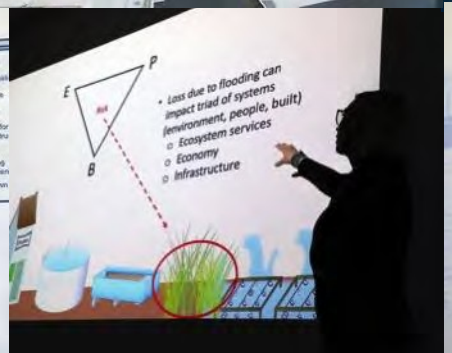




NEXT Steps
INDIVIDUALLY
AS a TEAM

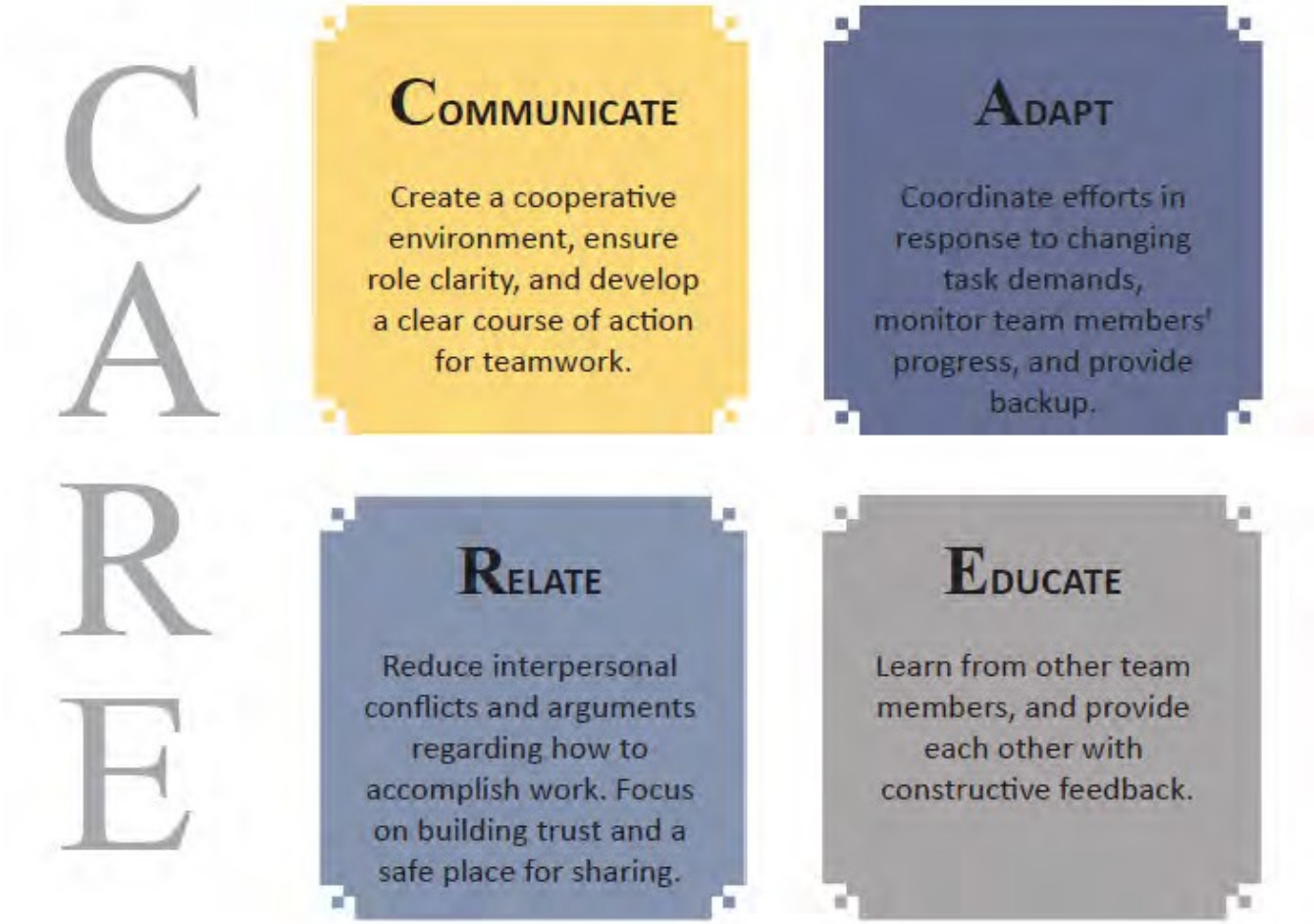





GENERAL FRAMEWORK
Hazards & Stakes
Adaptation & Mitigation
State of Resilience
Destructive Event
Impact trajectory for states due to destru event
Constantly evolving continuum of resilien
Event with unknown future impact
Low
State of Resilience
High

E
P
B
Loss due to flooding can impact triad of systems (environment, people, built)
Ecosystem services
Economy
Infrastructure

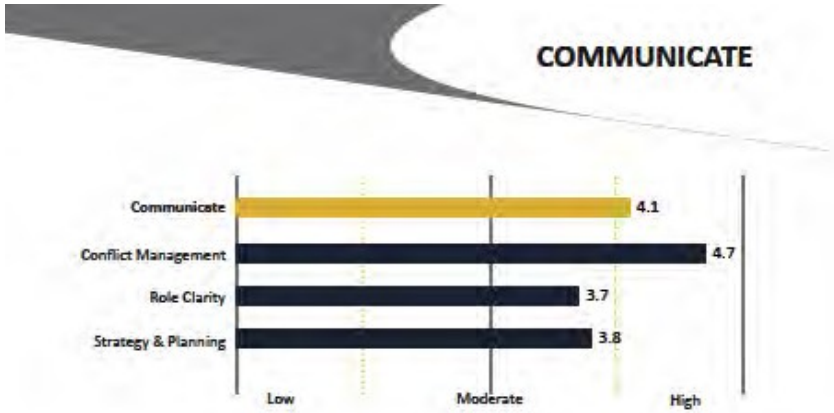
STRATEGY FOR INTERV
1. Conceptualize
2. Plan Actions and Monitoring
