

Education 200A: Fall 2020
Introduction to Data Analysis and Interpretation
Section 01 Mondays / Wednesdays 11:30AM-12:50PM
Section 02 Tuesdays / Thursdays 2:30PM-3:50PM

Instructor Section 01:

Ann Porteus

Office Hours: Calendly or Google

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TAs:

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Overview:

The course is designed primarily for master's degree students in the Graduate School of Education (GSE). The purpose of this course is to provide you with a rudimentary understanding of basic research design and introductory statistical analyses to help you read and understand and critique research. No previous experience in statistics or data analysis is expected (though some will come to the course with some statistical background). The focus is on consumers of the research literature, not on doing the research (although by becoming a good consumer, you will be learning how to do research at the same time). To that end, the course is conceptual and does not focus on statistical formulas (though you will be exposed to some) or computation; it is designed to enable you to read and interpret basic statistics as you come across them in research articles. The course has three legs: working through online materials (aka Learning Modules (LMs)), "in-class" (aka Zoom meetings) practice with basic research and statistical concepts and writing critical analyses of journal articles.

Course Goals:

When given a research article, students will be able to:

- Identify and state the study's justification, the research questions, research hypotheses.
- Describe the design and sampling approach used in the study.
- Describe the characteristics, role and meaning of variables in the study.
- Describe the logic of hypothesis testing and state the null and alternative hypotheses for t-tests, ANOVA, correlation analysis, and multiple regression analyses.
- Interpret the results of t-tests, ANOVA, correlation analysis, and multiple regression analyses and draw conclusions in context and in light of the research questions.
- Assess claims made in research studies and identify potential threats to validity (i.e. strengths and weaknesses of the study).

Course Structure:

The course has three major components (aka requirements):

- Online interactive course material (which must be completed prior to each class).
- “In-class” small-group practice in the application of the concepts learned online to interpreting and critiquing research.
- Three writing assignments (interpreting and critiquing three research studies).

The course meets twice a week for 1 hour. We will cover one major statistical topic each week (see course content below). We may adjust the ordering and the time spent on each topic as we go along. Both the online material and class participation are required and are necessary for you to succeed in mastering the course content and the three writing projects described below.

Learning Management System:

Canvas is the course management tool used to house course materials including the: syllabus, Learning Modules (LMs) weekly Powerpoint slides, supplemental material, supplemental readings, three writing assignments, supplemental assignments, etc. When you enroll on Axess you will automatically be enrolled in Canvas.

The structure in Canvas is the following: The week-by-week structure followed by the Learning Modules (LMs). All will unfold week by week as we move through the course; that is, we are not releasing all of the materials onto this course platform at once.

Week X

- Before class (preparation for class including LMs and supplemental readings)
- During class
- After class (homework from class (might be things we don't get to))

Learning Modules (LMs) that cover the following course content:

- Basic Research Design
- Descriptive Statistics
- Correlation
- Reliability and Validity of Measurement
- Basics of Inferential Statistics (Estimation and Hypothesis Testing)
- One and Two Sample Statistical Tests
- One-way Analysis of Variance (ANOVA)
- Significance Testing of Correlation Coefficients
- Simple and Multiple Linear Regression

By following the elements in the Week modules, you will be navigated to the LM's and assignments you are supposed to complete before class.

The assigned LMs are to be completed no later than 6:00am on the day of class. The online material and activities “in class” complement each other. We will not spend time in class repeating the online material. We will spend class time applying the concepts from the LMs to understanding and critiquing research. There are Learn By Doing (for practice) activities and Checkpoints (graded) embedded in the LMs that will provide the instructors and TAS information that will help us design the way we use the class time to best support your learning.

Because the content is taught conceptually (using words, visuals, and numbers) formulas play a secondary role in this course. We do not expect you to memorize or solve problems using formulas, though we will be looking at some formulas to help understand important concepts. For those for whom working through formulas is your preferred approach, there are many basic statistics books available (some listed below) that can supplement your learning in the course.

Online Polling System: PollEverywhere is a web-based polling system. PollEverywhere can be used on computer, tablet or smartphone. Students have often found doing the polls on their phones doesn't interrupt what they are viewing on their computers or tablets. Whatever you find works best for you, you need to download and install the PollEverywhere app on whatever digital device you plan to use for the polling activities. The instructions for using PollEverywhere and downloading the app are on Canvas.

Class Culture:

The underlying assumption of the course is that students learn from listening to and teaching other students. The benefits to you and to others in the course depend on you:

- Active engagement in the online component of the course
- Active involvement in and contributions to class discussions
- Completing the course assignments per stated deadlines
- Willingness to raise questions
- Willingness to invest yourself in your learning (including seeking help from the instructors and TAs)
- Willingness to help in others' learning (i.e., sharing what you know (and what you don't know))
- Willingness to provide constructive feedback

Success in the course requires a growth mindset—the belief that with dedication and hard work you will master the content of the course. And it requires you to find your voice, be it in the form of questions raised in class or by helping explain content to others. To that end, we have structured the course to enable you to learn both from us as the instructors and TAs, and with and from your peers. The learning journey involves all of us. It is well worth it as you find yourselves needing to engage in the world of research while you are a student in the GSE (and beyond).

