



Independent Study | in Idaho

PSYC 300
Statistical Methods

Providing independent study opportunities for more than 40 years.



The University of Idaho in statewide cooperation with
Boise State University — Idaho State University — Lewis-Clark State College

Course Guide

Independent
Study | in Idaho

Self-paced study. Anytime. Anywhere!

Psychology 300 Statistical Methods

Lewis-Clark State College
3 Semester-Hour Credits

Prepared by:
Dr. Teri Rust
Professor
Lewis-Clark State College

RV: August 2014
3-Psyc 300
Copyright Independent Study in Idaho/Idaho State Board of Education

Table of Contents

Welcome	4
Policies and Procedures	4
Course Description	4
Course Materials	4
Course Delivery	5
Course Introduction	5
Course Objectives.....	5
Lessons	6
Exams.....	7
Grading	8
About the Course Developer.....	9
Contacting Your Instructor	9
Assignment Submission Log.....	10
Lesson 1: Introduction to Statistics and Research Design	11
Lesson 2: Frequency Distributions	13
Lesson 3: Central Tendency.....	16
Lesson 4: Variability.....	19
Exam 1 Information	21
Lesson 5: Sampling and Probability.....	22
Lesson 6: The Normal Curve.....	25
Lesson 7: Hypothesis Testing with z Tests.....	27
Exam 2 Information	31
Lesson 8: Confidence Intervals.....	32
Lesson 9: The Single-Sample t	36
Lesson 10: The Paired-Samples t Test	40
Lesson 11: The Independent-Samples t Test.....	45
Exam 3 Information	50
Lesson 12: One-Way ANOVA.....	51
Lesson 13: Correlation.....	57
Lesson 14: Chi-Square	60
Exam 4 Information	68

Psyc 300: Statistical Methods

3 credits: LCSC

Welcome

Whether you are a new or returning student, welcome to the Independent Study in Idaho (ISI) program. Below, you will find information pertinent to your course including the course description, course materials, course objectives, as well as information about assignments, exams, and grading.

Policies and Procedures

Refer to the ISI website at www.uidaho.edu/isi and select *About ISI, Policies* for the most current policies, procedures, and course information, including information on setting up your accounts, exams and proctors, grades and transcripts, course exchanges and the refund schedule, library resources and other services, academic integrity, and disability support services. If you have any questions or concerns, please contact the ISI office for clarification before beginning your course.

Course Description

Survey of descriptive and inferential statistical concepts commonly used in the treatment of data in social science research. The understanding and application of the concepts will be emphasized. Topics covered will include: measures of central tendency, measures of variability, correlation methods, hypothesis testing and simple analysis of variance. Pre-requisite: Core Math. LCSC students: cross-listed with ECON 300, SS 300.

May submit all assignments to an exam in one week; then wait for feedback and grade before submitting assignments related to the next exam.

Recommended: Internet access

14 graded assignments, 4 proctored exams

Course Materials

Required Course Textbook

- Nolan, Susan and Heinzen, Thomas. *Essentials of Statistics for the Behavioral Sciences*, 2nd Ed. New York: Worth Publishers, 2014.

There is six-month access to Launch Pad and the Etext on the publisher's website with the purchase of a new printed or Etext textbook. **The publisher representative has agreed to extend the six month access for an additional six months (total one year). Contact your instructor if you need this extension, and she will share your request with the representative.**

Videos specific to the text have been created by the instructor and are available in Canvas along with the assignments. You may purchase an E-Text, which includes access to LaunchPad **OR** a print version of the textbook. A used textbook works well as **LaunchPad is unnecessary to complete the course.** In addition, the videos on LaunchPad give general information and can sometimes be frustrating as different symbols and formulas are used.

There are several options for purchasing the required textbook.

Printed textbook options:

- Loose-leaf printed textbook: ISBN: 978-1464113062
- Print textbook: ISBN: 9781429242271

- Used printed textbook (access code already used: Launch Pad unavailable): ISBN: 9781429242271

A new print textbook with a valid code includes free access to Launch Pad, the publisher's website. The Launch Pad includes the Etext and other support materials. To access the Launch Pad website which is the source for the Etext and online support materials, you must use the Course ID provided in Canvas.

If you purchase a print textbook you do not need access to Launch Pad to complete the course; the “Assignments” for each lesson are in Canvas (Blackboard). Additionally, your instructor has created videos specific to this course, which are accessible through Canvas. The videos in Launch Pad are not specific to the textbook, and use different symbols and formulas in some cases; therefore, for consistency, your instructor’s videos are preferable.

Online textbook option:

- Etext: ISBN: 9781464164507

Purchasing the Etext gives you access to the required readings in Launch Pad on the publisher’s website. If you need more than one year of access to Launch Pad, you must purchase the Etext again.

Course Delivery

All ISI courses are delivered through Canvas, an online management system that hosts the course lessons and assignments and other items that are essential to the course.

Course Introduction

This course is designed to provide students with a basic understanding of the fundamentals of statistics. The emphasis will be on understanding, application, and problem solving, not on extensive computations and the memorization of formulas. The concepts considered in this course are those related to the representation of information (descriptive statistics and graphs) and those concepts related to drawing conclusions based on sample data (inferential statistics, including probability, the normal distribution, and hypothesis testing—single-sample t, paired-samples t, independent t, correlation, chi-square, ANOVA).

