

## TEAM SCIENCE: COLLABORATIONS IN BIOMEDICAL SCIENCES

### **Course Directors**

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### **Course Objective**

Learn and understand the principles of team science and develop practical skills in conducting trans-disciplinary, team-based translational research.

### **Course Description**

This course will provide an introduction to the theory and practice of team science and explore the practical and theoretical knowledge and skills necessary to lead and participate in successful interdisciplinary research teams across a variety of biomedical disciplines. As a result of participating in the course, students will understand the barriers, approaches, benefits, limitations, and strategies associated with interdisciplinarity; identify the specific competencies necessary for cultivating effective research collaborations; and recognize the skills required in adapting to multiple contexts, roles, and organizational responsibilities as a team member and team leader.

### **Course Rationale**

Disciplinary convergence in scientific endeavor is increasingly recognized as a successful approach that can address most challenges that face society, in fields as diverse as health disparities and astrobiology. Yet little in traditional graduate biomedical training helps early-career researchers obtain an understanding of the concepts and practical aspects of team science. Moreover, this new course directly addresses a didactic program requirement in the NIH/NCATS-funded training program at Rutgers as there is no current course that addresses interdisciplinary research teams in the biomedical sciences.

**Overlap:** *In order for a new course to be approved, the School of Graduate Studies must verify that the course content does not replicate that of an existing course in another program and does not cover topical areas that fall into the domain of another program. Provide evidence that indicates how these two requirements are met. Indicate which other graduate programs have been consulted about the course, and which existing courses, if any, have content that may overlap or may be perceived as overlapping that of the proposed course. Provide copies of relevant correspondence with other faculty or program directors.*

Several leadership courses exist across the University; but none at the graduate level within RBHS or in the program that addresses interdisciplinary research in the biomedical sciences.

11:607:200 - Principles of Leadership (SEBS)

11:607:382 - Conflict Management Practicum (SEBS)

17:194:540 - Organizational Leadership (SCI)

Leadership in Organizations and Community undergraduate specialization (SCI)

Leadership and Management undergraduate major (Rutgers Business School)

### **Course Format**

The class will consist of readings, interactive multimedia content (e.g., [Coalesce team science modules](#)), and a combination of didactic lectures and group discussions. Students will be expected to complete the assigned materials prior to each class session and are expected to attend each class and actively participate in discussions that will include topical speakers and subject matter experts.

### **Academic Integrity**

As an approved course at Rutgers University, every student must abide by the Rutgers policy on academic integrity (Policy 10.2.13 found at <http://academicintegrity.rutgers.edu/>). The policy defines and outlines potential penalties for violations. Excerpted from the policy statement:

*As an academic community dedicated to the creation, dissemination, and application of knowledge, Rutgers University is committed to fostering an intellectual and ethical environment based on the principles of academic integrity. Academic integrity is essential to the success of the University's educational, research, and clinical missions, and violations of academic integrity constitute serious offenses against the entire academic community.*

*The principles of academic integrity require that a student:*

- *make sure that all work submitted in a course, academic research, or other activity is the student's own and created without the aid of impermissible technologies, materials, or collaborations.*
- *properly acknowledge and cite all use of the ideas, results, images, or words of others.*
- *properly acknowledge all contributors to a given piece of work.*
- *obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with the student's interpretation or conclusions.*
- *treat all other students ethically, respecting their integrity and right to pursue their educational goals without interference. This principle requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.*
- *uphold the ethical standards and professional code of conduct in the field for which the student is preparing.*

*Adherence to these principles is necessary to ensure that:*

- *proper credit for ideas, words, images, results, and other scholarly work, no matter the form or media, is attributed to the appropriate individual(s).*
- *all student research and work are fairly evaluated, and no student has an inappropriate advantage over others.*
- *the academic and ethical development of all students is fostered.*
- *the reputation of the University for integrity, ethics, scholarship, and professionalism is maintained and enhanced.*

Violations of academic integrity will be treated in accordance with University policy and sanctions for violations may range from no credit for the assignment to a failing course grade to (for the most severe violations) dismissal from the University.

