

Advanced Neuroscience Research I (NSCI 411)

Fall 2020

Lecture: TR (3:00-4:20), Science Center 1135

Lab: W (12:00-2:50), Science Center 1026

Dr. Lindsey Root Luna
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Office Hours: Wednesday 1:00-3:00pm &
by appointment; online only [via Zoom](https://zoom.us)
(calendly.com/profrootluna)

Course Description and Design

An interdisciplinary course in which students with different academic majors work together as a team to complete a self-designed neuroscience research project supervised by the instructor. This course is the first half of the capstone project for the Neuroscience minor program. Students will read and discuss primary research literature, write a formal research proposal, then design and conduct a study on a neuroscience topic. One 3-hour lab session plus 3 hours of discussion per week.

2020-21 Hope College Course Catalog

Course Learning Outcomes

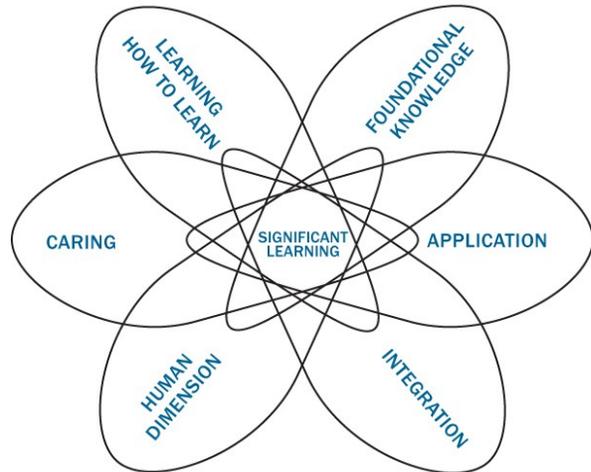
This course has two primary objectives. The first is to facilitate your growth as a neuroscientist regarding your understanding of the discipline, critical evaluation of the primary literature, collaborative research, and professional communication. The second is to contribute to your understanding of vocation within your chosen field and enhance your career readiness. Throughout this course you will

- ★ use both theory and prior empirical work to form relevant, testable hypotheses
- ★ design and execute experiments and interpret data related to neuroscience
- ★ use novel research techniques
- ★ think creatively about a problem and trouble-shoot experiments
- ★ obtain specific information from the primary neuroscience literature and apply it toward an experimental research project
- ★ summarize the pertinent information in scientific journal articles
- ★ write a formal research proposal
- ★ work independently as a researcher
- ★ work collaboratively with your peers to execute excellent research
- ★ discuss the concept of calling/vocation
- ★ practice habits of vocational reflection (e.g., developing and considering a clearer understanding of interests, strengths, values, and how these can be applied to professional contexts)
- ★ research professional and graduate school trends within a specific academic department or division
- ★ participate in an experiential learning component (i.e., collaborative research)

L. Dee Fink's Taxonomy of Significant Learning

In scientific research, we can become overly focused on facts and specific knowledge. As a result, we can expect that our performance will be evaluated purely on our ability to know and explain established scientific facts and knowledge. This is not the primary objective of this course. Rather, this course will stretch you to integrate and apply knowledge to new problems. Beyond the application of scientific knowledge, you are invited to learn more about yourself, how you learn, and how you learn to serve others through your specific gifts and strengths, as well as your areas for growth. Dee Fink's Taxonomy of Significant Learning illustrates this reality.

- **Foundational Knowledge:** Understanding & Remembering; Information & Ideas
- **Application:** Skills; Critical, creative, & practical thinking; Managing projects
- **Integration:** Connecting ideas, people, and realms of life
- **Human Dimension:** Learning about oneself and others
- **Caring:** Developing new Feelings, interests, and values
- **Learning how to Learn:** Becoming a better student; Inquiring about a subject; Self-directed learning



The intersection of these six dimensions is significant learning (Dee Fink, 2003), which “requires that there be some kind of *lasting* change that is *important* in terms of the learner's life” (emphasis original). I hope that you achieve this type of learning in this course and throughout your time at Hope College.

Course Format

Students will work in interdisciplinary groups to develop and complete an experiment-based, collaborative neuroscience project. This is a novel research project for which the outcome is unknown. Therefore, the goals and format of the lecture portion of this will adapt to best fit the needs of the students in response to the evolution of the research over the semester. Likewise, the laboratory portion of the course will shift from a focus on literature searches and critiques to learning procedures surrounding peripheral physiology in humans. As with all courses, this class will require time outside of the normally allotted class time, including time spent on data collection and analysis. The experiences that you will have in this course will be very similar to what you would have as part of a research team in graduate school. Indeed, we will be operating like a graduate research group in some ways: studying literature, asking questions, collecting data, and disseminating our findings. Each student should strive toward gaining independence in the lab throughout the course of the semester.

As in many classes, the more effort you put into this class, the more you will get out of the experience. I will be available to provide suggestions based on my experience and expertise in

the field; at the same time, this project will ultimately be completed by the students. In addition, this is a collaborative project which means that every student in the course is expected to contribute equally to this work. Just as a chain is only as strong as its weakest link, this collaborative project truly requires a team-based approach. However, each student has a different skill set and background, thus it is expected that each student will contribute differently to the project.

This is a design and discovery process. To do this well, we need exceptional ethics, diligent work habits, good listening, and pro-learning discussions that allow for different insights while coming to shared perspectives. We also need to be flexible, adaptive, maintain a sense of humor, be able to see possibilities when we face problems, acknowledge our limits and mistakes while working to minimize them, work hard individually on individual assignments, and come together to collaborate when appropriate to create a vibrant learning community. You will need to attend to the details of our project, even when not “in class.” As a result, you will be required to check your email daily for messages from me or your peers regarding the course project. Each student and groups of students will have specific responsibilities within our larger project; in order to have a successful research experience, every member of the team will need to be fully engaged.

