

Psychology 205: Statistics and Experimental Design

Dr. David Simpson, Professor of Psychology

Spring 2015 Syllabus:

**Section B:** MWF 8:00-9:10 Rankin 204A

**Lab** Wednesdays 10:40 - 1:10 TC 11

**FINAL EXAM Section B** (in our regular classroom): Friday, May 1: 8:00 - 11:00 a.m.

**Section A:** MWF 9:20 to 10:30 Ganfield 107

**Lab:** 1:20 – 3:50 TC 11

**FINAL EXAM Section A** (in our regular classroom): Tuesday, May 5: 8:00 - 11:00 a.m.

**Office:** Rankin 211

**Office Hours:** By appointment (MF 11 -1)

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Home (North Lake/Hartland):262 - 966-7206

**Electronic Mail:** [dsimpson@carrollu.edu](mailto:dsimpson@carrollu.edu)

**Carroll "Faculty Profile":**

[http://www.carrollu.edu/programs/psychology/faculty\\_profile.asp?id=2F38](http://www.carrollu.edu/programs/psychology/faculty_profile.asp?id=2F38)

**Blog:** <http://david-in-carroll-land.com/>

**This is how I teach**☺ <http://teachpsych.org/page-1703896/1521560>

**Here are some additional thoughts about this class:** <http://david-in-carroll-land.com/2014/08/14/still-looking-for-ways-to-improve-courses-after-36-years-of-teaching-pt-1-of-2/>

### **Important Links:**

There exists a wealth of resources online for teaching research methods and statistics. Here are a few of my current favorites.

<http://teachpsychscience.org/links.asp>

<http://onlinestatbook.com/index.html>

Here a link for "chi-square calculator" on the Internet that I have found useful. I primarily use SPSS for Chi-square only when I have a survey and am interested in a Chi-Square analysis on the cross-tabulations. In that case, I do NOT need to weight cases.

<http://www.quantpsy.org/chisq/chisq.htm>

Here is a link to software which calculates statistical power:

<http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>

Here is an informative link about how to randomly select or randomly assign participants:

<http://www.randomizer.org/>

**Texts: Required:** Gravetter, F. J., & Wallnau, L. B. (2013). *Statistics for the behavioral sciences*. (9th ed.). Belmont, CA: Wadsworth/Thomson CENGAGE Learning.

OPTIONAL but recommended (and what a deal!) :

\*\*\* Simpson, David D. [\*An Outline of Basic Data Analyses in Psychology: Examples, Exercises, and Applications\*](#)

**Also required:** A Texas Instrument 30 calculator or its equivalent with statistical functions.

### **About your professor:**

While earning my A.B. in psychology at Oberlin College in Ohio, I developed strong interests in humanistic psychology, educational innovation, and Spanish literature --- and avoided statistics and research methods as long as I could! I had a change of heart while I was a graduate student at Ohio State University where I earned my M. A. and Ph.D. degrees. There I took twelve statistics and research methods courses in addition to publishing research in experimental social psychology. I have been teaching Introductory Psychology, Statistics and Experimental Design, Social Psychology, Freshman seminars, Research Seminar, Psychological Testing and Assessment and special courses (e.g. "Electronic Surveys," "SPSS," "Why War?", "Pioneering Web 2.0 Internet Tools") at Carroll since February of 1978. This is my first job!

### **Examinations:** (500 points)

Examinations will occur in **THE LAB CLASSROOM** on the dates specified in this syllabus. These five examinations will measure both conceptual understanding and computational skills.

### **Labs**

Lab attendance and classroom involvement will affect whether a student who has a "borderline" grade should receive the higher letter grade and the quality of letters of recommendation which I write for you---if you at some time ask me to write one (and if I agree to do so!).

*Statistics is a language, a way of thinking about things, and a set of tools useful for answering questions. Using statistics on a regular basis is the best way to learn this language and to learn how appropriately to use statistical tools. Therefore, it*

*is very important that you attend labs, work problems I assign you from the text, and actively participate in data collection exercises. To further help you understand uses of statistics I shall often share with you examples of applications of statistics from my own work or that of student and faculty researchers.*

Cumulative Final Examination: (100 Points)

Course Grade: (Based on 600 Total Points)

A = 558 and above

AB = 540 to 557

B = 498 to 539

BC = 480 to 497

C = 420 to 479

D = 360 to 419

F = Below 360

Attendance:

I expect that you will attend each class and each laboratory prepared, attentive, and on time. Exams should be taken on time. Work which is handed in should be your own, neat, and on time. I expect honesty and civility in behavior.

<b>Approximate Weekly Schedule</b>		
Week of		READ
January 21	Introduction to Statistics and Experimental Design	Chapter 1
January 26	Frequency Distributions	Chapter 02
February 02	Characteristics of Distributions: Central Tendency and Variability	Chapters 03; 04
February 04	FOUNDERS' Day CONVOCATION	
<b>Wednesday, February 11: Examination # 1: 100 points</b>		
February 13	<u>z</u> -Scores	Chapter 5
February 16	Correlation ( $r$ ) and Simple Linear Regression	Chapters 15; 16

**Wednesday, February 25: Examination # 2: 100 points**

February 27	Introduction to Hypothesis Testing Single Sample $z$	Chapter 08
March 02	Introduction to the $t$ Statistic	Chapter 09
March 09 to March 13	SPRING BREAK	
March 16	Two-group Experimental Designs	Chapters 10; 11

