Research Design and Analysis I

EDUC/PSY 6600
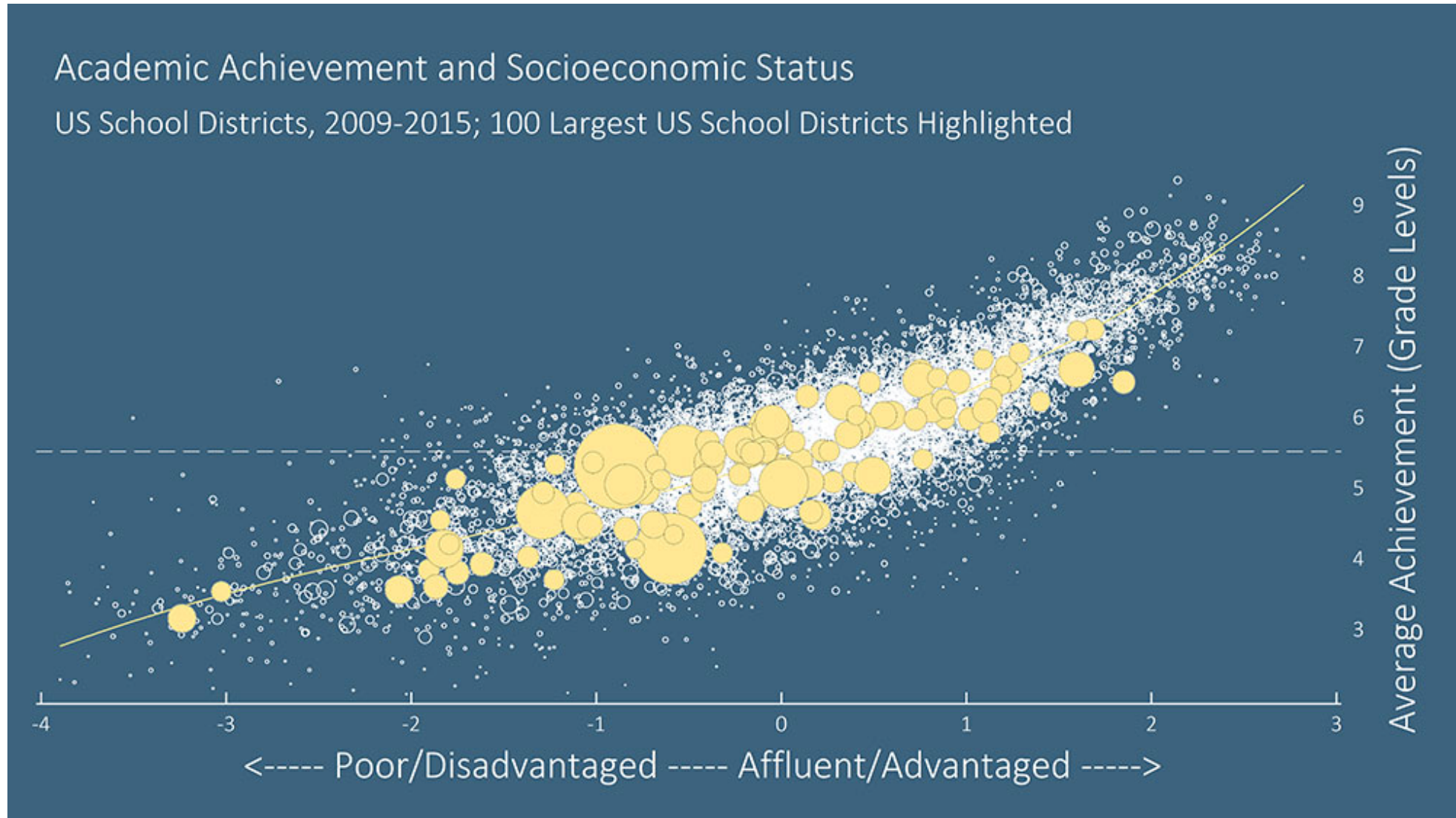
Unit 0

Welcome

Data, Data, Data, Data, Data, ...

Tesla Autopilot

Data, Data, Data, Data, Data, ...

