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### PSYX 523.01: Advanced Research Design

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# PSYX 523 – Advanced Research Design

## Spring 2022

Zoom: <https://umontana.zoom.us/j/98665634982?pwd=NHkrVndSQ3UyK0pEZXFkYUpYZFhtZz09>

(Meeting ID: 986 6563 4982, Passcode: 315180)

Tuesday/Thursday 9:30-10:50 am

## Contact Information

**Instructor:** Nathan Insel, Ph.D.

**Email:** [nathan.insel@umontana.edu](mailto:nathan.insel@umontana.edu)

**Office Hours:** Mondays, 10 to 11:30 am at <https://umontana.zoom.us/j/99275418068>

Also in person by appointment only (Skaggs Room 362)

## Course Description

This course covers methodological principles we use to perform research in the behavioral sciences. This includes how to properly plan the research, how to communicate (and propose) the plan, how to interpret results from the research project, and how to communicate those results. The course will start with the question “What is research?” and introduce the concept of causal inference. Ultimately, the way we understand the world around us, the way we make predictions about the future, is to understand its causal relationships. We gain knowledge about causal relationships by applying the scientific method, but there are many pitfalls in how we use experiments and observation. Although this class may address some of the basic choices regarding statistical tests and sample sizes, it is not meant to be a statistics or data analysis course. Instead, the aim is to convey the logic behind research methods, and the different problems that can limit conclusions when using these tools.

This class is ***designed to help prepare you for your own research projects***. This course is therefore not designed as a lecture course—though there will be some lecturing. The format is more like that of a **workshop** to help you plan your research. Many of you will be starting this course without a concrete research plan. Now is the time to develop one. By the end of the class you will be expected to have drafted a written proposal of your research (for many of you, this will be your Master’s project) and to present these to your classmates.

## Reading Material

- Research Design in Clinical Psychology, fifth edition (Kazdin)
- Selected readings on Moodle (see course outline for full citations)

## Course Evaluation

In this class you will be learning from the readings, the discussion you participate in, and feedback on the assignments. The breakdown of your final grade will be as follows:

- Participation (25% of final grade)
- Written reports (50% of final grade)
- Oral presentations (25% of final grade)

## Participation

Each class will include discussion on the reading topics. This can, and often should, include how the material from the readings applies to your own proposed research projects. Participation will be evaluated for each class, and will receive either a “credit”, “half credit”, or “no credit”. Credits will be tabulated at the end as a percentage for your final participation grade.

If for some reason you cannot make it to class, please send your comments or questions about the topic in the form of an email before the end of the week of the class.

## Written reports

There will be 4 written assignments.

- 1) A draft of your experimental “Aims” or summary of your research plan. This will be between one-half to one page in length. The aims page will be discussed the first day of class and in the first reading assignment.

This will be graded as “all or nothing”. If turned-in you will receive full credit (10% of your final grade). *Any writing beyond one page will not be read.*

- 2) A 2 to 3 page (single spaced) “Background and Significance” section, in which you introduce your research questions through a review of the literature. You will specifically focus on building a “gap statement” and justify the rationale for your hypotheses. You may or may not include rationale for your specific approach (some of this can be saved for Approach). *Please additionally include the current Summary/Aims as your first page.*

Background and Significance will be worth 10% of the final grade. A reference list should be included but will not be counted as part of the page count. Any writing beyond three pages will not be read.

- 3) A 2-to-4-page (single spaced, with at least one **figure**) draft of your “Approach” (or “research strategy”). This will describe the details of your 1) experimental design, 2) Subjects and analysis, 3) any preliminary data showing feasibility and progress. or clearly illustrated hypothetical results and 4) “potential pitfalls and alternative outcomes and interpretations.” (If you prefer to switch the order of parts 2 and 3, so that preliminary data/results goes immediately after design, that is fine.)
  - The experimental design portion describes the procedure and will likely contain information about the *measures* that you are using. You can write this as a list if needed, but it is important that you explain why those methods are appropriate, and whether they have been previously validated.
  - Participants and analysis (or “animals and analysis”, or just “sampling and analysis”) should describe how you are sampling your subjects (is this sample representative of the population you are interested in? Do you have sufficient power?) and very brief description of how you imagine the analysis will go
  - You may not have preliminary data, but then please illustrate your expected results in a clear and concise way. This subsection is where you should include a figure.

- “Potential pitfalls and alternative outcomes and interpretations” is a mouthful, but it means all of these things. First, what issues may prevent you from collecting or analyzing the data? Do you have a backup plan if those issues arise? Second, if your results **do not** support your predictions, what will you be left with? How can you interpret the data? Third, assuming your results **do** support your predictions, are there other factors that may explain the results? If your project involves more than one experiment, you can split this section up into two or more separate “aims”. *Please additionally include the current Summary/Aims as your first page.*

Approach will be worth 15% of your final grade.

- 4) A one-paged (single spaced) “Aims” or summary page, as described the first day of class and in the first reading assignment.  
This will be graded as “all or nothing”. If turned-in you will receive full credit (10% of your final grade). *Any writing beyond one page will not be read.*
- 5) The final research proposal (Aims + 4 to 7 single-spaced pages + references, worth 10% of the final grade)  
The research proposal will combine your Background & Significance with your Approach sections (also with a reference list). The goal of this final assignment is to make all suggested edits and changes from the previous assignments. This is the most “unfair” assignment in the sense that some students will have fewer suggested changes than others, but it is no less important than any other assignment. This final assignment also offers a kind of “re-do” opportunity if something was wrong with the previous assignments.