Student & Faculty Characteristics and Expectations

Each student enrolled in this course has the academic ability and intellectual interests that will make for an exciting process of group and individual discovery. As a hands-on research experience and a learning community, we will all benefit from embodying the following characteristics:

full attendance & participation	honesty	flexibility
focus	trust	determination
reliability	hope	patience
punctuality	a growth-mindset	respect
high ethical standards	frustration tolerance	individual responsibility
careful double-checking	careful preparation	team spirit
a sense of humor	individual responsibility	flexibility
interpersonal skills for listening well and speaking precisely	strong quantitative & verbal skills	openness to admit faults & mistakes, while working to overcome them

Producing high-quality research takes effort and resilience. In this course, we are striving to do **professional quality** research that has the potential to be published in a scientific outlet. The

success of our project depends on everyone, and I expect you to take the responsibility seriously. Living out the qualities listed above will help us accomplish our purpose. Specifically, the embodiment of these standards includes (but is not limited to) the following:

- ❖ Organize your life so that you can attend class regularly and fulfill your out-of-class responsibilities on time. This is particularly relevant when it comes to data collection. High quality experimental research requires high quality data collection, which requires a substantial amount of time. We will try to do much of our work together during our class meeting times, and we will not always meet during class time when we are involved in collecting data (which will involve around 6 hours of scheduled time outside of class). Overall, this course will require a substantial amount of outside work. Remember, Hope College defines each “credit hour” as requiring 4 hours of work; this figure will certainly be true in our course.
- ❖ Be actively engaged in course activities and discussions. **Do not multi-task in class or in the lab. Give us your full attention.** Come prepared, ask questions, and offer your thoughts and suggestions.
- ❖ Be flexible! The amount of time it will take to design, analyze, and write a research report can be unpredictable. As such, the number of hours you can expect to spend on this course will vary from week to week. You should be prepared for the possibility of changing assignments and/or deadlines as the semester progresses.
- ❖ Listen and learn from those around you. You are part of a professional research team, and working together well will be **KEY** to our project’s success.
- ❖ Take ownership of the project. You are expected to collaborate with each other and contribute to ALL aspects of the project, including design, data analysis, report writing, and presentation to the Hope community.
- ❖ Meet with me if you have questions or are having trouble in the course.

Along with the above, as your professor, I will:

- ❖ Strive to incorporate instruction, discussion, activities, and resources that maximize your learning and involvement.
- ❖ Make my expectations (including grading criteria) as clear as possible.
- ❖ Answer your questions as completely and promptly as I can.
- ❖ Provide timely feedback on your performance throughout the course.
- ❖ Adapt as needed given our current local and global situation regarding COVID-19.

Required Materials

1. Bound Composition Notebook: You will use this notebook for our lab notes.
2. Moodle & Google Docs access
3. Supplementary reading materials provided

We will utilize the primary neuroscience literature for this course. You will locate, assess, read, and summarize numerous scientific articles related to our research project. Because we will be using human subjects data, guidelines from the American Psychological Association are recommended for writing style (*Publication Manual of the American Psychological Association*,

7th Ed. (2019). Washington D.C.: American Psychological Association). *The APA website, Purdue OWL, and Calvin College also have helpful writing resources online.*

Inclusive Excellence

In an ideal world, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. I acknowledge that many of the readings for this course were authored by white men. I acknowledge that it is possible that there may be both overt and covert biases in the material, including more recent work and empirical papers, due to the lens with which it was written, even though the material is primarily of a scientific nature. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. Please contact me (in person or electronically) or [submit anonymous feedback](#) if you have any suggestions to improve the inclusivity of this course, including the materials we review together.

Furthermore, I aim to create a learning environment for you that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official Hope College records, please let me know.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. Remember that you can also submit anonymous feedback (which may lead to me making a general announcement to the class, if necessary to address your concerns). If you prefer to speak with someone outside of the course, the [Center for Diversity and Inclusion](#) is an excellent resource and place to start.
- I (like many of us) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone-including me!) that made you feel uncomfortable, please talk to me about it. (Again, [anonymous feedback](#) is always an option).

Contingency Planning

This is a highly unusual time. With the exception of the spring, we have never experienced something like this in our country, let alone higher education. This course always requires a high level of flexibility--but this semester will require even more. We may meet online at times as a whole cohort. Or, perhaps you will need to be isolated because you are sick, or you've had contact with someone who is sick. Or I will need to isolate or be in quarantine. We will do everything in our power to keep this course running smoothly. If I am unable to come to campus, we will meet remotely. If you are unable to come to campus, but well enough to join us online, you are expected to do so. Please use this [Zoom link](#) to join class, whether the whole group is meeting online or if only you are needing to remote into class.

If I am not well enough to continue to lead class, Dr. Charlotte Witvliet will assist you, with the support of other neuroscience faculty.

Recorded and Live Streamed Class Session Access Restrictions

Because of the unique nature of this semester, the college seeks to offer all students the opportunity to participate in courses despite possible health concerns, travel restrictions, or other barriers that will prevent full participation in face-to-face courses. To that end, the college will be recording and/or live streaming many courses throughout the semester. This approach to recording sessions will be a benefit to many students who find themselves unable to attend a particular course session in real time. These recordings are designed to be seen only by members of the particular class being recorded. The recorded and/or live streamed course access is intended for instructional purposes only and students may not share or distribute the recording or live streaming with anyone or any group.