### **Special Accommodations**

Any request for special accommodations must be made in writing provided with the Letter of Accommodations issued by the Coordinator of Services for Students with Disabilities. The University support services can be found at <https://ods.rutgers.edu/>. The Office of Disability Services can be reached at 848.202.3111 or [dsoffice@echo.rutgers.edu](mailto:dsoffice@echo.rutgers.edu).

### **Attendance, Preparation, and Class Participation**

Your preparation and active participation are important to ensure a supportive and stimulating environment for all of us. You are expected to attend every class, come prepared, complete assignments on time, and participate in class activities. Your participation will not only improve your abilities as an effective learner, but also contribute to the learning of other students. More than two absences for any reason throughout the duration of the semester will result in a failing grade for the course. If you know you will miss a class, you must inform the instructors prior to class. If you have a problem that will cause you to miss a significant amount of class, please talk to the instructor. The sooner you inform the instructor, the greater the chance that accommodations can be made.

### **Religious Observances**

It is University policy to excuse without penalty students who are absent from class because of religious observance, and to allow the make-up of work missed because of such an absence. Examinations and special required out-of-class activities shall ordinarily not be scheduled on those days when religiously observant students refrain from participating in secular activities. Absences for reasons of religious obligation shall not be counted for purposes of reporting. Students are advised to provide timely notification to instructors about necessary absences for religious observances and are responsible for making up the work or exams according to an agreed-upon schedule.

### **Team Science Capstone Reflection Assignment**

In this final capstone reflection assignment, students will be provided with a template that allows them to reflect on their learning in the course, the applications to personal and professional team dynamics, and ideas for further development. Specifically, this final assignment will provide students with an opportunity to connect the themes of the Team

Science course with their own experiences and to identify areas for growth as it relates to improving in one's capacity as a participant and leader of team science. In our final class session, students will provide a brief report-out of the major ideas presented in this capstone assignment.

### **Grading Scale**

This course is designed as a pass/fail 3-credit course. To successfully pass the course, students will be expected to attend and participate meaningfully in all class sessions and complete the Team Science Capstone Reflection Assignment at the conclusion of the course. Students who miss more than two class sessions or who fail to complete the concluding assignment will not be able to pass the course.

The following criteria will be used to assess students in the course:

#### **Class participation**

- Pass: Attends class regularly (no more than two excused absences) and consistently contributes to class discussions by raising thoughtful questions, analyzing relevant issues, building on others' ideas, integrating concepts from the readings and supplemental video modules, expanding the class' perspective, and appropriately challenging assumptions and perspectives.
- Fail: Student misses more than two excused absences and/or does not contribute to the course discussions.

#### **Capstone reflection assignment**

- Pass: The reflection assignment is submitted in a timely and high-quality manner. Using the template provided, the student provides a substantive reflection based on their learning in the course, offers specific applications to their experience with personal and professional team dynamics, and proposes tangible ideas for further development in the area of team science. The student provides a professional and high-quality report-out of the major ideas presented in this capstone assignment during the final class session. All required elements of the paper and presentation are included, and the paper meets the required length (2-3 pages) and is submitted before or by the deadline. The paper is well-written using standard English, and basically free from grammatical, punctuation, spelling, and usage errors. In-text citations and the reference list are formatted according to APA style.
- Fail: Student fails to submit the final assignment and/or presentation in a timely and high-quality manner based on the criteria detailed above.

