

# Research Methods in Cognitive Psychology (85-310)<sup>1</sup>

T/Th, 10:40am-12:00pm

Research Methods is an introduction to the science of cognitive psychology. By considering the research designs that underlie claims about psychological phenomena, this course will allow you to evaluate findings and separate brilliance from flimflam. In hands-on projects, you will proceed through the scientific method from generating hypotheses to creating a study to analyzing and explaining the results.

This class meets the research methods requirement for Psychology, Neuroscience, and Cognitive Neuroscience majors, and the skills developed here are useful in any situation that requires making sense of research findings. It's particularly important for students interested in graduate study in any area of science, in medical fields, law, journalism, or education. If you are considering an honors thesis or planning to take an upper level seminar with a research component, you should find this course good preparation. Even if you are not considering any of these, the ability to evaluate research findings, to analyze and visualize data, and to communicate effectively are useful life skills. They will make it easier to navigate a world that shouts "fake news", to make decisions about schooling, health care, and policies, or just to tweak your sourdough bread recipe until it is perfect.

**Spring 2021:** This semester, this will be a fully-remote class conducted over Zoom and Canvas. There will be a mix of synchronous (class-time) work, including brief lectures and activities; this time will let you practice new skills and receive feedback. There will also be asynchronous work, on Canvas; almost all of the graded work for this course will be asynchronous. This course emphasizes collaborative work in groups to design and conduct your research projects; group meetings will occur outside of class.

**Instructor:** Dr. Abigail Noyce / [anoyce@cmu.edu](mailto:anoyce@cmu.edu) / Office hours: <http://calendly.com/abbynoyce>

**Teaching Assistant:** Raouf Belkhir / [jbelkhir@andrew.cmu.edu](mailto:jbelkhir@andrew.cmu.edu) / Office hours: TBD

**Course website:** <https://canvas.cmu.edu>

**Course goals:** Students who complete this course will be able to...

- \* Formulate scientific research questions.
- \* Design and implement studies that answer scientific research questions.
- \* Use appropriate statistical tools to explain and reason about quantitative data.
- \* Write accurately, efficiently, and clearly about psychological research.
- \* Work collaboratively in teams to formulate and solve research problems.
- \* Use modern digital information and communication tools to find, evaluate, generate, and communicate information.
- \* Demonstrate professional behavior, including respectful demeanor, consideration of ethical issues, and intellectual honesty.

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<sup>1</sup> Portions of this syllabus are adapted from Ellen Wright's *Research Methods and Laboratory in Psychology* course at Brandeis University, and from materials from Robert Talbert and the Mastery Grading Slack.

**Textbooks and software:**

1. Jhangiani, R.S., Chiang, I-C. A., Cuttler, C., & Leighton, D.C. (2019). *Research Methods in Psychology* (4th ed.). <https://dx.doi.org/10.17605/OSF.IO/HF7>  
(**Note:** This is an open, online e-textbook available at <https://kpu.pressbooks.pub/psychmethods4e/>. You can read it online, download a pdf or ebook format, or buy a printed edition via Amazon. Like many open educational resources, this one is a bit uneven in its coverage, and we will supplement with videos and additional readings.)
2. You will need reliable internet access.
3. Canvas (<https://canvas.cmu.edu>) will host assignments, quizzes, and each week's asynchronous work.
4. Zoom (<http://cmu.zoom.us>) will be our tool for virtual meetings.
5. Jamovi (<http://jamovi.org>) will be our tool for data analysis.
6. Gorilla (<http://gorilla.sc>) will be our toolkit for creating experiments and collecting data.
7. **Optional reference:** Booth, W. C., Colomb, G. G., & Williams, J. M. (2008). *The Craft of Research* (3rd ed.). The University of Chicago Press. (**Note:** This text has great advice to guide development of research questions and to support writing clear and well-organized reports. It's available as an e-book through the CMU library.)