Healthy Behaviors Statement

Students, like all faculty and staff, are required to wear face coverings (mask, face shield, bandana, or other coverings) to cover their mouths and noses during all indoor course activities. Additionally, students must adhere to physical/social distancing protocols (e.g., stay six feet apart from individuals, enter and exit at labeled doors in a staggered fashion) as directed by the instructor, posted signage, or the college. Please note that some laboratory and studio courses may require instructors to get closer than six feet to students to achieve the learning objectives. This will be kept to a minimum both in frequency and duration. Students who have COVID-19 symptoms such as fever, body ache, shortness of breath, chills, or sudden loss of taste/smell will be excused from class and should stay home. Students experiencing these symptoms should contact the Health Center and email their instructors.

To protect the health of everyone, instructors have the right to ask those students not complying with these requirements to leave the class. We see adherence to this policy and other safety regulations as a demonstration of [one of our core values of Hope](#): to be a caring community. Let us all express this value in placing the care for one another as a top priority.

Evaluation

Academic Integrity Policy:

This course follows the [Hope College Code for Academic Integrity](#) (see the *Catalog* for further details). Specifically, it is a violation to:

1. Give, offer, or receive aid on examinations other than that specifically allowed by the professor.
2. Do course work in a manner that is inconsistent with the standards of conduct set forth by the professor.
3. Represent the work of others as his or her own. This includes, but is not limited to, plagiarism.
4. Falsify or fabricate data. This has particular application to laboratory work and research.
5. Engage in conduct that destroys another person's work or hinders another in their academic endeavors. This has particular application to computer files, library resources, and laboratory or studio work.

Grading Scale:

		B+	87-89	C+	77-79	D+	67-69	F	below 60
A	94-100	B	83-86	C	73-76	D	63-66		
A-	90-93	B-	80-82	C-	70-72	D-	60-62		

Please note: I do not round up.

Expected Course Assessment Plan

*Please be aware that any behaviors that erode our learning and research community and its success will override earned on individual assignments. Disrespectful or disruptive behavior in class or in the lab will impact your **entire grade**, not only the participation elements.*

<u>Assessment Category</u>	<u>Points</u>
Class Participation & Involvement	50
Lab Participation & Involvement (Research Responsibilities)	75
Skill Mastery (Physiological Data Collection & Reduction; Data Analysis)	75
HSRB Proposal/CITI Certification	50
Journal Article Summaries (10, 10pts each)	100
Journal Article Presentations	25
Lab Notebook & Documentation	25
Online Vocational Reflections	30
CV & Personal Statement/Cover Letter	20
NSF-style Grant Proposal Draft 1	40
Peer Review Process	50
NSF-style Grant Proposal Draft 2	60
Vocational Reflection (Draft)	40
Final Grant Proposal	150
Total	725 800

Participation & Involvement (Class & Research Responsibilities)

As noted above, for our project to be successful, every member of our team must be engaged and involved. Given our current circumstances, you will be able to remote into class (if you are well enough to participate, but unable to be with us) and are expected to do so if at all possible.

Some of our work will be done online, as it will allow us to see one another face to face without masks. If you miss a class or lab for an excused absence (illness, family emergency, or official Hope College activity), you need to take the initiative to consult with your peers and with me to find out any relevant content and details you have missed. Any absence from this course has the potential to negatively affect your grade; you must assume all of the responsibility to communicate with me and provide documentation for your absence. Note that, whenever possible, you should contact me by phone or by e-mail in advance of missing a meeting.

You will have various research responsibilities, which will include developing and implementing our research protocol, being prompt in preparing for participants, and diligently recording your work in our shared space both physically and online. Much of our research work will happen throughout the week (not just during our scheduled class time), particularly after our project protocol is established. You will be expected to work on our research protocol approximately 6 hours/week; plan to dedicate at least 12 hours per week total toward this course. I will always be available on Wednesdays, 12:00-2:50; consultation is available at other times as well, but can only be guaranteed if scheduled in advance.

Skill Mastery (Physiological Data Collection & Reduction)

As mentioned above, a necessity of strong experimental research is reliable and valid data collection. Therefore, you must demonstrate proficiency in the execution of our protocol and processing of physiological signals. This will include understanding the design of the experiment, operating the computers, reading physiological output, ensuring participant comfort and data fidelity (as much as possible), applying diligent data reduction procedures, and generally acting responsibly, professionally, and with integrity.

HSRB Proposal/CITI Certification

Within the first six weeks of the semester, you will write a Human Subject Review Board (HSRB) research protocol that details a summary of our project and discusses how ethical considerations of the research are handled. You will work together in small groups for this portion of the assignment, which will be discussed in more detail in class. You also will be asked to complete training on the ethical conduct of research with human participants (CITI). This is an online training that takes about 4 hours to complete. You do not need to complete it in a single block, but the training must be done *individually*. Once you have completed all the modules you will receive a certificate that you will turn to me electronically. Retain copies for your own records as well.

Journal Article Summaries

Over the course of the semester, you will be reading many different journal articles related to this research project as well as your individual proposal project. You will be expected to summarize 10 of these articles in a two-page essay. The first two journal articles you summarize will be from one of the papers that we all read together. The remainder of the articles that you summarize will be articles you select (at least 4 must be related to the class research project). All of the articles must be primary research papers that have been approved by Dr. Root Luna. While you may find it beneficial to read review papers in learning more about this area of research, you cannot summarize review papers. All of the student summaries and

the original papers will be uploaded to Moodle as a resource available to all students in the class as you write your final paper next semester.

Journal Club Presentations & Facilitation

In addition to writing summaries, you will be required to present one primary research paper related to your chosen proposal topic. Students will sign up for presentation times the third week of class. Dr. Root Luna will lead the first journal presentation and discussion in the third week as a model.