Please be aware that it is not appropriate to be using your class time to make or receive phone calls, text, browse the Internet, do your email, tweet, be on Facebook or any other non-class related activity. The content of this course requires focus. As recent research by a group of

Stanford researchers demonstrates, multi-tasking significantly reduces specialized focus. We expect you to fully engage with the course and the course materials

Office Hours/Getting Help and Support:

The instructors and TA will be available for support. We will be setting up a weekly group practice session (TBD) for after class practice. You can schedule other office hours by following the instructions on Canvas. If none of the slots work for you, please feel free to email so we can set up an alternative time to connect.. Office hours are a chance to clarify concepts, try out statistical lingo, and help you apply the concepts you are learning through the online materials and class work or just to connect with your teaching team. Take advantage of contact time with us, the instructors, and the TAs to get help in understanding/clarifying concepts, and as a way to check your own understanding of concepts. Statistics is like learning a foreign language for many; it doesn't just stick the first time you engage with the concepts.

Supplemental Resources for Introductory Level Statistics

The internet:

[Statistic fundamentals by Josh Starmer](#)

[Statistics and Probability by Kahn Academy](#)

[OnlineStatBook Project by David Lane](#)

[Introductory Statistics by OpenStax](#)

Texts:

The Stanford Library may have some of the following available as e-books, and places like Amazon have e-books available for rental.

Huck, Schuyler W. (2012, 6th Edition). *Reading Statistics and Research*. Pearson.

This is a kind of supplemental text which is very user friendly; no formulas but focussed on consuming quantitative research.

For those of you interested in formulas and calculations, you might want to look at a very basic text book. The following are some suggestions (there are plenty others):

Coladarci, Theodore, et.al. (2004). *Fundamentals of Statistical Reasoning in Education*. John Wiley & sons, Inc.

McCall, Robert B. (2001) *Fundamental Statistics for Behavior Sciences*. 8th Edition, Wadsworth- Thomson Learning.

Welkowitz, Joan, Ewen, Robert B., Cohen, Jacob (2000). *Introductory Statistics for the Behavioral Sciences*, 5th Edition, Harcourt Brace College Publishers.

“Statistics for Dummies” from the Dummy series, and other humorous texts (“The Cartoon Guide to Statistics”).

Shavelson, Richard (1996). *Statistical Reasoning for the Behavioral Sciences*, 3rd Edition, Allyn and Bacon. (More advanced)

Writing Projects:

There are three writing projects (the first one is divided into two parts) that are designed to help you become critical consumers of research by engaging you in analysis and integration of the concepts you are learning through the online curriculum and the in-class activities. Mark your calendar. These assignments can NOT be successfully done the night before. The assignments will be posted early enough so that you will have plenty of time to complete them.

Project 1.1 (Part I due Monday, September 28 by 10:00am for the MW Section, due Tuesday September 29 by 10:00am for the TTh section)

Project 1.2 (Part II due Wednesday, October 7 by 10:00am for the MW Section, due Thursday October 8 by 10:00am for the TTh section)

Project 2 (due Monday, November 2 by 10:00am for the MW Section, due Thursday, November 3 by 10:00am for the TTh section)

Project 3 (due Tuesday, December 1 by Noon for both Sections)

Each project requires an analysis of a journal article (picked by us, your instructors) covering the content of the course to date. Project 1 (parts 1 and 2) will be graded for progress (plus, check, minus) only. We consider the first paper as a kind of practice and does not have to count towards your final grade. Projects 2 and 3 will be graded based on your chosen grading status in Axess.

These writing projects are “open-book” and the final product must be done on your own under the University's Honor Code and The Fundamental Standard:

<https://communitystandards.stanford.edu/policies-and-guidance/honor-code>

We will give you more instructions about these assignments as they come up.

Late Policy and Incompletes:

Deadlines for the three writing assignments are firm. If you have a very special circumstance that prevents you from meeting a deadline, please discuss with your instructor in advance. We will not be giving any incompletes for this course. We think the most important learning in this course is through the papers and the subsequent feedback we give to each student and to the class. Because of this feedback component, papers must be completed by the designated deadlines so that we can provide feedback in a timely manner and so that we can discuss in class.

Course Grades:

You may take the course for a letter grade or CR/NC (must be decided by the University deadline by 5:00pm, November 6). Your course grade will be a combination the following:

- Completion of the online materials: You are expected to come to each class having completed the assigned online materials.
- Performance on the online “Checkpoints” at the end of each section.
- Performance of the writing projects

Students with Documented Disabilities

Students who may need academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: <http://studentaffairs.stanford.edu/oae>)

Course Outline (subject to change)