Course Objectives

Upon completion of the course, the student:

- will be familiar with the various scales of measurement;
- will be able to create and evaluate frequency distributions and various graphing techniques;
- will be familiar with the calculations, uses, and interpretations of the three measures of central tendency;
- will be familiar with the calculations, uses, and interpretations of measures of variability;
- will be familiar with the normal curve model, using the normal curve table;
- will be familiar with the basic theory behind hypothesis testing, including the concepts of rejecting, or failing to reject, the null hypothesis (statistical significance);
- will be able to follow the steps to carry out different types of t-tests and interpret the results;
- will be familiar with the concepts of Type I and Type II errors;

- will demonstrate an understanding of correlation, including the limitations of conclusions that can be drawn;
- will be able to follow the steps to carry out one-way and two-way chi square analyses and interpret the results;
- will be able to follow the steps to carry out a one-way ANOVA and interpret the results;
- will be able to select the appropriate inferential analysis;

Lessons

Overview

Each lesson includes lesson objectives, a reading assignment, a “lecture” to complement or clarify the text, recommended self-study, and an assignment. The assignments are from the even-numbered questions at the end of the chapters.

I have set up the course to work either with a traditional, print textbook or the Etext. However, with the traditional textbook, you will also (for no extra charge) have **full** access to Launch Pad, which is a publisher supplied web site with support materials, and this will include access to the Etext as well. The traditional text costs more, but some people prefer to have the printed material, and you have the option to keep the text for future reference.

Launch Pad provides access to the Etext, if that is your preferred text format. Launch Pad also has some video support materials. All of the written assignments come from the End of Chapter Exercises. The assignment questions are all compiled for you on Canvas, and they are in multiple-choice format. This way you can complete the calculations for a question, and if the answer you get isn’t in the options, you will know there is an error somewhere! You will also receive the answers to the questions once you have completed the assignment and submitted it. This provides you with immediate feedback and scoring.

I have chosen some supplemental materials in Launch Pad. I find all the “extras” to be a bit confusing sometimes, so I will try to clarify some of the materials here. After you login to Launch Pad, you then select the Chapter you want to work on. For example, if you open Chapter 1, you will find the following materials:

- Etext material, nicely broken down into sections;
- Videos within a section of Etext. Sometimes I have not selected these because they cover material we are not covering, and sometimes because they present formulas a bit differently from the text.
 - StatClips: These are mini lectures.
 - StatClips Examples: These walk you step-by-step through examples.
 - SnapShots: These present real-world people using statistics in their careers.
- **Chapter Review.** This offers several different ways to review the material. There are the **Exercises** from the end of each chapter. Each Lesson has some of the odd-numbered items recommended for self-study. A button follows each item that will show you the answer.
- LearningCurve. These can be some nice review questions, but sometimes we are not covering EVERYTHING in a chapter. I have no way to select only the material I want on the LearningCurve

questions. So you may encounter questions that aren't relevant for us. If that causes you frustration or confusion, you may skip this activity.

- **Browse more resources for this unit.** These are parts of the chapter or videos I have not selected. You are free to use any of these materials to enhance your understanding.

Each lesson includes the following components:

- lesson objectives
- reading assignment
- important terms
- lecture
- self-study recommendations
- written assignment

Study Hints:

- Complete all reading assignments.
- Complete lesson assignments in Canvas. You will receive immediate feedback after submission.
- Set a schedule allowing for course completion one month prior to your personal deadline. An Assignment Submission Log is provided for this purpose.
- I have experienced some issues with Launch Pad, the website that accompanies our text. If you have problems, please contact their help line. I have found them to be very helpful over the phone. It would also be great if you could let me know about any problems, so I can be aware of them, and I can also contract the help line to know when problems are fixed.
- It can be relatively easy to complete problems while looking at previously worked examples. These will not be available on the test. Be sure to practice problems without looking at previous examples, so that you are attempting them under "test conditions."
- If you need more assistance than you find in the text or Launch Pad materials, you may need to find a tutor. I can address simple questions through email, but for more in-depth assistance, you may need to find a tutor.

Exams

Refer to *Grading* for specific information on assignment/exam points and percentages.

All exams are closed book and closed note exams. Exam 1 will cover the objectives from lessons 1-4. All of the subsequent exams are somewhat comprehensive, because concepts used in earlier lessons continue to be used in later lessons and exams, but they will focus on the new material. Exam 2 will focus on the objectives from lessons 5-7. Exam 3 will focus on the objectives from lessons 8-11. Exam 4 will focus on objectives from lessons 12-14, but there will be some extra review material on the final. The review material will focus on concepts, not calculations from earlier lessons, unless those calculations are also part of lessons 12-14.

Students often ask if I allow them to create "cheat sheets" for exams. I do not. Research has shown that students create cheat sheets of different quality, which creates greater variability among scores rather than less. So I create the cheat sheets for students! They are included with lessons 7 through 14 so you can familiarize yourself with them and practice with them before the tests. Copies will be sent to the proctor along with the exams, in addition to a list of equations provided inside the front and back covers of the text, and the tables from Appendix B for exams 2-4.