Lab Notebook and Documentation

Each student will be required to maintain a lab notebook and submit it for evaluation. For each day you work on the research project, you should detail what you did and the information you obtained. This semester will be unusual, as our work will (for the most part) happen in our own space, rather than in our shared lab. Nevertheless, you must also record when you worked on our research protocol and the amount of time you worked each week. It is important that you write everything down in scrupulous detail. Our goal is to produce professional level research, to ultimately be published in a peer-reviewed journal. Additionally, you will need to write the materials and methods section of your research report (next semester) such that anyone could repeat the study exactly! You should record any changes to procedures used, any problems with an experiment, any things you note about the participant's behavior that day, what time of day you were in the lab, what file you saved the data in, etc., etc., etc. Please see the handout for more details and a rubric on the expectations and evaluation of your lab notebook.

Grant Proposal & Peer Review

Obtaining research funds is an essential component of the scientific process as we seek to discover and evaluate hypotheses. Necessary equipment, materials, subjects (animals and human), hardware, and software are all costly. A number of government and private agencies support research efforts by offering scientists the opportunity to compete for research funding. To aid in the development of this skill set, students will write an original [Graduate Research Fellowship Program](#) grant. The National Science Foundation (NSF) sponsors this grant for graduate students (and graduating college seniors applying to graduate school are also eligible to apply) to support research activities at the beginning of their professional research career. I will provide a rubric aligned with the expectations and review criteria of the NSF. You will also have access to the example funded GRFP proposals.

Every element of the proposal will need to be completed and turned in online. We will also be using online functionality for peer review. Evaluation of peer review will be based on attention to detail, adherence to the criteria as well as the delivering summaries and critiques honestly and kindly. It is a valuable skill to be able effectively analyze and appreciate the hard work of others. To promote honesty among reviewers, the authors of the grants being reviewed will not be present.

- GRFP Personal Statement, Relevant Background, and Future Goals-Draft 1 (9/15)
- GRFP Personal Statement, Relevant Background, and Future Goals-Draft 2 (10/6)
- GRFP Graduate Research Statement-Draft 1 (10/20)
- GRFP Graduate Research Statement-Draft 2 (11/10)

- GRFP Final Proposal (11/24)

A Note About Late Work

As our work this semester is a team effort, all participants depend on the timely work of others, be it protocol development, written work, data collection, or data reduction and analysis. Thus, assignments are due at the *beginning* of the class period unless otherwise explicitly stated on the assignment and on moodle. If your work is late (i.e., after the beginning of the class period), you will lose 20% per day. (For example: Our class meets at 3:00pm on TR. If you turn in your assignment before 12:00pm on Wednesday, you lose only 20%. If you turn it in after 3:00pm on Wednesday, you lose 40%. This means work will not be accepted if it is more than 5 days late). Missing class the day an assignment is due does not alter the due date.

Disabilities

If you have questions about access or are a student needing accommodations for a disability, please contact me. I will ask that you connect with [Disability and Accessibility Resources](#) if you haven't already.

Tentative Schedule of Class Activities and Assignments:

The nature of the work we will do together requires flexibility and problem-solving. Therefore, I have outlined our class activities and assignments; however, it may be necessary to adjust this schedule.

Date	Topic	Readings & Assignments
Week 1	Developing a Research Project	
Aug. 18	Course Introduction Research Background Discussion	Syllabus; Pre-test assessment (in class)
<i>Aug. 19 Lab: Beginning research plans</i>	Literature searches--Methods for online data collection	Read Shaffer et al. (2014) and Li et al. (2019)
Aug. 20	Continued Research Background; Description of NSF GRFP; Discuss current view of vocation	Read Xie et al. (2020) ; Complete IDP <i>Skills</i> and <i>Interests</i> sections; Initial Vocation Reflection: <i>Why Neuroscience? Why _____?</i>
Week 2		
Aug. 25	Best Practices in Taking Notes & Summaries; Discuss vocation as secular and sacred	Hardy, L. (1990). (Chapter 3) Steger, Pickering, Shin, & Dik (2010) Online Reflection

		Review List of Resources & Articles supplied by LRL
<i>Lab: Developing research plans</i>	Literature searches--Methods for online data collection	Begin list of topics that are of interest and that you need to learn more about – bring to class
Aug. 27	Potential Papers to Read Journal club presentation (Dr. Root Luna)	
Week 3		
Sept. 1	Individual Meetings with LRL	Submit your list of at least 3 primary literature articles of interest, relevant to our collaborative project, including abstracts
Sept. 2	Individual Meetings with LRL	First draft journal summary #1 (Xie et al.)
Sept. 3	Individual Meetings with LRL	
Week 4		
Sept. 8	GRFP Preparations; Research in Neuroscience	List of 9 primary papers you plan to summarize (3-4 should be connected to our collaborative project) Final draft of journal summary #1
<i>Lab: Ethical Human Subjects Research</i>	Hypothesis Presentations Writing an HSRB proposal (Group activity)	Specific Hypothesis Presentations
Sept. 10	Finalization of project plans; Boerigter Center Presentation—Job trends and search strategies	Watch The Joys of Science and Challenges (posted to moodle) Read What do Neuroscience Majors Do and Why you should (or shouldn't) get a PhD in Neuroscience Transferable Skills Worksheet Journal Summary #2 (Friday @11:59pm)
Week 5	Hypotheses & Methods	

