

Spring 2021
Educ/Psy 6600: Statistical Foundations
Sarah Schwartz

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Office Location: ZOOM (Educ 455)
Office Hours: by appointment

Lecture Location: ZOOM BROADCAST
Lecture Hours: M & W 4:30 – 5:45 pm

Course Purpose

Statistical Foundations is designed to provide the student with a **practical, applied approach** to the application of fundamental behavioral and educational research design and statistical principles. Students will learn how to differentiate and appropriately select the best statistical methods for use in various research designs and analytical problems.

This course will mostly focus on **basic statistical techniques** and **several forms of the ANOVA model**, which can be used by themselves or as building blocks for more advanced techniques in other courses. Students will also learn how to:

- 1) Use the R statistical programming environment (via the R Studio IDE) to analyze data and
- 2) Interpret and communicate the results of analyses (including creating reproducible research reports with R Markdown).

Prerequisites

- Prior/concurrent EDUC/PSY 6570 'Introduction to Educational & Psychological Research'
- Passing the EDUC/PSY 6600 **pretest** (70% or better)

Course Structure

This is a lecture and applied skills course. Students will be expected to demonstrate their learning via *class/discussion participation, assignments, and examinations*. The purpose of class lectures is to **elaborate** on interesting or difficult material presented in the text, conduct skill-building **exercises** and **demonstrations**, and to provide a forum for **discussion**.

Required Materials

- Cohen, B. H. (2008). **Explaining Psychological Statistics** (4th Ed.). New York: Wiley.
- **APA Publication Manual** 7th Edition
- **eBook** *Encyclopedia of Quant Methods in R* (free online at <https://cehs-research.github.io/eBooks/>)
- **Canvas** (my.usu.edu) Please check Canvas frequently for course updates, assignments, & grades
- **R, R Studio, & TeX** software (all free to download online, instructions will be given)
- **G*Power** software (free for PC or Mac at www.gpower.hhu.de)
- Scientific or statistical **calculator** (may be a graphic calculator, but NOT a cell phone, iPod, ect.)

Grade Components

I. Canvas Discussions

30% of grade

By design, class time is to enhance your understanding and experience with statistical concepts, rather than present them the first time (this is not an introductory course). It is of utmost importance that students **read the material PRIOR to the designated lecture**, as well as read through the associated homework assignment. Also, you are required to **watch pre-recorded lectures**, as this is a partially-flipped course. This ensures class time may be more valuably spent on answering higher level questions and working through assignments, to more importantly prepare student to conduct their own research.

To facilitate this, a **chapter discussion point** of the assigned readings is due on the day the material is covered in class **BEFORE** the class begins. This discussion point is to be posted **on Canvas** and should include a **summary** of ideas from the chapter (excluding chapter one), **questions** that you have regarding the material, or ways in which you **can use** the material in your research. Further, each student must **respond/reply** to at least one other student's point. Your **lowest TWO scores will be dropped.**

Each student must compose his or her own. Discussion points must NOT be a copy of the lecture notes. Discussion points will be posted electronically **by 4:00 pm** on the due date, but preferably much **earlier** so as to allow fellow students to comment on or answer your discussion point.

II. Chapter Homework Assignments

35% of grade

NINETEEN equally weighted assignments form the basis for learning the practice of statistics at the level required by this course. These require the manipulation or analysis of data and communication of results (complete sentences, APA format). Most, if not all, will also require analysis using software. Additional reading of provided articles will also be required. These will be reviewed together in class as time allows, though each student will submit their own work within Canvas. Your **lowest TWO scores will be dropped.**

Students may work together, however each student must turn in his or her own work, **not duplicates or identical replicates**. Assignments are due by **11:59pm** on the due date. Details on what is required to be turned in will be posted on canvas. Late assignments turned in within 24 hours of the due date will receive **half** the score earned. No points will be awarded thereafter.

III. Examinations

35% of grade

SIX equally weighted examinations will be given during this course. Examinations will be offered via **Proctorio** for a maximum duration of **2 hours** anytime over two+ scheduled days. Examinations will cover all material discussed in class, recordings, AND in the readings (which are not necessarily one and the same). All formulas needed and applicable statistical tables will be provided (see Appendix A of Cohen's textbook). Calculators may be used, but not any electronic device that may transmit/receive, such as cell phones, ipods, tables, ect. **All exams are REQUIRED: NO scores will be dropped.**

Examinations may consist of definitions, multiple choice questions, computations, output interpretations, and short-answer essays. No code or syntax will be required on exams, however partial output may be included, and students will be expected to **interpret the results and communicate the meaning correctly**. Student may use their own printed chapter summaries, homework, and other notes during examinations. In the event of an emergency the student must contact the instructor immediately and BEFORE the examination period ends.

* No exam is not truly comprehensive; HOWEVER, all prior material is fair game on every exam. *

The standard grade breakdown used by Utah State University will be followed to assign the student a letter grade. The final percentage will be determined by a weighted average of the student's percentages earned in each of the three areas.

A 93-100%	B+ 87-89%	C+ 77-79%	D 60-69%
A- 90-92%	B 83-86%	C 73-76%	F < 60%
	B- 80-82%	C- 70-72%	

Preparation & Attendance

Please note that this is a 3-credit course in a 7-week period, requiring an average of approximately **18 HOURS of time outside of class EVERY WEEK** devoted to reading, watching, and working homework questions to adequately prepared for this course.

The nature of this course **requires** regular class **attendance AND participation**. The instructor encourages all students who have or anticipate attendance difficulties to discuss these issues with them as soon as possible. Even missing one class during the summer condensed schedule is very detrimental and missing two may make it impossible to be successful.