## **Proposed Course Schedule**

*Note: Readings and speakers are presented as examples; final selections may be changed and/or altered based on speaker availability, literature suggestions, and refinements to specific topics in the course curriculum. Mini-evaluations will be conducted at the conclusion of each class session to solicit student feedback and enhance the course curriculum for future classes.*

### **Monday, January 25**

#### **Week 1**

#### **Introduction to Team Science**

A comprehensive overview of team science, including considerations in assembling a team; managing a team; evaluating team performance; incentives and challenges

Confirmed speakers: Biju Parekkadan and Ralph Gigliotti

*Potential guest speaker: L. Michelle Bennett, NCI/NIH, co-author, Collaboration and Team Science Field Guide*

Coalesce Module 1: The Science of Team Science (<https://www.teamscience.net/home>)

*Supplemental readings:*

Calhoun, C. *Playing for "Team Science": Tips for Students. Psychological Science Agenda, April 2013.* <https://www.apa.org/science/about/psa/2013/04/team-science>

M. L. Disis, J. T. Slattery, *The road we must take: Multidisciplinary team science. Sci. Transl. Med. 2, 22cm9 (2010)*

Hall KL, Vogel AL, Huang GC, Serrano KJ, Rice EL, Tsakraklides SP, Fiore SM. *The science of team science: A review of the empirical evidence and research gaps on collaboration in science. Am Psychol. 2018 May-Jun;73(4):532-548. doi: 10.1037/amp0000319. PMID: 29792466.*

Hall KL, Feng AX, Moser RP, Stokols D, Taylor BK. *Moving the science of team science forward: collaboration and creativity. Am J Prev Med. 2008 Aug;35(2 Suppl):S243-9. doi: 10.1016/j.amepre.2008.05.007. PMID: 18619406; PMCID: PMC3321548.*

Vollstedt EJ, Kasten M, Klein C; MJFF Global Genetic Parkinson's Disease Study Group. *Using global team science to identify genetic Parkinson's disease worldwide. Ann Neurol. 2019 Aug;86(2):153-157. doi: 10.1002/ana.25514. Epub 2019 Jun 26. PMID: 31155756; PMCID: PMC7410260.*

### **Monday, February 1**

#### **Week 2**

**Principles of effective communication, collaboration, and leadership in team settings; leveraging individual and shared talents**

Discuss foundational principles for effective communication, collaboration, and leadership in team settings, focusing specifically on communication theory, leveraging individual and shared talents, and engaging in difficult conversations

*Confirmed Speaker: Dr. Ralph Gigliotti, Director of Rutgers Center for Organizational Leadership*

*Supplemental readings:*

*Goldthwaite, C., Gigliotti, RA, Ruben, BD. Communication theory, competencies, and concepts: A guide for strategic communication and difficult conversations. In Gigliotti, RA and Goldthwaite, C, Leadership in Academic Health Centers: Core Concepts and Critical Cases, 2021, Kendall Hunt Publishing.*

*Ruben, BD and Gigliotti, RA (2016). Leadership as social influence: An expanded view of leadership communication theory and practice. Journal of Leadership and Organizational Studies, 23(4), 467-479.*

**Monday, February 8**

**Week 3**

**Forming an interdisciplinary team; identifying and securing appropriate team funding, successfully launching a team project, managing conflict, and evaluating team science mid-project.**

Example of class discussion launch: how an authorship agreement at project outset can reduce team conflict

*Confirmed Speakers: Dr. Nancy Reichman, Professor of Pediatrics and Dr. Edmund Lattime, Professory of Surgery*

*Coalesce Module 2: Behavioral Team Science (<https://www.teamscience.net/home>)*

*Supplemental readings:*

*Conn VS, McCarthy AM, Cohen MZ, Anderson CM, Killion C, DeVon HA, Topp R, Fahrenwald NL, Herrick LM, Benefield LE, Smith CE, Jefferson UT, Anderson EA. Pearls and Pitfalls of Team Science. West J Nurs Res. 2019 Jun;41(6):920-940. doi: 10.1177/0193945918793097. Epub 2018 Aug 9. PMID: 30089443.*

*Schnapp, L. M., Rotschy, L., Hall, T. E., Crowley, S., & O'Rourke, M. (2012). How to talk to strangers: facilitating knowledge sharing within translational health teams with the Toolbox dialogue method. Translational behavioral medicine, 2(4), 469–479.*  
<https://doi.org/10.1007/s13142-012-0171-2>

Hunt PW. *The Clinical-Translational Physician-Scientist: Translating Bedside to Bench*. *J Infect Dis*. 2018 Aug 14;218(suppl\_1):S12-S15. doi: 10.1093/infdis/jiy264. PMID: 30124982; PMCID: PMC6093316.

