Special Topics in Freshwater Ecology: Science of Team Science
(formally known as Freshwaters in the Anthropocene)
BIOL 6064
Spring 2020

"Across your scientific career thus far, which collaboration have you been most excited about and most willing to prioritize above all others, and why? We anticipate that the most common response to this question describes a collaboration in which the team members worked well with and cared about each other professionally and personally, had a shared vision, were excited about the science being conducted, and made that science a top priority. This team likely had many important research outcomes as well. To realize this goal for most teams, members of the scientific community must redefine research success to include collaborative outcomes, promote teamwork training for ecologists at all career stages, and pay deliberate attention to and guide how teams are formed and maintained." -Cheruvelil et al. 2014, page 37; doi:10.1890/130001

TIME & ROOM
Tuesdays and Thursdays, 9:30 - 10:45 AM
Derring Hall 1065

INSTRUCTOR
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Office hours by appointment

COURSE OVERVIEW
We face unprecedented complex environmental and social challenges that necessitate cross-disciplinary integration and collaboration. However, unless researchers are able to establish effective working relationships in teams, it is unlikely that they will be able to tackle these challenges. This course analyzes literature from many disciplines – including business management, organizational psychology, philosophy, and ecology – to provide an overview of the emerging discipline of the Science of Team Science (SciTS), with a particular focus on SciTS applications for ecology. Students will gain practical skills about how best to work effectively with team members, develop their own leadership and team philosophy, and assess team performance to produce high-impact research outcomes. The course will be centered on reading discussions, supplemented by weekly reflections and student presentations.

LEARNING OBJECTIVES
- Describe the trend toward greater collaboration in scientific research over the last 50 years
- Understand the science of team science and how its findings can provide evidence-based guidance that impacts the effectiveness of science teams

- Differentiate between multidisciplinary, interdisciplinary, and transdisciplinary research
- Identify factors that promote and inhibit productivity of science teams
- Gain a greater self-awareness of the role you play on teams and your own individual readiness to work on a science team
- Develop a leadership philosophy and collaboration plan for a new research team
- Apply strategies for team evaluation and self-correction
- Demonstrate an understanding of meta-cognitive processes and leadership important for team functioning
- Recognize and resolve conflict that arises during the life cycle of a scientific team

COURSE POLICIES
<u>Your success in this course is dependent on your participation.</u> You will be expected to regularly attend class, complete all of the readings beforehand, ask questions, provide feedback, and contribute to discussion. Being successful in team science requires clear verbal communication of ideas, and I expect students to engage and lead discussions throughout the course.

Classes are structured around analysis and discussion of the reading materials, which will be posted at the course Canvas site or emailed. In addition to class discussions about team science principles, strategies, and evidence of effectiveness, **students will be expected to identify a current research team of their choice that they are involved in**, and practice team science strategies during the semester. I will lead many of the discussions, but also will ask students to lead discussion some weeks to promote the sharing of novel perspectives on the material.

Assignments will include short weekly reflections on how you are applying what you are learning in class towards your own collaborative endeavors, preparation of a leadership philosophy and collaboration plan, and mini-presentations. Weeks during which a session is not scheduled may be used to work on assignments in class.

Please let me know beforehand if you will miss a class period or be late for research or personal reasons. If you feel that you are falling behind, I encourage you to seek help from your peers and from me. I am 100% invested in your success in this class and will do everything in my power to help you if you pull your weight in the course. Please schedule a meeting with me through email or by talking after class. Any student with special needs or circumstances should make arrangements to meet with me during the first week of classes.

COURSE PROJECTS
Weekly journal reflections: A major part of this course is processing the reading material and applying what you are learning to your own team experiences. To stimulate reflection and self-awareness, a short journal reflection (0.5-1 page length) is expected after the Thursday course period every week. Some weeks I may give short prompts,

but otherwise the reflections may address any topic covered in class that week. Reflections will be due before the Tuesday class of every week via submission to Canvas. I will not share these reflections unless I have received your permission and will provide feedback via the Canvas comments tools. These reflections are primarily for your benefit, and will thus be graded as Complete/Incomplete.

Leadership philosophy: One of the most important things you can do to become an effective team member is to think about, define, and then articulate your own personal leadership philosophy. Your personal leadership philosophy gives you consistency, and becomes your true north. Everything you do, everything you say, every action, every decision, and every plan is filtered through your philosophy. Your leadership philosophy is all about your own personal mission and who you are as a leader or manager. If you are not clear on your personal mission, your role as a leader of a team will also not be clear. These documents are expected to be ~1 page long and incorporate your core values, your personal mission as a leader, and how exactly you will lead.

We have allocated one class period before spring break for everyone to make mini-presentations on their leadership philosophy and receive feedback, which you can use to revise your philosophy throughout the 2nd half of the semester before you turn in the final version.

Collaboration plan: The capstone of the course is for you to develop a collaboration plan for a new research team that you are embarking on. Collaboration plans are becoming more common as a way to ensure that all team members are on the same page and make expectations explicit, and are increasingly required by NSF for certain funding programs. Your collaboration plan should cover the overall goals/vision of the team, anticipated outcomes, project timing and logistics, expected contributions from team members, data management, authorship/credit guidelines, communication, conflict management, and intellectual property. It is my hope that the collaboration plan you develop for this class can be used for future collaborative efforts, so I encourage you to tailor yours to fit a particular project that you intend to work on.

At the end of the semester, copies of your collaboration plan will be distributed to ~3 of your classmates, who will write a max 1-page review of your plan and lead a discussion your plan in class. It is expected that everyone will provide conscientious and respectful feedback on each other's work.