**Course requirements:** Research Methods requires several types of work.

1. Weekly **pre-tests** (on Canvas) over each week's reading ensure that students are prepared to participate constructively in class. These are not directly counted toward your grade, but you must earn at least 80% correct to unlock the remaining work for the week. Many weeks will also have a quick check-in assignment that must be completed.
2. **Learning Targets** cover the concepts and vocabulary that are essential for Research Methods. These will be primarily assessed via weekly homework quizzes. [More information about Learning Targets.](#)
3. **QALMRI Critiques** ask you to distill, explain, and assess the critical logic of research papers in cognitive psychology by explaining the question, alternatives, logic, methods, results, and interpretation.
4. Every student must complete the online human subjects research ethics training and submit their **CITI Training certificate**.
5. Two **Research Projects**. One Archival project, and one Experimental project.  
Each project has several milestones. Milestones a and b must be approved before you may continue with each project.
  - a. **Research question, operational definition, and data collection plan.**
  - b. **Ethics proposal**
  - c. **Data collection**

d. **Statistical analysis**

Each project also has two research writing assignments:

- e. **QALMRI** writeup, a one-page distillation of the most important ideas from your research project.
- f. **APA-style paper**

For each project, milestones a-d will be completed with your group, while the research writing assignments will be completed independently. Finally, for research project 2, each group will participate in the Research Methods poster session.

g. **Poster presentation**

Each research project has an additional milestone that is optional and serves as a **challenge project**. Unlike other challenge projects, these have fixed deadlines. Challenge projects should be completed independently.

h. **Annotated bibliography**

- 6. **Challenge projects.** Challenge projects ask you to integrate the new concepts and skills you are learning, and to apply them in some context. You do not need to complete all of the challenges that are posted; instead, choose from among them the ones that you think you would enjoy doing. Although challenge projects do not have fixed deadlines, you may submit only two challenge projects (including revised challenge projects) in a given calendar week.
- 7. **Attendance and participation.** Regular class attendance is the easiest way to master the course material, practice new skills, contribute to group projects, and get direct feedback from the professor and TA. However, attendance in class is not mandatory (and we understand that people have sick days, family obligations, university-sponsored events, and so on). Groups will reflect on each team member's contributions over the course of the semester, and credit for completed assignments may be adjusted accordingly. If you cannot attend class, it is your responsibility to review the material you missed and to contribute to your group in other ways.

### **Deadlines and scheduling:**

Each week's work is due at 11:59 pm Sunday, at the end of the week. (All deadlines are stated in CMU local time.) This lets us grade on Monday, and get feedback to you promptly.

### **Help!**

In general, expect a response to take approximately 1 business day. Your professor and TA usually do not answer course-related emails over the weekend.

### **If you have...**

**...a question about the course material:** First, try posting your question to the "Help Lounge" forum on Canvas. Your classmates may know the answer! If 24 hours have passed and nobody has answered your question, then email your professor or TA. Include the course number (85-310) in the subject of your email.

...**a question about the course logistics:** First, try posting your question to the “Help Lounge” forum on Canvas. Your classmates may know the answer! If 24 hours have passed and nobody has answered your question, then email your professor or TA. Include the course number (85-310) in the subject of your email.

...**a question about your grade or performance in this course:** Email your professor or TA with your question, or to set up a meeting. Include the course number (85-310) in the subject of your email.

...**a technical support question about Canvas:** Email ([canvas-help@andrew.cmu.edu](mailto:canvas-help@andrew.cmu.edu)) or call (412-268-9090) CMU Canvas support.

...**a technical support question about Zoom:** Email ([it-help@cmu.edu](mailto:it-help@cmu.edu)) or call (412-268-4357) CMU Computing Services.

I encourage you to regularly check the Help Lounge forum for questions that you can answer; good answers in the Help Lounge can earn extra **tokens**.

### What if things are not okay?

Take care of yourself. This semester is likely to be hard and weird. My goal is to support you in learning about research and producing excellent work, while not making things any harder or weirder. To that end, this class is structured so that you have a lot of flexibility. Most work for the course can be reattempted or revised. Many (but not all) deadlines are flexible (see policy on extensions). If you are struggling with the course, or with the combination of your coursework and your life outside of class, please come talk to me. I will work with you.