Sept. 15	Developing Methods; Constructing a CV	Review example CVs and Resumes
<i>No Lab</i>	Midsemester Break	Draft 1: Personal Statement, Relevant Background, & Future Goals (11:59pm)
Sept. 17	<i>Journal Presentation 1;</i> Data collection preparation	Journal Summary #3
Week 6	Hypotheses & Methods	
Sept. 22	<i>Journal Presentations 2 & 3;</i> Review/update experiment plans	Journal Summary #4
<i>Lab: Preparation for Data Collection</i>	HSRB; Programming and preparation for data collection	
Sept. 24	Methods Presentations	Methods Presentation
Week 7	Data Collection & Cleaning	
Sept. 29	GRFP Support	Journal Summary #5
<i>Lab: Data Collection and Cleaning</i>	PsyToolKit, Camera HRV, data collection preparation	
Oct. 1	<i>Journal Presentation 4 & 5</i>	Journal Summary #6
Week 8	Data Collection & Cleaning	
Oct. 6	Proposal Review--Individual meetings	
<i>Lab: Data Collection and Cleaning</i>	Programming--PsyToolKit, Video Instruction, Other Data Collection Prep	
Oct. 8	<i>Journal Presentations 6 & 7;</i> Discuss Data Collection	Journal Summary #7
Week 9	Data Collection & Cleaning	Monday @ 11:59pm--Draft 2: Personal Statement, Relevant Background, & Future Goals

Oct. 13	Discuss Data Collection; Discuss <i>Let Your Life Speak</i>	Read Chs 1 & 2—<i>Let Your Life Speak</i> Online Reflection
<i>Lab: Data Collection</i>	Learning R	
Oct. 15	<i>Journal Presentations 8 & 9</i> ; Discuss Data Collection	Journal Summary #8
Week 10	Data Collection & Cleaning	Monday at 11:59pm--Draft 1: Graduate Research Statement
Oct. 20	CVs	
<i>Lab: Data Collection</i>	MPA Abstracts & OSF	
Oct. 22	<i>Journal Presentations 10 & 11</i> ; Discuss Data Collection	Journal Summary #9
Week 11	Data Collection & Cleaning	
Oct. 27	Proposal Refinement & Discuss <i>Let Your Life Speak</i>	Read Chs 3 & 4— <i>Let Your Life Speak</i> Online Reflection
<i>Lab: Data Collection</i>	OSF Preregistration & Learning R	
Oct. 29	<i>Journal Presentation 12</i> ; Discuss Data Collection	Journal Summary #10
Week 12	Data Collection & Cleaning	Monday at 11:59pm--Draft 2: Graduate Research Statement
Nov. 3	Discuss college students' perceptions on calling	Hunter, Dik, & Banning, (2010) Online Reflection
<i>Lab: Data Collection</i>	Learning R	
Nov. 5	Data Cleaning & Processing	Journal Summary #11 (Optional)

Week 13	Data Collection & Cleaning	
Nov. 10	Prepare for Peer Review--Touch base on Zoom for 5-10 minutes re: Data Collection	Submit a Cover Letter or Personal Statement
Lab: GRFP Proposal Panel Review	Peer Review Panels Meet for One Hour Each	
Nov. 12	Discuss <i>Let Your Life Speak</i> ; Wrapping Up the Fall Semester; Looking forward	Read Chs 5 & 6— <i>Let Your Life Speak</i> Online Reflection Friday: CVs submitted by 5pm
Week 14		
Finals	Vocational Reflection Due November 20 Full GRFP Proposal Due on November 24	

Advanced Neuroscience Research II (NSCI 412)

Spring 2021

Lecture: TR (12:00-1:20), MMC 240

Dr. Lindsey Root Luna
Schaap Science Center 1161
Ext: 7727 ~ Email: rootluna@hope.edu

Office Hours: TR 1:30–2:45 &
by appointment; online only [via Zoom](https://www.zoom.us)
(calendly.com/profrootluna)

Welcome back! NSCI 412 is the second of two research capstone classes for the Neuroscience program. In this course, your final product will be the formal, journal-style manuscript describing the findings of the project you designed last semester.

Course Description and Design

This is the second semester of the capstone project for the neuroscience minor program. In this course, students with different academic majors work together as a team to complete the self-designed neuroscience research project that was initiated in NSCI 411. Students will continue to examine and discuss the relevant neuroscience literature, finish any remaining data collection and data analysis, and prepare a formal scientific report and research presentation. Three hours of discussion per week. *2020-21 Hope College Course Catalog*

Course Learning Outcomes

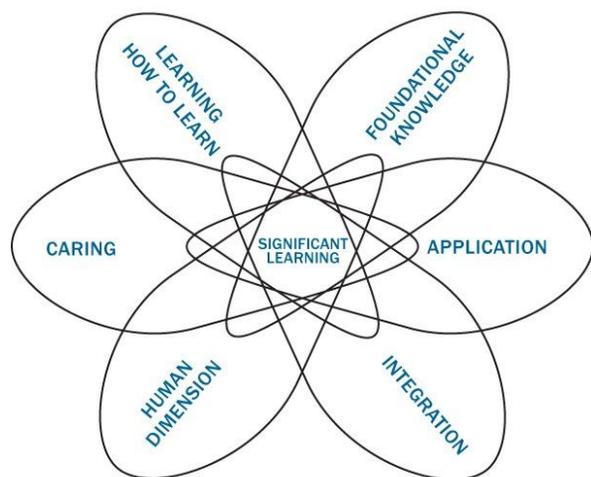
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L. Dee Fink's Taxonomy of Significant Learning

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The intersection of these six dimensions is significant learning (Dee Fink, 2003), which “requires that there be some kind of *lasting* change that is *important* in terms of the learner's life” (emphasis original). I hope that you achieve this type of learning in this course and throughout your time at Hope College.