## **Monday, February 15**

### **Week 4**

#### **Clinical team science for an NIH R01 proposal**

Learning to successfully form a team for a 5-year NIH R01 proposal; managing conflict with senior collaborators, postdocs, graduate students; exploring ways to evaluate individual and team success

*Confirmed guest speakers: Hao Lin, David Shreiber, and Jeffrey Zahn, School of Engineering*

*Potential guest speakers: Panel of successful senior NIH R01 career researchers*

*Coalesce Module 4: Clinical Team Science* (<https://www.teamscience.net/home>)

#### *Supplemental readings:*

*Enhancing the Effectiveness of Team Science (Report from the National Academies Press) 2015. Available in pdf: <https://www.nap.edu/catalog/19007/enhancing-the-effectiveness-of-team-science> (chapter 8: Institutional and Organizational Support for Team Science)*

*AAMC Report: Challenges and Opportunities for New Collaborative Science: <https://www.aamc.org/download/>*

## **Monday, February 22**

### **Week 5**

#### **Initiating a large, cross-disciplinary, inter-institutional project, developing a proposal and budget; cultivating a relationship with the funder; promoting collaboration across a large team**

*Confirmed guest speaker: Rey Panettieri, Jr.*

*Coalesce Module 3: Biomedical Team Science* (<https://www.teamscience.net/home>)

#### *Supplemental readings:*

*Learning leadership in higher education: Communicative implications for graduate education*  
*Ralph A Gigliotti, Maria Dwyer, Stephanie A. Brescia, Magy Gergus & James R. Stefanelli.*  
*Atlantic Journal of Communication, 28(4), 209-233.*

*Gray, B. Enhancing transdisciplinary research through collaborative leadership. American Journal of Preventive Medicine 2008; 35(2S), S124-132.*

## **Monday, March 1**

### **Week 6**

#### **Stakeholder Dialogue about evidence-based practice**

Learn how to understand different perspectives about research and EBP across disciplines between researchers, practitioners, and communities. Practice-based and community-based research; shared decision-making and collaboration; barriers and facilitators to conducting research and implementing evidence-based practices in community settings

*Confirmed guest speakers: Benjamin Crabtree and Shawna Hudson, Department of Family Medicine and Community Health*

*Coalesce Module 5: Stakeholder dialogue about evidence-based practice*

(<https://www.teamscience.net/home>)

#### *Supplemental readings:*

*Israel BA, Schulz AJ, Parker EA and Becker AB. Review of Community-Based Research: Assessing Partnership Approaches to Improve Public Health. Annual Review of Public Health 2008;19:173-202.*

*Ying-Ying G, Bogart LM, Sipple-Asher BK, Uyeda K, Hawes-Dawson J, Olarita-Dhungana J, Ryan GW, and Schuster MA. Using community-based participatory research to identify potential interventions to overcome barriers to adolescents' healthy eating and physical activity. J Behav Med 2009;32:491-502.*

## **Monday, March 8**

### **Week 7**

#### **Shared decision-making with individual patients and clients (Part 1)**

#### **Implementation of evidence-based practices (Part 2)**

Making decisions about how to promote health by integrating the best available evidence with practitioner expertise and other resources, while also considering the characteristics, state, needs, values, and preferences of those who will be affected.