Asking for support sooner rather than later is almost always helpful. If you or anyone you know experiences academic stress, difficult life events, or feelings of anxiety or depression, please seek support. Counseling and Psychological Services (CaPS) is available at 412-268-2922 or via <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty member, or family member you trust for assistance with getting connected to the support that can help.

### Policy on extensions:

Please do not ask me for an extension on any assignment. **I will not determine whether you deserve an extension**, but I will accept your personal judgment according to the policy outlined below.

1. First, research project milestones a-c are not eligible for excused extensions, because they are critical stepping stones for each project to move forward. However, you may use tokens for late submissions of these items. Each group member must commit a token per 24 hours of lateness. Similarly, in-class presentations may not be rescheduled (even with a token).
2. For weekly quizzes, QALMRI critiques, research writing assignments, and challenge projects (except presentations), you may take an **excused 48-hour extension for any reason** that is interfering with your ability to complete the work on time (including but not limited to personal illness, family crisis, or college-sanctioned activity). You do not need to tell me the reason you are taking an extension. You must:

1. **Before the work is due**, notify me (via email) that you are taking an excused extension for this assignment, *and*
2. Complete and submit the assignment within 2 days of the original deadline.
3. Any late work for which the procedures above are not followed will be considered unexcused late work. Unexcused late work cannot earn a mark of Excellent; unexcused late work that is more than 12 hours late cannot earn a mark of Satisfactory or Meets Expectations.
4. Excused or unexcused **late work waives your right to timely feedback**; it goes on the bottom of the grading pile.
5. If life circumstances cause you to need more than two days of extension (e.g. serious illness, family crisis, etc.), you must meet with me to agree on updated deadlines for catching back up with the course material; the policies for late work and extensions will apply to these new deadlines.
6. Tokens may be used to “buy” additional flexibility. Each student will start the semester with 2 virtual tokens. You may exchange a token for:
  - 24 hours grace on any assignment, including 24 hours grace on notifying us that you are taking an excused extension.
  - A third Challenge Problem submission in a given week.
  - A second “convince me” meeting in a given week, or a “convince me” meeting without first submitting a good-faith attempt at a quiz.
  - Resubmission of a “Not Assessable” assignment.

### **Diversity and inclusion statement:<sup>2</sup>**

In an ideal world, science would be objective and unbiased. Historically, however, much of our scientific knowledge has been built by a small set of privileged voices. In this class, we will make an effort to discuss work from a diverse group of scientists, but limits still exist on this diversity. I acknowledge that there are likely to be both overt and covert biases in the material we cover due to the perspective with which it was written, even though the material is primarily scientific. Integrating a more diverse set of experiences is important for improving our scientific understanding of ourselves and our universe. We will discuss issues of diversity in psychology as part of the course from time to time, and I encourage you to raise any issues that you notice.

Please contact me if you have any suggestions to improve the quality or equity of the course materials.

I would like to create a learning environment that supports a broad range of thoughts, perspectives, and experiences, and that honors your identities (including race, gender, class, sexuality, religion, ability, etc.).

- Please let me know if you have a name and/or set of pronouns that differ from those that appear in your official records.

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<sup>2</sup> Adapted from Monica Linden, <https://tomprof.stanford.edu/posting/1625>

- If you feel that your performance in class is being impacted by your life outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. If you prefer to speak with someone outside of the course, the Office of Student Affairs is an excellent resource.
- I (like many people) am still learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it. If you would prefer to speak with someone outside of the course, Dr. Jessica Cantlon (chair of the department's Diversity & Inclusion committee) is available ([jcantlon@andrew.cmu.edu](mailto:jcantlon@andrew.cmu.edu)) to hear concerns related to respect for diversity for any class you are taking in the Department of Psychology.
- As a participant in class discussions, you should strive to honor the diversity of your classmates.

### **Policy on academic integrity:**

In the sciences, we have an ethical duty to be honest and transparent. We often work collaboratively, and give credit to our collaborators and to the sources of our ideas. In this course, you are expected to meet those ethical standards.

Some assignments are "group assignments," in which a group of students will work together to submit a single piece of work. Others, including papers and weekly homework quizzes, are individual assignments. I encourage you to discuss the material with classmates, but each student needs to write their own unique answer that reflects their own understanding.