Course Format

Students will work in interdisciplinary groups to develop and complete an experiment-based, collaborative neuroscience project. This is a novel research project for which the outcome is unknown. Therefore, the goals and format of the lecture portion of this will adapt to best fit the needs of the students in response to the evolution of the research over the semester. As with all courses, this class will require time outside of the normally allotted class time, including time spent on data collection and analysis. The experiences that you will have in this course will be very similar to what you would have as part of a research team in graduate school. Indeed, we will be operating like a graduate research group in some ways: studying literature, asking questions, collecting data, and disseminating our findings. Each student should strive toward gaining independence in the lab throughout the course of the semester.

As in many classes, the more effort you put into this class, the more you will get out of the experience. I will be available to provide suggestions based on my experience and expertise in

the field; at the same time, this project will ultimately be completed by the students. In addition, this is a collaborative project which means that every student in the course is expected to contribute equally to this work. Just as a chain is only as strong as its weakest link, this collaborative project truly requires a team-based approach. However, each student has a different skill set and background, thus it is expected that each student will contribute differently to the project.

This is a design and discovery process. To do this well, we need exceptional ethics, diligent work habits, good listening, and pro-learning discussions that allow for different insights while coming to shared perspectives. We also need to be flexible, adaptive, maintain a sense of humor, be able to see possibilities when we face problems, acknowledge our limits and mistakes while working to minimize them, work hard individually on individual assignments, and come together to collaborate when appropriate to create a vibrant learning community. You will need to attend to the details of our project, even when not “in class.” As a result, you will be required to check your e-mail daily for messages from me or your peers regarding the course project. Each student and groups of students will have specific responsibilities within our larger project; in order to have a successful research experience, every member of the team will need to be fully engaged.

Student & Faculty Characteristics and Expectations

Each student enrolled in this course has the academic ability and intellectual interests that will make for an exciting process of group and individual discovery. As a hands-on research experience and a learning community, we will all benefit from embodying the following characteristics:

full attendance & participation	honesty	flexibility
focus	trust	determination
reliability	hope	patience
punctuality	a growth-mindset	respect
high ethical standards	frustration tolerance	individual responsibility
careful double-checking	careful preparation	team spirit
a sense of humor	individual responsibility	flexibility
interpersonal skills for listening well and speaking precisely	strong quantitative & verbal skills	openness to admit faults & mistakes, while working to overcome them

Producing high-quality research takes effort and resilience. In this course, we are striving to do **professional quality** research that has the potential to be published in a scientific outlet. The

success of our project depends on everyone, and I expect you to take the responsibility seriously. Living out the qualities listed above will help us accomplish our purpose. Specifically, the embodiment of these standards includes (but is not limited to) the following:

- ❖ Organize your life so that you can attend class regularly and fulfill your out-of-class responsibilities on time. This is particularly relevant when it comes to data collection. High quality experimental research requires high quality data collection, which requires a substantial amount of time. We will try to do much of our work together during our class meeting times, and we will not always meet during class time when we are involved in collecting data (which will involve around 6 hours of scheduled time outside of class). Overall, this course will require a substantial amount of outside work. Remember, Hope College defines each “credit hour” as requiring 4 hours of work; this figure will certainly be true in our course.
- ❖ Be actively engaged in course activities and discussions. **Do not multi-task in class or in the lab. Give us your full attention.** Come prepared, ask questions, and offer your thoughts and suggestions.
- ❖ Be flexible! The amount of time it will take to design, analyze, and write a research report can be unpredictable. As such, the number of hours you can expect to spend on this course will vary from week to week. You should be prepared for the possibility of changing assignments and/or deadlines as the semester progresses.
- ❖ Listen and learn from those around you. You are part of a professional research team, and working together well will be **KEY** to our project’s success.
- ❖ Take ownership of the project. You are expected to collaborate with each other and contribute to ALL aspects of the project, including design, data analysis, report writing, and presentation to the Hope community.
- ❖ Meet with me if you have questions or are having trouble in the course.

Along with the above, as your professor, I will:

- ❖ Strive to incorporate instruction, discussion, activities, and resources that maximize your learning and involvement.
- ❖ Make my expectations (including grading criteria) as clear as possible.
- ❖ Answer your questions as completely and promptly as I can.
- ❖ Provide timely feedback on your performance throughout the course.
- ❖ Adapt as needed given our current local and global situation regarding COVID-19.

Required Materials

1. Moodle & Google Docs access
2. Supplementary reading materials provided

We will utilize the primary neuroscience literature for this course. You will locate, assess, read, and summarize numerous scientific articles related to our research project. Because we will be using human subjects data, guidelines from the American Psychological Association are recommended for writing style (*Publication Manual of the American Psychological Association*,

7th Ed. (2019). Washington D.C.: American Psychological Association). *The APA website, Purdue OWL, and Calvin University also have helpful writing resources online.*

Inclusive Excellence

In an ideal world, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. I acknowledge that many of the readings for this course were authored by white men. I acknowledge that it is possible that there may be both overt and covert biases in the material, including more recent work and empirical papers, due to the lens with which it was written, even though the material is primarily of a scientific nature. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. Please contact me (in person or electronically) or [submit anonymous feedback](#) if you have any suggestions to improve the inclusivity of this course, including the materials we review together.

Furthermore, I aim to create a learning environment for you that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official Hope College records, please let me know.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. Remember that you can also submit anonymous feedback (which may lead to me making a general announcement to the class, if necessary to address your concerns). If you prefer to speak with someone outside of the course, the [Center for Diversity and Inclusion](#) is an excellent resource and place to start.
- I (like many of us) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone-including me!) that made you feel uncomfortable, please talk to me about it. (Again, [anonymous feedback](#) is always an option).