3. Implement Ac Monitoring
4. Analyze, Use, Adapt
5. Capture and Share Learning
Conservation Measures Partnership Open Standards


Supporting Teamwork in Team Science



Team CARE Model developed by Dr. Tom O'Neill at Individual and Team Performance Lab at the University of Calgary ITPmetrics.org

Supporting Teamwork in Team Science



Cooperative Conflict Management

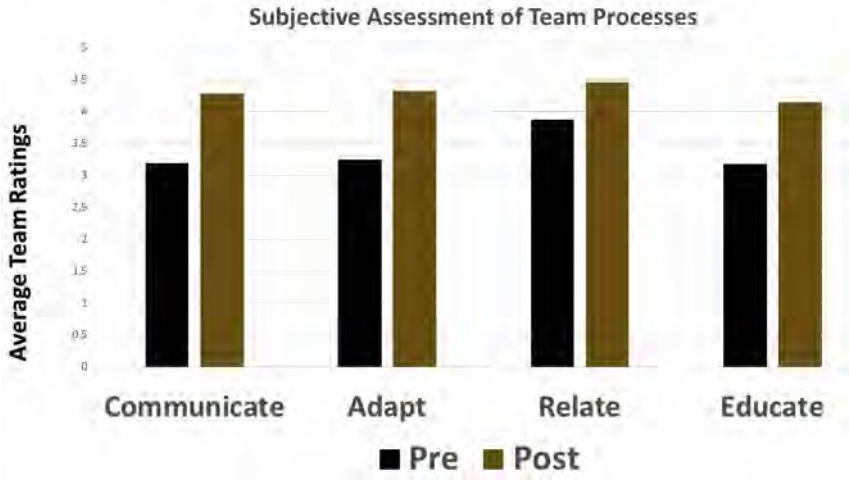
Approaching conflict and incompatibilities such that win-win solutions are sought. Conflict is viewed as a chance to learn and make quality improvements, and members work through different viewpoints with mutual respect.