Academic Achievement and Socioeconomic Status

US School Districts, 2009-2015; 100 Largest US School Districts Highlighted

<----- Poor/Disadvantaged ----- Affluent/Advantaged ----->

Average Achievement (Grade Levels)

Data, Data, Data, Data, Data, ...

Health Care Policy and Cost

Data are/is Cool

"In God we trust. All others must bring data."
W. Edwards Deming

"It is a capital mistake to theorize before one has data."
Sherlock Holmes, "A Study in Scarlett" (Arthur Conan Doyle).

"You can have data without information, but you cannot have information without data."
Daniel Keys Moran

Purpose of this course

Develop quantitative skills

Prepare you for:
1. Your thesis
2. Your career

What is expected of you

- Attend and participate in class
- Prepare for class (readings before class)
- Professional correspondence with colleagues
- Use assignments to learn
- Ask questions
- Communicate with me

Who am I?

Research Assistant Professor

EDUC 435

tyson.barrett@usu.edu

Office Hours: 3:00 – 4:15

EDUC/PSY 6600
Research Design & Analysis I

Tuesday & Thursday 4:30 - 5:45 pm
Room: TBD

Instructor
Tyson S. Barrett
tyson.barrett@usu.edu
Office Hours: T/TH 3:00 – 4:15
Office: EDUC 435

Course Purpose

Research Design & Analysis I 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 serve as building blocks for more advanced techniques in other courses.

Two Prerequisites

1) Completion of **EDUC/PSY 6570** *'Introduction to Educational & Psychological Research'* (approved equivalent)
2) Passing the EDUC/PSY 6600 **pretest** (70% or better)

These prerequisites are **mandated** by the *College of Education & Human Services* to ensure that each student has the necessary background knowledge to be successful in this course. EDUC/PSY 6570 must be completed with a passing grade **prior** to enrolling in EDUC/PSY 6600, precluding concurrent enrollment. Students interested in a less technical and more of an applied statistics course should consider the course EDUC 6050.

Course Structure

This is a lecture and applied skills course. Students will be expected to demonstrate their learning via *classroom 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.
- **Canvas** (my.usu.edu) Please check Canvas frequently for course updates, assignments, & grades.
- **R** and **RStudio** software (both are free; downloading and installing are discussed in class)
- **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, tablet, etc.)

Note: it is advantageous to bring a laptop to class, but not required.

Preparation & Attendance

The nature of this course *requires* regular class attendance and participation. The student is therefore expected to read assigned chapters and any assigned readings **BEFORE** each class session in order to be prepared for classroom activities and discussion (see 'Summaries' below). Please note that this is a 3-credit course in a 15-week period, requiring an average of approximately 9 **HOURS of time outside of class EVERY WEEK** devoted to reading and homework for students who are adequately prepared for this course. Students should **not miss class lectures** as some material covered in class will not be covered in the text. All information covered in the text and lectures can be used for examination questions.

Prerequisites

EDUC/PSY 6570 Pretest

Mandatory

Can take the pretest up until the end of this week

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Prep and Attendance

Prepare for class

It makes the lectures much more meaningful and less stressful

We'll talk about the schedule in a moment

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Grading

I. Summaries, 30% of grade

By design, lectures are 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 upmost importance that students read the material **PRIOR** to the designated lecture, as well as read through the associated homework assignment. This ensures class time may be more valuably spent on answering higher level questions and preparing students for assignments, but more importantly for conducting your own research. To facilitate this, a chapter **summary or outline** of the assigned readings is due on the day the material is covered in class, **before** the lecture time begins.

Each of the SEVENTEEN chapter's summaries (no summary turned in for chapter 1) must be no longer than **1 single-spaced page** using **RMarkdown** (discussed in class) and produced as a **PDF**. Summaries will be reviewed and assigned credit/no-credit. Please note, copied summaries (either from posted lecture notes or from students of previous semesters), summaries that violate page specifications, or late summaries will not receive any credit. Given students can use these summaries on the exams (described below), it is useful to make sure these highlight important material succinctly.

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II. Assignments, 35% of grade

SEVEN equally weighted unit assignments form the basis for learning the practice of statistics at the level required by this course. The units are outlined on the course schedule (chapters are from Cohen's 4th edition text). Details regarding what is required for each assignment will be available on Canvas. Assignments require the manipulation or analysis of data and professional communication of results. Most, if not all, assignments will require analysis in R and RStudio. Additional reading of provided articles may be required, too.