Contingency Planning

This course always requires a high level of flexibility, and like the fall semester, we will continue to need even more understanding and willingness to shift direction. We may meet online at times as a whole cohort. Or, perhaps you will need to be isolated because you are sick, or you've had contact with someone who is sick. Or I will need to isolate or be in quarantine. We will do everything in our power to keep this course running smoothly. If I am unable to come to campus, we will meet remotely. If you are unable to come to campus, but well enough to join us online, you are expected to do so. Please use this [Zoom link](#) to join class, whether the whole group is meeting online or if only you are needing to remote into class.

If I am not well enough to continue to lead class, Dr. Charlotte Witvliet will assist you, with the support of other neuroscience faculty.

Recorded and Live Streamed Class Session Access Restrictions

Because of the unique nature of this semester, the college seeks to offer all students the opportunity to participate in courses despite possible health concerns, travel restrictions, or other barriers that will prevent full participation in face-to-face courses. To that end, the college will be recording and/or live streaming many courses throughout the semester. This approach to recording sessions will be a benefit to many students who find themselves unable to attend a particular course session in real time. These recordings are designed to be seen only by members of the particular class being recorded. The recorded and/or live streamed course access is intended for instructional purposes only and students may not share or distribute the recording or live streaming with anyone or any group.

Healthy Behaviors Statement

Students, like all faculty and staff, are required to wear face coverings (mask, face shield, bandana, or other coverings) to cover their mouths and noses during all indoor course activities. Additionally, students must adhere to physical/social distancing protocols (e.g., stay six feet apart from individuals, enter and exit at labeled doors in a staggered fashion) as directed by the instructor, posted signage, or the college. Please note that some laboratory and studio courses may require instructors to get closer than six feet to students to achieve the learning objectives. This will be kept to a minimum both in frequency and duration. Students who have COVID-19 symptoms such as fever, body ache, shortness of breath, chills, or sudden loss of taste/smell will be excused from class and should stay home. Students experiencing these symptoms should contact the Health Center and email their instructors.

To protect the health of everyone, instructors have the right to ask those students not complying with these requirements to leave the class. We see adherence to this policy and other safety regulations as a demonstration of [one of our core values of Hope](#): to be a caring community. Let us all express this value in placing the care for one another as a top priority.

Evaluation

Academic Integrity Policy:

This course follows the [Hope College Code for Academic Integrity](#) (see the *Catalog* for further details). Specifically, it is a violation to:

1. Give, offer, or receive aid on examinations other than that specifically allowed by the professor.
2. Do course work in a manner that is inconsistent with the standards of conduct set forth by the professor.
3. Represent the work of others as his or her own. This includes, but is not limited to, plagiarism.
4. Falsify or fabricate data. This has particular application to laboratory work and research.
5. Engage in conduct that destroys another person's work or hinders another in their academic endeavors. This has particular application to computer files, library resources, and laboratory or studio work.

Grading Scale:

		B+	87-89	C+	77-79	D+	67-69	F	below 60
A	94-100	B	83-86	C	73-76	D	63-66		
A-	90-93	B-	80-82	C-	70-72	D-	60-62		

Please note: I do not round up.

Expected Course Assessment Plan

*Please be aware that any behaviors that erode our learning and research community and its success will override earned on individual assignments. Disrespectful or disruptive behavior in class or in the lab will impact your **entire grade**, not only the participation elements.*

<u>Assessment Category</u>	<u>Points</u>
Class Participation & Involvement	50
Lab Participation & Involvement (Research Responsibilities)	50
Skill Mastery (Physiological Data Reduction; Data Analysis)	50
Journal Article Summaries (5, 10pts each)	50
Journal Article Presentations (2; 35 pts each)	70
Manuscript Draft (Method)	25
Manuscript Draft (Introduction & Method)	50
Manuscript Draft (Introduction, Method, & Results)	75
Poster Presentation (MPA & CURCA)	50
Peer Review Feedback (3; 30pts each)	30
Online Vocational Reflections	50
Vocational Reflection	50
Final Scientific Manuscript	150
Total	750

Participation & Involvement (Class & Research Responsibilities)

As noted above, for our project to be successful, every member of our team must be engaged and involved. Given our current circumstances, you will be able to remote into class (if you are well enough to participate, but unable to be with us) and are expected to do so if at all possible. Some of our work will be done online, as it will allow us to see one another face to face without masks. If you miss a class or lab for an excused absence (illness, family emergency, or official Hope College activity), you need to take the initiative to consult with your peers and with me to

find out any relevant content and details you have missed. Any absence from this course has the potential to negatively affect your grade; you must assume all of the responsibility to communicate with me and provide documentation for your absence. Note that, whenever possible, you should contact me by phone or by e-mail in advance of missing a meeting.

You will have various research responsibilities, which will include developing and implementing our research protocol, being prompt in preparing for participants, and diligently recording your work in our shared space both physically and online. Much of our research work will happen throughout the week (not just during our scheduled class time), particularly after our project protocol is established. You will be expected to work on our research protocol approximately 6 hours/week; plan to dedicate at least 12 hours per week total toward this course. I will always be available on Wednesdays, 12:00-2:50; consultation is available at other times as well, but can only be guaranteed if scheduled in advance.

Skill Mastery (Physiological Data Reduction & Analysis)

As mentioned above, a necessity of strong experimental research is reliable and valid data collection. Therefore, you must demonstrate proficiency in the execution of our protocol and processing of physiological signals. This will include understanding the design of the experiment, operating the computers, reading physiological output, ensuring participant comfort and data fidelity (as much as possible), applying diligent data reduction procedures, and generally acting responsibly, professionally, and with integrity.

Journal Article Summaries

Over the course of the semester, you will be reading many different journal articles related to this research project as well as your individual proposal project. You will be expected to summarize 5 of these articles in a two-page essay. All of the articles must be primary research papers that have been approved by Dr. Root Luna. While you may find it beneficial to read review papers in learning more about this area of research, you cannot summarize review papers. All of the student summaries and the original papers will be uploaded to Moodle as a resource available to all students in the class as you write your final paper next semester.