Plagiarism and cheating are serious academic offenses with serious consequences. If you are discovered to engage in either behavior in this course, you will earn a zero (Unsatisfactory / Not Assessable) on the assignment in question, and further disciplinary action may be taken. **Assignments that earn zeros for plagiarism or cheating may not be revised and reassessed.**

For a clear description of what counts as plagiarism, cheating, and/or the use of unauthorized sources, please see the University's Policy on Academic Integrity: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

### **Accommodations for students with disabilities:**

If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu).

### **Grading:**

This class uses a **specifications grading** approach.<sup>3</sup> Your course grade is determined by the quality and

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<sup>3</sup> The philosophy of specifications grading is that (1) the instructors should specify exactly what work needs to be completed, and to what standard, and (2) only the work that is submitted should count towards grades. Rather than earning points, students work to revise assignments until they meet a moderately high threshold of "Satisfactory" achievement. The goal is to emphasize feedback, learning, and development.

quantity of the work that you submit in the class that is completed at an acceptable level; individual assignments are largely marked “Satisfactory/Unsatisfactory”. In general, a “Satisfactory” grade requires B-level work. Many assessments may be revised or reattempted if the first attempt did not meet the standard.

You will receive the highest grade for which you have completed all of the requirements. **There is no averaging across categories.**

Students who are taking the class pass/fail must meet at least the requirements for a D.

To earn:	Accomplish all of these:
<b>A</b>	Earn <b>Satisfactory</b> on <b>12 Learning Targets</b> , and earn <b>Satisfactory</b> on <b>8</b> of research project milestones <b>1a-1d, 2a-2d, &amp; 2g</b> , and earn at least <b>Meets Expectations</b> on <b>all 4 research writing assignments</b> , and earn <b>Excellent</b> on <b>2 research writing assignments</b> (QALMRI or APA-style), and earn <b>Satisfactory</b> on <b>3 QALMRI critiques</b> , and earn <b>Satisfactory</b> on <b>5 challenge projects</b> .
<b>B</b>	Earn <b>Satisfactory</b> on at least <b>10 Learning Targets</b> , and earn <b>Satisfactory</b> on <b>7</b> of research project milestones <b>1a-1d, 2a-2d, &amp; 2g</b> and earn at least <b>Meets Expectations</b> on <b>4 research writing assignments</b> , and earn <b>Satisfactory</b> on <b>2 QALMRI critiques</b> , and earn <b>Satisfactory</b> on <b>3 challenge projects</b> .
<b>C</b>	Earn <b>Satisfactory</b> on at least <b>8 Learning Targets</b> , and earn <b>Satisfactory</b> on <b>6</b> of research project milestones <b>1a-1d, 2a-2d, &amp; 2g</b> and earn at least <b>Meets Expectations</b> on <b>3 research writing assignments</b> , and earn <b>Satisfactory</b> on <b>1 QALMRI critique</b> , and earn <b>Satisfactory</b> on <b>1 challenge project</b> .
<b>D</b>	Earn <b>Satisfactory</b> on at least <b>6 Learning Targets</b> , and earn <b>Satisfactory</b> on <b>5</b> of research project milestones <b>1a-1d, 2a-2d, &amp; 2g</b> and earn at least <b>Meets Expectations</b> on <b>1 APA research paper</b> , and earn at least <b>Meets Expectations</b> on <b>1 other research writing assignment</b> .

To track your progress in completing your requirements, you can use this Google Spreadsheet: <https://tinyurl.com/85310-grades-s21>

### Grading: Research project milestones

Group research milestones will be graded on a Satisfactory/Unsatisfactory scale. Milestones a and b must each be approved by the professor or TA before moving forward.

### Grading: Learning Targets

The basic skills for this course are divided into 12 Learning Targets, given below. LTs will be graded **Satisfactory** or **Unsatisfactory**; in order to earn an A (or B, C, D, etc) you need to earn Satisfactory on some number of Learning Targets.