All assignments are REQUIRED: NO scores will be dropped. Students may work together, however each student must turn in his or her own work, **not photocopies or identical replicates**. Assignments are due by **11:59pm** on the due date (see course schedule). Details on what is required to be turned in will be posted on canvas.

Rubrics will be used for grading. Half of the points are earned for **completion** and half for **correctness** (based on a subset of problems chosen for grading). Skipped portions of an assignment may result in loss of points for **BOTH** completeness **AND** correctness. 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 (same unit/chapter breakdown as the assignments; unit 0 does not have an exam). Examinations will be given **IN CLASS** and will require **less than 30 minutes**. Examinations will cover material discussed in class AND in the readings. All formulas needed will be provided on examinations (unless noted during examination reviews). Applicable statistical tables will also be provided (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, etc.

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Grading

Summaries

30% of Grade

Essentially free points -> Can use on Exams

Use RMarkdown (we'll discuss a lot more)

Three Components of Your Grade

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Grading

Assignments

35% of Grade

10 journal articles in your area using quantitative research

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Grading

Exams

35% of Grade

**6 Equally weighted
Only 30 min
Open note (use your
summaries)**

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Schedule

- Tentative
- Summaries (and readings) are due before class
- Assignment by the end of the day

Date	Day	Summary Due by 4:30pm	Lecture Topic	Unit	Assignment Due by 11:59pm
09-Jan	Tues		Syllabus, Textbook, APA Style, & Journal Articles	0	Preparatory Topics
11-Jan	Thur		Ihno's Dataset, SPSS Basics, & Data Manipulation		
16-Jan	Tues	Ch 2	Exploration of Data with Plots	1	HW 0
18-Jan	Thur	Ch 3	Summarizing Data with Descriptive Statistics		Exploratory Analysis
23-Jan	Tues	Ch 4	Standardized Scores & The Normal Distribution		
25-Jan	Thur		EXAM 1		HW 1
30-Jan	Tues	Ch 5	Intro to Hypothesis Testing: 1 Sample z-test	2	Groundwork for Inference
01-Feb	Thur	Ch 6	Confidence Interval Estimation: The t Distribution		
06-Feb	Tues	Ch 7	Independent Samples t-Test for Means		
08-Feb	Thur	Ch 8	Statistical Power & Effect Size		
13-Feb	Tues		EXAM 2		HW 2
15-Feb	Thur	Ch 9	Linear Correlation	3	Hypothesis Tests for 2 Measures Per Subject
20-Feb	Tues		Monday schedule - no class		
22-Feb	Thur	Ch 10	Linear Regression		
27-Feb	Tues	Ch 11	Matched t-Test		
01-Mar	Thur		EXAM 3		HW 3
			Spring Break - no class	4	ANOVA without Repeated Measures
13-Mar	Tues	Ch 12	1-way Independent Groups ANOVA		
15-Mar	Thur	Ch 13	Multiple Comparisons		
20-Mar	Tues				
22-Mar	Thur	Ch 14	2-way ANOVA		
27-Mar	Tues				
29-Mar	Thur		EXAM 4		HW 4
03-Apr	Tues	Ch 15	Repeated Measures ANOVA	5	ANOVA with Repeated Measures
05-Apr	Thur				
10-Apr	Tues	Ch 16	2-way Mixed Design ANOVA		
12-Apr	Thur				
17-Apr	Tues		EXAM 5		HW 5
19-Apr	Thur	Ch 19	The Binomial Distribution	6	Categorical Data
24-Apr	Tues	Ch 20	Chi-Squared Tests		
26-Apr	Thur		Review		
01-May	Tues		EXAM 6		HW 6

Schedule

- Tenta~tive~
- Summa~ries (and~ readi~ngs) are due~ befor~e class~
- Assig~nment by the~ end o~f syllabus~

Please read the syllabus in depth

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24-Apr	Tues	Ch 20	Chi-Squared Tests		
26-Apr	Thur		Review		
01-May	Tues		EXAM 6		HW 6