The material in the course will be presented over the course of 10 weeks, organized around 3 basic topics: Basics of Research Design (producing data), Descriptive Statistics (exploratory data analysis), and Inferential Statistics. You can also follow the course outline by focusing on the weekly modules in Canvas that will explain what to do before, during and after class each week. Note: LM=Learning Module

| Week | To Dos | Supplemental Materials |
|---|--|---|
| <p>Week 01 (week of 9/14)</p> <p>Reading a Research Article and Basic Research Design</p> | <p>Before First Class PollEverywhere: -Download app (if using smartphone or tablet in class)</p> <p>Complete the Background Information Survey (Instructions on Canvas)</p> <p>LM: Introduction to the Learning Modules -Entire module</p> <p>Before Second Class LM: Producing Data: Sampling -Entire module LM: Producing Data: Research Design -Entire module</p> <p>Read: Wang and Newlin “Characteristics of Students Who Enroll and Succeed in Psychology Web-Based Classes” up until Procedure and Materials (on Canvas).</p> | <p>Evaluating Research: Mertens: Questions for evaluating research, pp. 54-55, 81-82, 101-102, 139-140, 280-281, 325-326, 365. (“Tools A”) (on Canvas)</p> <p>McMillan: Questions for evaluating research, pp. 53-55, 101-102, 139-140, 313-315, 353-354 (“Tools B”) (on Canvas)</p> <p>Basic Research Design: Ruiz-Primo, Mitchell, Shavelson: Research design basics, pp 11-13, 14,-16, 17-24 (on Canvas) McMillan and Schumacher (2006), “Research in Education” pp 134-142 Design Validity (on Canvas)</p> |
| <p>Week 02 (week of 9/21)</p> | <p>Before First Class</p> | |

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| <p>Descriptive Statistics</p> | <p>LM: Exploratory Data Analysis: Examining Distributions -Introduction to Exploratory Data Analysis - <u>Up through</u> Quantitative Variables - Graphical Representation</p> <p>Wang and Newlin, “Characteristics of Students Who Enroll and Succeed in Psychology Web-Based Classes” (up to Results section)</p> <p>Before Second Class LM: Exploratory Data Analysis: Examining Distributions - From Quantitative Variables - Central Tendency - To the end of the module</p> | |
| <p>*9/28 MW *9/29 TTh</p> | <p>Writing Project #1: Part I due by 10:00am</p> | <p>Submit via Canvas Assignments</p> |
| <p>Week 03 (week of 9/28)</p> <p>Examining Relationships - Correlation</p> | <p>Before First Class LM: Exploratory Data Analysis: Examining Relationships - Introduction to Examining Relationships - <u>Up to</u> Practical Importance: The Coefficient of Determination</p> <p>Before Second Class LM: Exploratory Data Analysis: Examining Relationships -<u>From</u> Practical Importance -The Coefficient of Determination - To end of the module</p> | |
| <p>*10/7 MW *10/8 TTh</p> | <p>Writing Project #1: Part II due by 10:00am</p> | <p>Submit via Canvas Assignments</p> |

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| <p>Week 04 (week of 10/5)</p> <p>Quality of Measurement - Reliability and Validity</p> | <p>Before First Class LM: Quality of Measurement -Entire module</p> <p>Before Second Class LM: Probability -Entire module</p> | <p>Statistical Tables (on Canvas) (Make sure you have access to them at all remaining classes.)</p> |
| <p>Week 05 (week of 10/12)</p> <p>Estimation and Hypothesis Testing</p> | <p>Before First Class: LM:Inference: Estimation -Entire module</p> <p>Before Second Class: LM: Inference - Hypothesis Testing -Entire module</p> | |
| <p>Week 06 (week of 10/19)</p> <p>One or Two Sample Significance Tests</p> | <p>Before First Class: LM: One Sample Tests about Means: The Z-test and t-Test - One Sample Z-test - Entire module</p> <p>Before Second Class: LM: One Sample Tests about Means: The Z-test and t-Test - One Sample t-Test - Entire module LM:Two Sample t-Tests - Entire module</p> | |
| <p>Week 07 (week of 10/26)</p> <p>One-Way ANOVA</p> | <p>Before First Class Formative Assessment (t-tests) – on Canvas: Course Materials</p> <p>LM: Analysis of Variance (ANOVA) and Post-Hoc Comparisons - Introduction to Analysis of Variance (ANOVA) -<u>Up to</u> Post-hoc Comparisons</p> <p>Before Second Class</p> | <p>”.</p> |

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| | LM: Analysis of Variance (ANOVA) and Post-Hoc Comparisons - Post-Hoc Comparisons - Entire module | |
| *11/2 M/W *11/3 T/TH | Writing Project #2 due by 10:00am | Submit via Canvas Assignments |
| Week 08 (week of 11/2) Testing Correlation Coefficients & Simple Linear Regression | Before First Class LM: Correlation: Significance Testing - Entire module Before Second Class LM: Simple Linear Regression - Entire module | |
| Week 09 (week of 11/9) Multiple Regression | Before First Class LM: Multiple Regression - The entire module Before Second Class Review LM above | |
| Week 10 (week of 11/16) Hierarchical Multiple Regression | Before First Class LM: Hierarchical Multiple Regression - Entire module Before Second Class LM: Inference Summary - Entire module | |
| T-Day Break 11/23-27 | Have a nice break! | |
| *12/1 Both Sections | Writing Project #3 due by Noon | Submit via Canvas Assignments |
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