Review and discussion of case studies of actual community implementation projects highlighting challenges, successes, reflections

*Confirmed guest speakers: Alfred Tallia, Department of Family Medicine and Community Health*

*Potential guest speaker: Barbara Hale (awaiting confirmation)*

*Coalesce Module 6: Evidence-based Behavioral Practice: Shared Decision-making*

(<https://www.teamscience.net/home>)



Coalesce Module 7: Implementation of evidence-based practices  
(<https://www.teamscience.net/home>)

*Supplemental readings:*

Bazemore A, Neale AV, Lupo P, Seehusen D. *Advancing the Science of Implementation in Primary Health Care. J Am Board Fam Med. 2018 May-Jun;31(3):307-311. doi: 10.3122/jabfm.2018.03.180091. PMID: 29743211.*

Dobrozsi S, Trowbridge A, Mack JW, Rosenberg AR. *Effective Communication for Newly Diagnosed Pediatric Patients with Cancer: Considerations for the Patients, Family Members, Providers, and Multidisciplinary Team. Am Soc Clin Oncol Educ Book. 2019 Jan;39:573-581. doi: 10.1200/EDBK\_238181. Epub 2019 May 17. PMID: 31099665.*

Mathieson A, Grande G, Luker K. *Strategies, facilitators and barriers to implementation of evidence-based practice in community nursing: a systematic mixed-studies review and qualitative synthesis. Prim Health Care Res Dev. 2019 Jan;20:e6. doi: 10.1017/S1463423618000488. Epub 2018 Aug 2. PMID: 30068402; PMCID: PMC6476399.*

Xu J, Prince AER. *Shared decision-making in vascular surgery. J Vasc Surg. 2019 Nov;70(5):1711-1715. doi: 10.1016/j.jvs.2019.03.002. Epub 2019 May 5. PMID: 31068265.*

**Monday, March 15: No Class – Spring Break**

**Monday, March 22**

**Week 8**

**Community engagement and collaborative decision-making with communities**

Working with communities to advance research: identifying partners; working with a Community Advisory Board; setting priorities; establishing a successful organizational structure

Public health education and implementation: challenges, successes, considerations

*Confirmed guest speakers: Perry Halkitis and Kristen Krause (SPH)*

Coalesce Module 8: Collaborative decision-making with communities  
(<https://www.teamscience.net/home>)

Coalesce Module 9: Community engagement (<https://www.teamscience.net/home>)

*Supplemental readings:*

Bhalerao A, Sivandzade F, Archie SR, Cucullo L. *Public Health Policies on E-Cigarettes. Curr Cardiol Rep. 2019 Aug 28;21(10):111. doi: 10.1007/s11886-019-1204-y. PMID: 31463564; PMCID: PMC6713696.*

Subbian V, Solomonides A, Clarkson M, Rahimzadeh VN, Petersen C, Schreiber R, DeMuro PR, Dua P, Goodman KW, Kaplan B, Koppel R, Lehmann CU, Pan E, Senathirajah Y. *Ethics and Informatics in the Age of COVID-19: Challenges and Recommendations for Public Health Organization and Public Policy*. *J Am Med Inform Assoc*. 2020 Jul 28:ocaa188. doi: 10.1093/jamia/ocaa188. Epub ahead of print. PMID: 32722749; PMCID: PMC7454584.

Tebes JK, Thai ND. *Interdisciplinary team science and the public: Steps toward a participatory team science*. *Am Psychol*. 2018 May-Jun;73(4):549-562. doi: 10.1037/amp000281. PMID: 29792467; PMCID: PMC5973546.

## **Monday, March 29**

### **Week 9**

#### **Team science in the private pharmaceutical sector (Big pharma)**

An overview of the R&D process from bench to manufacturing to marketing to patient in the U.S. pharmaceutical sector

Potential guest speakers: Representative(s) from U.S. pharmaceutical sector

#### *Supplemental readings:*

Fishburn CS. *Translational research: the changing landscape of drug discovery*. *Drug Discov Today*. 2013 May;18(9-10):487-94. doi: 10.1016/j.drudis.2012.12.002. Epub 2012 Dec 13. PMID: 23247258.

Germann PG, Schuhmacher A, Harrison J, Law R, Haug K, Wong G. *How to create innovation by building the translation bridge from basic research into medicinal drugs: an industrial perspective*. *Hum Genomics*. 2013 Mar 5;7(1):5. doi: 10.1186/1479-7364-7-5. PMID: 23496921; PMCID: PMC3608963.