There are two ways to earn **Satisfactory** on a Learning Target:

- 1. Weekly homework quizzes.** Each week, quizzes will be available over 2-4 of the Learning Targets. If you score Satisfactory on the first appearance of an LT, you do not need to take the quiz the next time it is available. Homework quizzes are open-book, open-note, and open-discussion, but should reflect **your own understanding** written in **your own words**. Each homework quiz is designed to take 30-60 minutes. Over the course of the semester, each LT will be available for quizzes on 2 separate weeks.
- 2. “Convince me.”** If you have attempted an LT quiz, scored Unsatisfactory, and no further attempts will be available, you may make an appointment with either the professor or the TA to discuss the LT and convince us that you have mastered the material. This conversation may include revisiting the previous quiz questions, or new scenarios and applications. **Note: The “convince me” option is only available after making a good-faith effort at an LT quiz.** You may make one “convince me” appointment per week.

### **Grading: Major writing assignments**

The QALMRI write-ups and APA style papers will be graded on a 4-level EMRN scale. Full rubrics will be available.

- **Excellent** papers demonstrate mastery of many paper-writing skills, including use of language, constructing elegant arguments, demonstrating scientific creativity, quality of research and analysis, etc.
- **Meets Expectations** papers meet all criteria for the assignment; these papers may be revised and resubmitted.
- **Revision Needed** papers do not meet at least one criterion; these papers may be revised and resubmitted.
- **Not Assessable** papers are not sufficiently complete to be assessed, or are not submitted at all. Revising and resubmitting these papers requires that students redeem a token.

### **Grading: QALMRI critiques**

These critiques ask you to distill, explain, and assess the critical logic of research papers in cognitive psychology. Papers will be assigned and full rubrics will be provided. These will be graded Satisfactory/Unsatisfactory, and may be revised and resubmitted.

### **Grading: Challenge projects**

Challenge projects ask you to extend and integrate your skills to tackle interesting problems or new contexts. In general, they require work that is thoughtful, detail-oriented, and clearly and correctly written. Each challenge project will be posted with a detailed specification explaining what you need to do to earn a Satisfactory mark; if your first attempt is Unsatisfactory, you may revise and resubmit a project. You do not have to do all of the challenges that are posted; choose the ones that you think you would enjoy doing. With the exception of research milestones 1.h and 2.h, there are no fixed deadlines for challenge projects.



You can work on each project until you believe it is ready to be assessed. However, you may only submit two challenge projects per course week, including revisions of earlier work.

## Course Schedule

Each week's material is due at the end of the week, at 11:59pm (Pittsburgh time) on Sunday night. This gives you the maximum flexibility to find studying time and manage your own schedule.

Week	Dates	Topic	Reading	Due this week (Sunday night)
1	Feb 2, 4	What is science?	<i>Research Methods in Psychology</i> (RMP) Ch I	Syllabus quiz Group work availability survey Remote learning success plan Milestone 0 - CITI certificate Up to 2 challenge projects
2	Feb 9, 10	Implementation	RMP Ch III RMP Ch IV	Milestone 1.a - Research question & plan LTs 1, 2 Up to 2 challenge projects QALMRI Critique 1 (Hyman et al., 2010)
3	Feb 16, 18	Public Knowledge	RMP Ch II	Milestone 1.b - Ethics proposal LTs 3, 4 Up to 2 challenge projects (including Milestone 1.h - Annotated bibliography)
4	Feb 25	Observational & Archival Research	RMP Ch VI	Milestone 1.c - Data collection LTs 5, 6, 1 Up to 2 challenge projects QALMRI Critique 2 (Ravizza et al., 2017)
5	Mar 2, 4	Statistical Thinking	RMP Ch XII RMP Ch XIII	Milestone 1.d - Statistical analysis LTs 7, 8, 2 Up to 2 challenge projects Reassessment as needed on LT 1
— — Earn Satisfactory on three or more Challenge Projects by March 7 in order to earn an extra token — —				
6	Mar 9, 11	Experimental Designs	RMP Ch V	Milestone 1.e - QALMRI writeup Milestone 2.a - Research question & plan Up to 2 challenge projects Reassessment as needed on LTs 1, 2
— — March 15 is the deadline to Drop from this course. — — Daylight Savings Time starts March 14. — —				
7	Mar 16, 18	Scientific Writing		Milestone 2.b - Ethics analysis LTs 9, 10, 3 Up to 2 challenge projects (including Milestone 2.h - Annotated bibliography) Reassessment as needed on LTs 1, 2