Again, each student is expected to read assigned chapters **BEFORE** each class session in order to be prepared for classroom activities and discussion (see prior 'Discussions'). Students should also not miss **WATCHING pre-recorded lectures** as some material covered in class will not be covered in the text. All information covered in the text and lectures is fair game for examination questions.

Changes in Assignments and Schedule

The instructor reserves the right to make changes to this syllabus at any time. Changes will be announced in class and **posted on Canvas**. The included schedule and all deadlines are extremely tentative and will be adjusted as needed.

Students Needing Assistance with the English Language

Several assignments in this course require **English composition**. If you feel you need assistance, please visit the USU Writing Center. They have tutors available to help: <http://writingcenter.usu.edu>.

Academic Integrity - "The Honor System"

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The **Honor System** is designed to establish the higher level of conduct expected and required of all Utah State University students.

The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution;
- Is a welcomed and valued member of Utah State University.

Plagiarism

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged used of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." **The penalties for plagiarism are severe**. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

Sexual Harassment

Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature." If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266

Students with Disabilities

Qualified students with disabilities may be eligible for reasonable accommodations. If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the **Disability Resource Center** (797-2444 voice, 797-0740 TTY, or toll free at 1-800-259-2966; Room 101 of the University Inn), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille."

Withdrawal Policy and "I" Grade Policy

Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of **extenuating circumstances**, but not due to poor performance or to retain financial aid. In such cases an 'I' will be submitted as the grade for the semester. The term 'extenuating' circumstances includes:

- (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks,
- (2) a death in the immediate family,
- (3) financial responsibilities requiring a student to alter a work schedule to secure employment,
- (4) change in work schedule as required by an employer, or
- (5) other emergencies deemed appropriate by the instructor.

Free Advice

Many of you will learn to appreciate, and may even develop a deep interest in, statistical analysis over the course of our semester together. I hope that you do as the skills you will acquire in this course will benefit you in many ways. You will see that statistical methods are tools in the **social scientist's toolkit**, which will help you to better interpret and understand the applied research of your given field and will be of great value to you in conducting your own research.

However, I understand that many of you are somewhat "*mathephobic*". Although statistics is a branch of mathematics, in this applied course we keep the level of mathematics to a minimum – arithmetic and high school algebra. So, please do not let a fear of mathematics prevent you from excelling in this course. Some of you may also fear work on the computer. The practice of modern statistics relies almost exclusively on computer software. I believe that learning a statistical computing language or syntax is key to the learning of statistics. However, **you should expect some frustration** as you begin to use the statistical software in this course, but as you gain experience you will come to appreciate the power of statistical software as a tool for discovery. So, **be patient with yourself** and the material, it comes naturally to very few.

A final word of warning: **Beware technology misbehaving near deadlines**. All discussions and assignments are to be turned in before the strict deadlines. Additionally, most assignments require some use of R or other software to complete them. It never ceases to amaze me how **computers seem to sense when you are in a time crunch** since they seem to not play nice every time I procrastinate. **Work ahead as much as possible.**

Tentative Schedule

Date	Day	Discussion Post Due by 4:00pm	Class Topics	Assignments Due by 11:59pm
Jan 20	Wed	Intro	Syllabus, Textbook, Ihno's Dataset, R/R Studio Basics	Getting Started & Exploratory Data Analysis
Jan 25	Mon	Ch 1	Variables & Scales, Rounding, Summation	
Jan 27	Wed	APA & R	APA Style, & Journal Articles, & Data Manipulation	
Feb 1	Mon	Ch 2	Exploration of Data with Plots	
Feb 3	Wed	Ch 3	Summarizing Data with Descriptive Statistics	
Feb 8	Mon	Ch 4	Standardized Scores & The Normal Distribution	
Feb 10-13		EXAM 1 (Review Feb 10)		HW 0 - 4
Feb 15	Mon	President's Day – No Class		Groundwork for Inference
Feb 17	Wed	Ch 5	Intro to Hypothesis Testing: 1 Sample z-test	
Feb 22	Mon	Ch 6	Confidence Interval Estimation: The t Distribution	
Feb 24	Wed	Ch 7	Independent Samples t-Test for Means	
Mar 1	Mon	Ch 8	Statistical Power & Effect Size	
Mar 3-6		EXAM 2 (Review March 3)		HW 5 - 8
Mar 8	Mon	Ch 9 & 10	Linear Correlation & Regression	Hypothesis Tests for 2 Measures Per Subject
Mar 10	Wed	Ch 11	Matched t-Test	
Mar 15-17		EXAM 3 (Review March 15)		HW 9 - 11
Mar 17	Wed	Ch 12	1-way Independent Groups ANOVA	ANOVA without Repeated Measures
Mar 22	Mon			
Mar 24	Wed	Ch 13	Multiple Comparisons	
Mar 29	Mon	Ch 14	2-way Factorial ANOVA	
Mar 31	Wed			
April 5-7		EXAM 4 (Review Apr 5)		HW 12 - 14
Apr 7	Wed	Ch 15	Repeated Measures ANOVA	ANOVA with Repeated Measures
Apr 12	Mon	Ch 16	2-way Mixed Design ANOVA	
Apr 14	Wed			
April 19-21		EXAM 5 (Review April 19)		HW 15 - 16
Apr 21	Wed	Ch 19	The Binomial Distribution (Test of Goodness of Fit)	Categorical Data
Apr 26	Mon	Ch 20	Chi-Squared Tests (Test of Independence)	
April 29 – May 3		EXAM 6 "FINAL"		HW 19 - 20