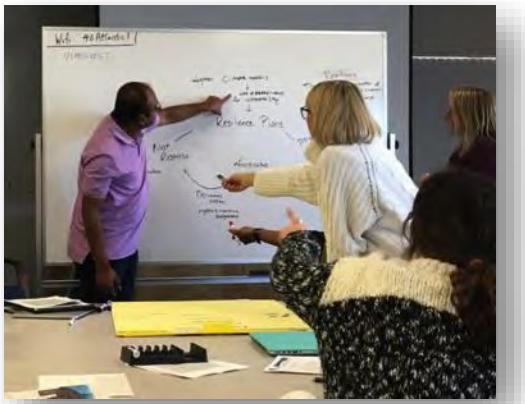
Role Clarity

The existence of well-defined and understood roles within the team, demonstrated through the establishment and maintenance of clarity regarding responsibilities, goals, expectations, and relative authority of each role within the team.

Strategy Formulation & Planning

Developing overall strategies that guide team efforts, including the sequencing of planned work elements, evaluation of processes, and formulation of contingency plans.





Team Reflection Prompts for Coaches

Example: Knowledge, Skills and Abilities

Reflection Oriented Prompts

- What did you do, or what did you see your teammates do, that you think helped them acquire new skills or knowledge to improve the team's performance?
- What kinds of questions did you ask, or hear your teammates ask, that helped you better understand teammate tasks or roles?

Future Oriented Prompts

- To improve your collaboration competencies, how might you acquire new skills or knowledge to improve the team's performance?
- To improve your collaboration competencies, how could you learn about other teammates' tasks and roles?

Select Observations

Developing a shared conceptual framework and knowledge integration takes time.

Visualization is effective for moving team towards shared understanding.

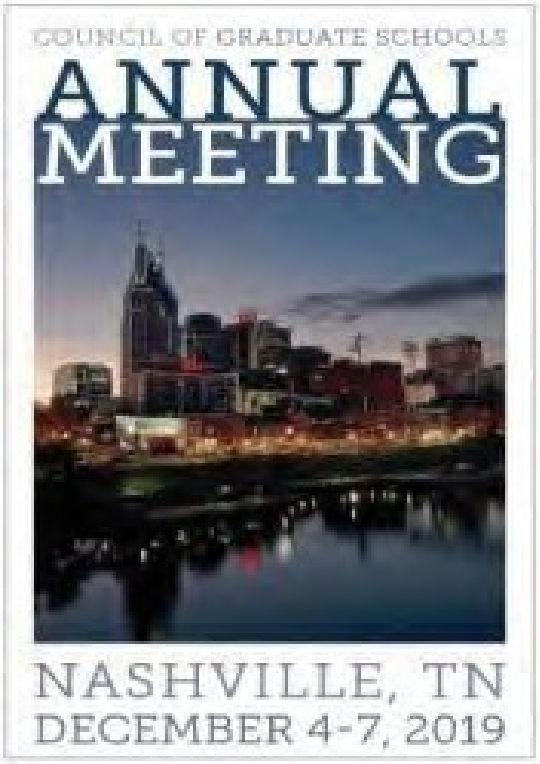
Self-reflective and team-reflective assignments and coaching encouraged team discussion.

Self assessments → increases in “transportable competencies”

Teams stayed focused during workshops and were remarkably engaged outside of the workshops - possibly linked to focus on an authentic resilience challenge.

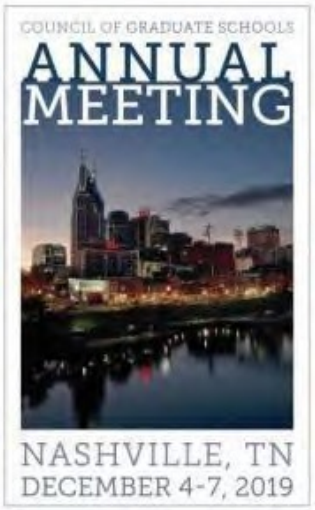
Teams were not necessarily good at navigating conflict – long discussions ensued, and some teams resorted to simplification of models when time became limiting.

A training framework for coaches (faculty, professional staff and others) would likely enhance the application of SciTS recommendations and best practices.