Journal Article Presentations & Facilitation

In addition to writing summaries, you will be required to present two primary research papers related to our collaborative project. Students will sign up for presentation times during the first week of the semester.

Lab Notebook and Documentation

We will continue to utilize a shared record of data collection and lab experience in our online data collection efforts.

Manuscript Drafts & Peer Review

All students will be expected to *individually* write a research manuscript that follows the author guidelines for the outlet we decide would be best suited for this work. There will be multiple opportunities for peer review and instructor feedback during this process. We will work on this manuscript in sections during the second half of the course. The timeline for this process will be

distributed after the data analysis is complete. Your final draft of this paper will be due during Finals Week.

The drafts and final paper will be graded in terms of accuracy, completeness, logical argument, utilization of appropriate references, writing mechanics, adherence to APA style, and demonstration of understanding of the project. Grading for peer review will be based on the potential for your review to help the author improve his or her paper.

*Please Note: Although you will be writing a paper based on the same course activities as the other members of your lab group, this is NOT a group project. Each student is expected to hand in individual and unique papers. **Academic dishonesty is to be avoided at all costs! Be sure that your work is your own! Violations of academic integrity or plagiarism will be treated very seriously (see above).***

A Note About Late Work

As our work this semester is a team effort, all participants depend on the timely work of others, be it protocol development, written work, data collection, or data reduction and analysis. Thus, assignments are due at the *beginning* of the class period unless otherwise explicitly stated on the assignment and on moodle. If your work is late (i.e., after the beginning of the class period), you will lose 20% per day. (For example: Our class meets at 3:00pm on TR. If you turn in your assignment before 12:00pm on Wednesday, you lose only 20%. If you turn it in after 3:00pm on Wednesday, you lose 40%. This means work will not be accepted if it is more than 5 days late). Missing class the day an assignment is due does not alter the due date.

Disabilities

If you have questions about access or are a student needing accommodations for a disability, please contact me. I will ask that you connect with [Disability and Accessibility Resources](#) if you haven't already.

Tentative Schedule of Class Activities and Assignments:

The nature of the work we will do together requires flexibility and problem-solving. Therefore, I have outlined our class activities and assignments; however, it may be necessary to adjust this schedule.

See [THIS LINK](#) for an up-to-date schedule.

Tentative Schedule of Class Activities and Assignments:

The nature of the work we will do together requires flexibility and problem-solving. Therefore, I have outlined our class activities and assignments; however, it may be necessary to adjust this schedule.

Date	Topic	Readings & Assignments
Week 1		
1/26	Semester Planning and State of the Project; Data Analysis in R	Syllabus; Bring your computer to class with R ready to go
1/28	Data Evaluation & Reduction	Read Kemp et al. (2017)
Week 2		
2/2	Data Collection; Discuss papers to review & possible publication outlets	5 additional references submitted to moodle
2/4	Data Collection and Data Reduction	<i>Journal Summary #1</i>
Week 3		
2/9	Journal Presentations 1, 2, & 3	Wolff et al. (2020) ; Geisler, et al. (2010) ; Xu & Cheng (2021)
2/11	Writing the Method section	<i>Journal Summary #2</i> Submit your possible publication outlet and rationale
Week 4		
2/16	Journal Presentations 4, 5, & 6	Johnson et al., (2012); Fellman et al., (2020); Clark et al., (2020)
2/18	Discussion Sources of a Sense of Calling; Data Reduction	Duffy et al. (2014) <i>Online Reflection #1</i>
Week 5		
2/23	Method Draft Peer Review	Draft submitted on moodle and provided to your partner for peer review during class
2/25	Journal Presentations 7, 8, & 9	<i>Journal Summary #3</i>

Week 6		
3/2	Writing the Introduction; Data Analysis	Method Draft Due to Dr. Root Luna
3/4	Journal Presentations 10, 11, & 12 Data Analysis	Reading TBD <i>Journal Summary #4</i>
Week 7		
3/9	Discuss the Reality of Multiple Callings; Data Analysis	Bronson (2002); Poirazi et al., (2016) <i>Online Reflection #2</i>
3/11	Writing Workshop	Readings TBD <i>Journal Summary #5</i>
Week 8		
3/16	No Class–Break Day	
3/18	Introduction & Method Draft Peer Review	Draft submitted on moodle and provided to your partner for peer review during class
Week 9		
3/23	Journal Presentations 13, 14, & 15	
3/25	No Class–Break Day	
Week 10		
3/30	Data Analysis Poster Creation	Introduction & Method Draft Due to Dr. Root Luna
4/1	Individual Meetings with Dr. Root Luna	
Week 11		
4/6	Journal Presentations 16, 17, & 18	
4/8	Writing the Results	

Week 12		
4/13	Discuss strategies for successful NSCI and other careers	Joëls et al. (2015) <i>Online Reflection #3</i>
4/15	Journal Presentations 19, 20, 21	
Week 13		
4/20	Introduction, Method, & Results Draft Peer Review	Draft submitted on moodle and provided to your partner for peer review during class
4/22	No Class–MPA	
Week 14		
4/27	Discuss healthy & unhealthy approaches to calling	Cardador, & Caza (2012) <i>Online Reflection #4</i>
4/29	Journal Presentations 22, 23, & 24	
Week 15		
5/4	Discuss the impact of the source of a calling or vocation	Duffy, Allan, Bott, & Dik (2014) <i>Online Reflection #5</i>
5/6	Course Wrap Up; In class writing exercise	
Finals		
	Final Vocation Essay Due; Full Manuscript Due to Dr. Root Luna	