### **Oral presentations**

There will be 2 oral presentations:

- 1) Mid-semester you will provide a brief overview of your proposal (use PowerPoint, roughly 10 minutes with 5 minutes for Q&A). This will not be graded but will count 10% toward your final grade. It should be fun (really!). The priority of this presentation is to practice taking and giving constructive feedback on the proposal, including feedback that may seem “harsh”. Note that grades for the final presentation will largely depend on how feedback has been incorporated from this presentation. So it’s good to have critical feedback in this case.
- 2) During the final weeks of class, you will present on your proposal. This will be graded and count for 15% of your final grade. Grades will primarily depend on how you have incorporated feedback from the previous presentation.

### **Course Policies**

#### **General**

Success in this class will depend on your attendance. I understand there will be circumstances beyond your control that, on occasion, will require you to leave class early or be absent. Please plan accordingly by notifying the instructor before class. You should always feel free to ask any questions in class. Also, please feel free to see the instructor about any classroom issue during office hours.

### Drop Date

Policies on dropping can be found on the [Registrar's website](#). Beginning the 46<sup>th</sup> instructional day of the semester through the last day of instruction before scheduled examinations, students must petition to drop.

### Academic Misconduct

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the [Student Conduct Code](#).

### Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the [Office for Disability Equality](#). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with the Office for Disability Equality (ODE), please contact ODE in Lommasson Center 154 or call 406.243.2243. I will work you and ODE to provide an appropriate modification.

### Course Outline

Date	Topics	Assigned reading
Jan 18 <sup>th</sup>	Overview of course, science and scientific methods, description of Aims page assignment	(Post-class) Website on writing a Specific Aims page: <a href="http://www.biosciencewriters.com/NIH-Grant-Applications-The-Anatomy-of-a-Specific-Aims-Page.aspx">http://www.biosciencewriters.com/NIH-Grant-Applications-The-Anatomy-of-a-Specific-Aims-Page.aspx</a>
Jan 20 <sup>th</sup>	The replication crisis in psychological sciences	Open Science Collaboration (2015). Estimating the reproducibility for psychological science. <i>Science</i> , 349, 1-7.
Jan 25 <sup>th</sup>	Internal and external validity	Kazdin Chapter 2 <b>Specific Aims page due</b>
Jan 27 <sup>nd</sup>	Construct and data-Evaluation validity	Kazdin Chapter 3
Feb 1 <sup>st</sup>	Forming hypotheses and predictions	Kazdin Chapter 4
Feb 3 <sup>rd</sup>	Experiments using group designs (sampling)	Kazdin Chapter 5
Feb 8 <sup>th</sup>	Controls	Kazdin Chapter 6 <b>No deadline, but you should have completed literature searches for the lit review before this time</b>
Feb 10 <sup>th</sup>	Case-control and cohort designs	Kazdin Chapter 7

Date	Topics	Assigned reading
Feb 15 <sup>th</sup>	Single-case designs	Kazdin Chapter 8
Feb 17 <sup>th</sup>	Qualitative research methods	Kazdin Chapter 9 & qualitative mini-assessment assignment
Feb 22 <sup>nd</sup>	Measures part 1	<b>Background &amp; Significance due</b> Kazdin Chapter 10
Feb 24 <sup>th</sup>	Measures part 2	Kazdin Chapter 11
Mar 1 <sup>st</sup>	Special topics in assessment	Kazdin Chapter 12
Mar 3 <sup>rd</sup>	Data evaluation part 1: null hypothesis significant testing	Kazdin Chapter 13
Mar 8 <sup>th</sup>	<b>Individual meetings to discuss Background &amp; Significance</b>	
Mar 11 <sup>th</sup>	Data evaluation part 2: presenting and analyzing data	Kazdin Chapter 14 “Ten common statistical mistakes to watch-out for when writing or reviewing a manuscript” <a href="https://elifesciences.org/articles/48175">https://elifesciences.org/articles/48175</a>
Mar 15 <sup>th</sup>	Data evaluation part 3: cautions, negative effects, and replication	Kazdin Chapter 15
Mar 17 <sup>th</sup>	Ethics & Scientific integrity (plan peer paper assignments)	<b>Draft of Approach due</b> Kazdin Chapter 16 & 17
Mar 22 <sup>rd</sup> /24 <sup>th</sup>	<b>Spring break—no classes!</b>	
Mar 29 <sup>th</sup> /31 <sup>st</sup>	<b>In-class presentations of hypothesis &amp; proposed research design &amp; analysis</b>	<b>In-class presentations of hypothesis &amp; proposed research design &amp; analysis</b>
Apr 5 <sup>th</sup>	<b>Individual meetings to discuss Approach</b>	
Apr 7 <sup>st</sup>	<b>Workshopping Research Papers</b>	<b>Peer paper</b>
Apr 12 <sup>th</sup>	Communicating science	Kazdin Chapter 18
Apr 14 <sup>th</sup>	Contemporary methods & approaches	Kazdin Chapter 19
Apr 19 <sup>th</sup>	Promises and pitfalls of big data & machine learning	<b>Specific Aims page due</b>
Apr 21 <sup>st</sup>	<b>Formal paper presentations</b>	<b>In-class presentations about proposal</b>

Date	Topics	Assigned reading
Apr 26 <sup>th</sup>	<b>Formal paper presentations</b>	<b>In-class presentations about proposal</b>
Apr 28 <sup>nd</sup>	Review of course concepts & their application	<b>Final paper due</b>