Approaches to Teamwork Training

Susan Cozzens, Georgia Institute of Technology
Wayne T. McCormack, University of Florida
Linda Schaffner, William & Mary



Approaches to Teamwork Training

Collaborative, interdisciplinary, and cross-cultural research has significantly increased, but often students do not receive sufficient preparation in teamwork skill building. This session will feature examples of developing teamwork skills specifically for graduate students and that draw on the new "Science of Team Science."

Speakers: Susan Cozzens, Professor Emerita, Georgia Institute of Technology
Wayne T. McCormack, Distinguished Teaching Scholar & Professor, University of Florida
Linda Schaffner, Professor and Associate Dean, Academic Studies, William & Mary

Please indicate (✓) how strongly you agree or disagree with each of the following statements:	**Strongly Disagree (1)**	**Somewhat Disagree (2)**	**Neutral (3)**	**Somewhat Agree (4)**	**Strongly Agree (5)**	
1. I tend to be more productive working on my own research projects than working as a member of a collaborative research team.						A
2. There is so much work to be done within my field that it is important to focus my research efforts with others in my own discipline.						
3. While working on a research project within my discipline, I sometimes feel it is important to seek the perspective of other disciplines when trying to answer particular parts of my research question.						B
4. Although I rely primarily on knowledge from my primary field of interest, I usually work interactively with colleagues from other disciplines to address a research problem.						
5. In my own work, I typically incorporate perspectives from disciplinary orientations that are different from my own.						C
6. Although I was trained in a particular discipline, I devote much of my time to understanding other disciplines in order to inform my research.						

Please
followi

1. I te
wo

2. The
foc

3. Whi
is i
ans

4. Alth
usu
a r

5. In
orientations that are different from my own.

6. Although I was trained in a particular discipline, I devote much of my time to understanding other disciplines in order to inform my research.

Low

Level of Interaction and Integration

High

A

Multidisciplinary: shares insights & perspectives with other fields, collaboration may be additive, complementary, independent, sequential

B

Interdisciplinary: collaboration is more interactive, combined, integrated

Transdisciplinary: transcends disciplinary perspectives, develops new methodologic or conceptual frameworks

C

Ten people turned in their results. The number of people with the highest score in each category is shown to the right.

Low

Level of Interaction and Integration

High

UNIDISCIPLINARY: use of theories and methods from a single field

A

2

CROSS DISCIPLINARY: combines concepts & methods from multiple disciplines

1

A&B tie

Multidisciplinary: shares insights & perspectives with other fields, collaboration may be additive, complementary, independent, sequential

B

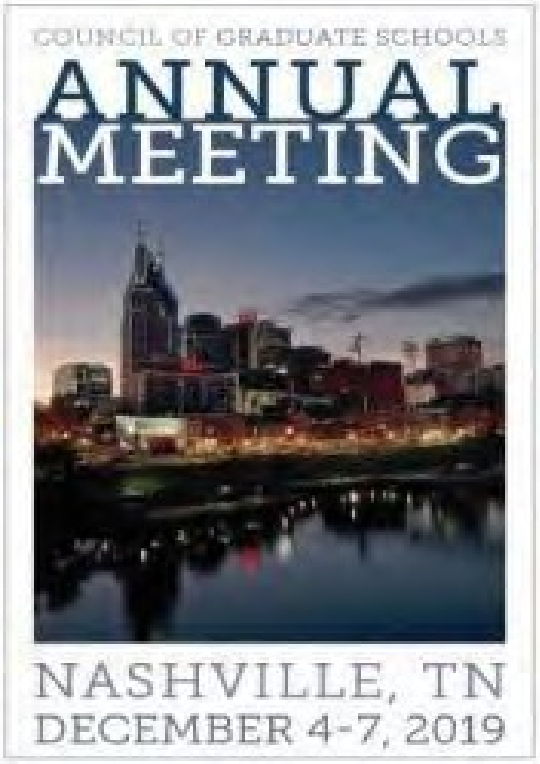
3

Interdisciplinary: collaboration is more interactive, combined, integrated

Transdisciplinary: transcends disciplinary perspectives, develops new methodologic or conceptual frameworks

C

4



Approaches to Teamwork Training

Susan Cozzens, Georgia Institute of Technology
Wayne T. McCormack, University of Florida
Linda Schaffner, William & Mary

Thank you for your participation!