**Wednesday, March 25: Examination # 3: 100 points**

March 27	Introduction to Analysis of Variance	Chapter 12
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**Wednesday, April 8: Examination # 4: 100 points**

April 10	Factorial Experimental Designs	Chapter 15
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WEDNESDAY, April 22: CELEBRATE CARROLL

**Friday, April 24: Examination # 5: 100 points**

April 27: Nonparametric Statistics: Chi-Square Chapter 17

April 29: (Last Day of Class) Review, Integration and Application: Chapter 19

**Final Exam: Section A (9:20 class): Tuesday, May 05 : 8:00 – 11:00 a.m.**  
**Section B (8:00 class): Friday, May 01 : 8:00 – 11:00 a.m.**

## **Carroll Policy Statements**

*Statement on Academic Integrity* – The Carroll Academic Integrity Policy is located in your student handbook. I encourage you to familiarize yourself with it. If a student violates this policy in any way, I reserve the right to impose a sanction of failure on the assignment/assessment or failure in the course. If you have questions about appropriate citations, please ask.

*Accommodation for Disabilities* – Any requests for accommodation must be made through the Disability Services Coordinator at Carroll. I will make appropriate accommodations once I receive notification from that office and have met with you privately.

*Modifications to the Syllabus:* The instructor and Carroll reserve the right to modify, amend, or change the syllabus (schedule, course requirements, grading policy, etc.) as the curriculum and/or program require(s).

### **What Should You Know and Be Able to Do at the End of this Course?**

Mastery of skills and concepts will be regularly assessed via exams, lab exercises, individual and group conferences, journal reading, and mentored computer applications.

#### **I. Factual Knowledge: Understanding Important Concepts and Terms:**

- Inferential vs. Descriptive Statistics
- Parametric vs. Nonparametric Statistics
- Random Sampling vs. Random Assignment
- Independent Variable (IV) vs. Dependent Variable (DV)
- Sample vs. Population
- Levels of Measurement of Data
- Sample Statistic vs. Population Parameter
- Simple Frequency Distribution vs. Grouped Frequency Distribution
- Abscissa vs. Ordinate
- Real Limits vs. Apparent Limits of a Class Interval

- O Negatively Skewed vs. Positively Skewed vs. Normal Distributions
- O Symmetric vs. Asymmetric Distributions of Scores
- O Relative vs. Cumulative Proportions in Frequency Distributions
- O Measures of Central Tendency vs. Measures of Variability
- O Mean vs. Median vs. Mode
- O Range vs. Standard Deviation vs. Quartile Deviation
- O "Biased" (Population) vs. "Unbiased" (Sample) Standard Deviation
- O Variance
- O Percentile Point vs. Percentile Rank vs. Standard Score
- O  $z$ -score
- O The Standard Normal Curve
- O Scatter Plots;  $r$ ; "positive", "zero"; and "negative" correlations
- O Homoscedasticity of Variances vs. Homogeneity of Variances
- O Slope and Intercept of a Linear Regression Equation;
- O Standard Error of Estimate
- O Null Hypothesis ( $H_0$ ) vs. Alternative Hypothesis ( $H_A$ )
- O Type I vs. Type II Errors
- O Sampling Error
- O Sampling Distribution
- O One-tailed (Directional) vs. Two-Tailed (Non-directional) Hypotheses
- O Rejecting vs. Failing to Reject the Null Hypothesis
- O Single Sample  $z$  vs. Single Sample  $t$
- O Independent  $t$  vs. related groups  $t$
- O Statistically Significant (Reliable) Results
- O Analysis of Variance (ANOVA):  $F$ -test
- O Post Hoc Tests (e.g. Tukey's HSD)
- O Sums of Squares (SS); Mean Squares (MS);  $F$ -ratio
- O Factorial Experimental Designs
- O Levels of an Independent Variable
- O Chi-Square ( $\chi^2$ )
- O True Experiment vs. Intact Groups Design
- O Between Subjects IV's vs. Within Subjects IV's

## II. Applied Knowledge and Skills:

### A. Use Statistical Tables to Find Critical Values of Statistics

- Pearson's  $r$
- $z$
- $t$  and  $F$
- $q$  (the studentized range statistic used in Tukey's HSD)  Chi-Square ( $X^2$ )
- Draw random samples and randomly assign subjects to conditions
- Determine experimental design to use and appropriate data analyses to perform
- Recognize assumptions made when choosing particular parametric statistic or deciding instead to use a nonparametric statistic
- Know critical values for a 1-tailed and a 2-tailed  $z$  at the .05 alpha level
- Know correspondence between measures of central tendency and measures of variability. Which measure of variability should be used with which measure of central tendency? Why?
- Know how and when to find proportions, percentile points, and percentile ranks using the standard normal curve
- Know how to find percentile points and percentile ranks when a distribution of scores is not normally distributed
- Know how to read graphs and tables for both descriptive statistical analyses (e.g. surveys) and results of experiments. Know how to draw graphs of the results of a survey or experiment.
- Be able to compute Tukey's HSD and use subscript notation to communicate which post hoc comparisons are statistically significant.
- Be able to recognize when a particular statistical computation is most likely erroneous.
- Read the results section of journal article with increased understanding.
- Know statistical analysis resources available on campus.
- Know how to interpret SPSS/PASW (Statistical Package for the Social Sciences)
- Know nonparametric analogues of major parametric statistics
- Know the advantages and disadvantages of parametric vs nonparametric inferential statistics. When should one versus the other be used?
- Understand the concept of statistical power.
- Be knowledgeable about Effect size statistics (especially Cohen's  $d$ )