Week	Dates	Topic	Reading	Due this week (Sunday night)
8	Mar 23, 25	Adding Complexity	RMP Ch XI	Milestone 1.f - APA style paper Milestone 2.c.0 - Experimental setup Up to 2 challenge projects Reassessment as needed on LTs 1-3
9	Mar 3, Apr 1	Validity, Reliability, and Replication	RMP Ch IX	Milestone 2.c.1 - Data collection (interim) LTs 11, 12, 4 Up to 2 challenge projects Reassessment as needed on LTs 1-3
— — For feedback before Milestone 2.d is due, submit revised Milestone 1.d by April 4. — —				
10	Apr 6, 8	Best Practices		Milestone 2.c - Data collection LTs 5, 6, 7, 8 Up to 2 challenge projects QALMRI Critique 3 () Reassessment as needed on LTs 1-4
— — Apr 12 is the deadline to Withdraw from this course or to opt for pass/fail grading — —				
11	Apr 13	Quasi-Experiments	RMP Ch VIII	Milestone 2.d - Statistical analysis LTs 9, 10, 11, 12 Up to 2 challenge projects Reassessment as needed on LTs 1-8
12	Apr 20, 22			Milestone 2.e - QALMRI writeup Up to 2 challenge projects Reassessment as needed on any LT
— — For feedback before Milestone 2.e is due, submit revised Milestone 1.e by April 25. — —				
13	Apr 27, 29	Poster work week		Milestone 2.g.1 - In-class poster rehearsal & peer feedback Up to 2 <u>revised</u> challenge projects Reassessment as needed on any LT
14	May 4, 6	Paper work week		Milestone 2.g.2 - Poster session Up to 2 <u>revised</u> challenge projects Revised Milestone 1.d, 1.e Revised QALMRI critiques Reassessment as needed on any LT
— — No final exam in this course. — —				Milestone 2.f - APA paper Revised Milestone 2.e Reassessment as needed on any LT

**Learning Targets for 85-310**

- 1.** I can explain what a science is, and why psychology is a science. I can define and explain key concepts that characterize psychological research (eg hypothesis, theory, operational definition).
- 2.** I can summarize and explain the five general ethical principles that psychologists follow. I can describe and explain the key regulations in the APA Ethics code for protection of human and non-human research subjects. I can assess whether psychological research adheres to these principles and regulations.
- 3.** I can recognize, describe, and generate well-defined research problems. I can generate and use operational definitions of abstract constructs.
- 4.** I can explain the fundamental principles of research design, and apply them to a question. I can identify independent, dependent, and moderating variables.
- 5.** I can define and explain reliability and validity. I can explain and apply strategies to increase reliability and validity. I can define statistical power and its importance in study design.
- 6.** I can find appropriate previous research on a topic using techniques of database searches and citation tracing.
- 7.** I can describe different information sources (primary vs. secondary, peer-reviewed vs. non-reviewed) and explain their strengths and weaknesses. I can articulate and apply criteria for identifying reliable sources of psychology information.
- 8.** I can distinguish between categorical, ordinal, and interval/ratio variables. I can select and report an appropriate descriptive statistic for my research question or data. I can select an appropriate statistical significance test for my research question or hypothesis (chi-squared, single-sample t, paired-sample t, independent groups t, one-way ANOVA, two-way ANOVA, Pearson's r).
- 9.** I can conduct a statistical test of my hypothesis and report the results in APA style.
- 10.** I can interpret graphs and statistical findings, including their level of statistical significance and their effect size, and can explain these findings.
- 11.** I can apply various types of sampling, and explain the pros and cons of each. I can explain the difference between a sample and a population, and identify under what conditions it is appropriate to generalize a research finding.
- 12.** I can describe the types of research questions and principal methods that characterize cognitive psychology.