Zehring D, Jarrahan C, Giersing B, Kristensen D. *Exploring new packaging and delivery options for the immunization supply chain*. *Vaccine*. 2017 Apr 19;35(17):2265-2271. doi: 10.1016/j.vaccine.2016.11.095. PMID: 28364941.

## **Monday, April 5**

### **Week 10**

#### **Team science in the private pharmaceutical sector (Biotech startup)**

An overview of the R&D process from the perspective of a biotechnology company startup.

Confirmed speaker: Biju Parekkadan

Potential guest speakers: Representative(s) from Biotech startup

#### *Supplemental readings:*

Reichman M, Simpson PB. Open innovation in early drug discovery: roadmaps and roadblocks. *Drug Discov Today*. 2016 May;21(5):779-88. doi: 10.1016/j.drudis.2015.12.008. Epub 2015 Dec 29. PMID: 26743597.

Chung TD. Collaborative pre-competitive preclinical drug discovery with academics and pharma/biotech partners at Sanford|Burnham: infrastructure, capabilities & operational models. *Comb Chem High Throughput Screen*. 2014 Mar;17(3):272-89. doi: 10.2174/1386207317666140109124735. PMID: 24409951.

<https://hinj.org/life-sciences-new-jersey/new-jersey-the-medicine-chest-of-the-world/>  
HealthCare Institute of New Jersey (brochure)

## **Monday, April 12**

### **Week 11**

#### **Promoting team science at the national level**

Class discussion: overview and critical comparisons of NSF's Big Ideas, NIH "All of Us", Brain, opioid, and pain research initiatives, NASA Astrobiology

*Potential guest speaker: Kelly Gebo, MD, MPH, NIH Office of the Director, Chief Medical and Science Officer*

#### *Supplemental readings:*

Danko, D., Mohan, G. B. M., Sierra, M. A., Rucker, M., Singh, N., Regberg, A., ... Venkateswaran, K. (2020). Characterization of Spacesuit Associated Microbial Communities and Their Implications for NASA Missions. *None*. doi:10.21203/rs.3.rs-70768/v1

Mervis J. SCIENCE POLICY. NSF director unveils big ideas. *Science*. 2016 May 13;352(6287):755-6. doi: 10.1126/science.352.6287.755. PMID: 27174966.

Koroshetz, W., Gordon, J., Adams, A., Beckel-Mitchener, A., Churchill, J., Farber, G., Freund, M., Gnad, J., Hsu, N. S., Langhals, N., Lisanby, S., Liu, G., Peng, G., Ramos, K., Steinmetz, M., Talley, E., & White, S. (2018). The State of the NIH BRAIN Initiative. *The Journal of neuroscience: the official journal of the Society for Neuroscience*, 38(29), 6427–6438.  
<https://doi.org/10.1523/JNEUROSCI.3174-17.2018>

## **Monday, April 19**

### **Week 12**

#### **In-class Presentations of Team Science Capstone Reflection Assignments**

Additional suggested resources and readings:

- <https://www.teamsciencetoolkit.cancer.gov/Public/GetStarted.aspx>
- Guidelines for the conduct of research at NIH (2019)
- Strategies for Team Science Success: Handbook of evidence-based principles for cross-disciplinary science and practical lessons learned from health researchers, 2019. Hall, Vogel, Croyle, eds.
- University of California, Irvine Team Science Consult Service  
<https://icts.uci.edu/services/team.php>
- International Network for the Science of Team Science (<https://www.inscits.org/>)
- The Collaboration Kit. Alliance for the Arts in Research Universities  
*The Collaboration Kit is a collection of readymade workshop materials, activities, and session plan to help develop the knowledge, skills, and dispositions needed for collaboration across difference.*  
<https://www.a2ru.org/projects/collaboration-kit/>
- Committee on the Science of Team Science; Board on Behavioral, Cognitive, and Sensory Sciences; Division of Behavioral and Social Sciences and Education; National Research Council. Enhancing the Effectiveness of Team Science. Cooke NJ, Hilton ML, editors. Washington (DC): National Academies Press (US); 2015 Jul 15. PMID: 26247083.