ASSESSMENT
Assessment of student performance will be based upon the traditional A-F plus/minus grading scale. Assessment will be based on the following assignments:

Assignment	Percent of final grade
Discussion participation and leading	30
Weekly journal reflections	20
Mini-presentations: application of Liberating Structures, leadership philosophy	5
Leadership philosophy	
: first draft	10
: final draft	10
Collaboration plan	
: final written plan	20
: reviews of other plans	5

Students enrolled in this course are responsible for abiding by the Virginia Tech Honor Code. The Honor Code pledge that each member of the university community agrees to abide by states: "As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code. The Virginia Tech Honor Code can be found at: http://www.honorsystem.vt.edu.

SEMESTER COURSE SCHEDULE
Note: The topics covered and timing are subject to change

Week	Month	Day	Class plan	Theme/Notes
1	Jan	21	Introduction to the science of team science: why teams?	Course introduction, semester overview
		23	Discussion of Calhoun 2013 or Wallen et al. 2019 (page 221 left column, Tables 3-6), NRC pages 1-3 and 5-7, CTSFG pages 7-13, CTSFG case study 1	How do graduate students engage in team science?
2		28	Discussion of NRC pages 19-43, CTSFG page 14, CTSFG case study 2	Challenges that teams face
		30	Discussion of Eigenbrode et al. 2007, Brown et al. 2015	Interdisciplinarity, Multidisciplinarity, Transdiciplinarity
3	Feb	4	No class	CCC at Duke

		6	Discussion of your toolbox results (send to CCC beforehand for class survey); Robinson et al. 2019	Interdisciplinarity, Multidisciplinarity, Transdiciplinarity
4		11	Discussion of your MBTI and Parker Team survey assessments; CTSFG 19-21	Self-awareness of the role individuals play on teams
		13	Discussion of Thanks for the Feedback pages 1-26 and 165-205; CTSFG 15-18 and 21-26, case study 3	Self-awareness of the role individuals play on teams
5		18	Discussion of NRC pages 125-147; Lilly 2019	Models of team leadership
		20	Discussion of CTSFG 27-36, case studies 4 and 5; Farrell et al. 2020 or Cheruvelil et al. 2014	Models of team leadership
6		25	Discussion of NRC 81-96, Guimera et al. 2005	Building a research team: who and why, and setting expectations
		27	Discussion of CTSFG 37-49, case studies 6 and 7; Kazmierski & Lilly 2001	Building a research team: who and why, and setting expectations
7	March	3	Discussion of NRC 59-80; Trust-building exercise	Team mental models
		5	Leadership philosophy mini-presentations; **First draft of leadership philosophy due**	
8		10	SPRING BREAK	
		12	SPRING BREAK	
9		17	Discussion of Duhigg 2016; CTSFG 50-57, case studies 8 & 9	Trust and psychological safety
		19	Discussion of Cummings & Kiesler 2007; NRC 151-176	Communication and coordination; virtual collaboration
10		24	Discussion of CTSFG 58-63, 64-76, and 132-133, case studies 10 & 11; Pentland 2012	Developing a collaboration plan
		26	Discussion of CTSFG 77-89, case studies 16 & 17 and others	"Credit" management, authorship
11		31	Discussion of Duffy 2017 or Weltzin et al. 2006; SCC authorship guidelines and Data management plan	Authorship practices in ecology
	April	2	No class	CCC at U-Cincinnati
12		7	Discussion of CTSFG 90-99, case studies 18 & 19; Thompson et al. 2009	Managing diversity and differences
		9	Discussion of CTSFG 112-121, case studies 22 & 23; Lilly 2018 and liberating structures	Team maintenance and management

13		14	**Mini-presentations on the application of liberating structures on your team**	Team maintenance and management
		16	Discussion of CTSFG 100-111, case studies 20 & 21	Conflict management
14		21	Discussion of DuBois et al. 2013, NSF Conflict of Interest and Research Misconduct Policy, COI case studies; **Collaboration plan due**	Conflict management
		23	No class	CCC at NSF
15		28	Collaboration plan in-class review	
		30	Collaboration plan in-class review and catch-up	
16	May	5	Discussion of NRC 7-16, CTSFG 2-3 and 128-129	Course conclusion

READINGS
I will post most of the readings listed in the table above on Canvas and let you know beforehand if you will need to find materials elsewhere. The two pillars of this course will be:

Bennett L.M., H. Gadlin, and C. Marchand. 2018. Collaboration and Team Science: a Field Guide, 2nd edn. National Institutes of Health, Washington, D.C.
    [abbreviated as CTSFG in the schedule]

National Research Council. 2015. Enhancing the Effectiveness of Team Science. Committee on the Science of Team Science, N.J. Cooke and M.L. Hilton, Editors. Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education. The National Academies Press, Washington, DC.
    [abbreviated as NRC in the schedule]

FEEDBACK AND EVALUATION
This course is for you to learn important fundamental concepts to build your understanding and application of the science of team science. I will do my best to create a positive learning environment. But because learning styles differ among individual students, some activities or approaches may not be optimal for you. If this happens, please let me know! Because I need to keep the interest of all students in mind, I cannot promise that I will change the course, but I will listen and try to implement your suggestions.

In this course, we will talk about our own experiences working on teams. Given that this may include private reflections, I request confidentiality outside of class when it comes to any personally-identifying information. **It is critically important that everyone feels comfortable sharing their opinions and beliefs, and that those perspectives are**

respected within the classroom environment. Please let me know immediately if you have any concerns about these issues throughout the semester.