I will also provide a list of equations provided inside the front and back covers of the text and the tables from Appendix B for exams 2-4.

You will need to use a calculator on the exams. Be sure you know how to work the calculator you have. At a minimum, you need a calculator with a square root key. You do not need anything more complicated. There is a 2-hour time limit on the exams, and each exam must be completed in one sitting.

Proctor Selection/Scheduling Exams

All exams require a proctor.

Refer to the ISI website at www.uidaho.edu/isi and select *Students*, then *Assignments and Exams* for guidelines on how to choose a proctor and schedule exams. Complete the *Proctor/Exam Request* form and submit it to the ISI office at least two weeks prior to scheduling your first exam. As it is the policy of the program that actual exams are not returned to ISI students, your instructor will contact you electronically (via Canvas or email) with your grade and specific feedback on your exam.

Grading

The course grade will be based upon the following considerations:

The total weight of all exams exceeds the weight of all assignments combined. The student cannot fail all assignments or all exams and still pass the course.

Assignments	Percentage (approx.)
Unit 1	
Assignment 1	3
Assignment 2	3
Assignment 3	3
Assignment 4	3
Unit 2	
Assignment 5	3
Assignment 6	3
Assignment 7	3
Unit 3	
Assignment 8	3
Assignment 9	3
Assignment 10	3
Assignment 11	3
Unit 4	
Assignment 12	3
Assignment 13	3
Assignment 14	3
Total	42

Exams	Points	Percentage
Unit 1	80	12
Unit 2	90	13
Unit 3	100	15
<u>Unit 4</u>	<u>130</u>	<u>18</u>

Total **400** **58**

Self-study lessons

It is recommended you complete the CHECK YOUR LEARNING activities within the chapters. The answers to these questions are provided in Appendix D of the text.

There are self-study exercises at the end of each assignment. These are all odd-numbered exercises from the textbook, and the answers are provided in Appendix C of the text, or by a button on Launch Pad. Suggested items are listed in each lesson. You are welcome to complete all of the odd-numbered items in the text, but sometimes there are concepts that I am not including in my expectations, so I have selected items to focus on those concepts I consider to be the most important.

Acts of academic dishonesty, including cheating or plagiarism are considered a very serious transgression and may result in a grade of F for the course.

About the Course Developer

Your course developer is Teri Rust, a Professor of Psychology at Lewis-Clark State College. I received my Ph.D. in Educational Psychology from the University of Iowa in 1991. My areas of emphasis included Statistics, Research, Cognition, and Motivation. Statistics is my favorite class to teach. In 2005 I also received a M.Ed. in Counseling from the University of Idaho.

Contacting Your Instructor

Instructor contact information is posted on your Canvas site.

Assignment Submission Log				
Use this log to help you keep track of your progress through the course.				
Lesson	Date Completed	Date Submitted	Percent/Grade	Total Points
1				
2				
3				
4				
It is time to make arrangements with your proctor to take Exam 1.				
Send the completed Proctor Information Form to the ISI office at least two weeks prior to taking your first exam.				
Exam 1				
5				
6				
7				
It is time to make arrangements with your proctor to take Exam 2.				
Exam 2				
8				
9				
10				
11				
It is time to make arrangements with your proctor to take Exam 3.				
Exam 3				
12				
13				
14				
It is time to make arrangements with your proctor to take the Final Exam.				
Final Exam				

Lesson 1

Introduction to Statistics and Research Design

Lesson Objectives

- Define, understand, and give examples of all the terms listed below.
- Differentiate between descriptive and inferential statistics.
- Differentiate between samples and populations and how they are related to descriptive and inferential statistics.
- Differentiate between discrete and continuous variables.
- Differentiate among nominal, ordinal, interval, ratio, and scale variables.
- Differentiate among independent, dependent, and confounding variables, and what is meant by hypothesis testing and operationalizing a variable.
- Understand the relationship between reliability and validity.
- Differentiate between correlational studies and experiments, and discuss the importance of random assignment.
- Differentiate between between-groups and within-groups experimental designs.

Reading Assignment

Essentials of Statistics for the Behavioral Sciences: Chapter 1: An Introduction to Statistics and Research Design (Print: pp. 1-15; Etext: all)

Important Terms

descriptive statistics	ratio variable	operational definition
inferential statistics	scale variables	correlation (correlational study)
sample	levels	experiment
population	independent variables	random assignment
discrete	dependent variables	between-groups research design
continuous	confounding variables	within-group research design
nominal variable	reliability	
ordinal variable	validity	
interval variable	hypothesis testing	

Lecture

One of the most important objectives in statistics is to learn the vocabulary. Statistics requires learning a new language as much as it requires learning computations. This chapter starts with a lot of vocabulary. Do NOT make the mistake of glossing over it. There is the tendency to rush to the calculations and to focus on the calculations, even among students who “dislike” math. Students often complain, “I know how to do it, I just didn’t understand what you were asking me to do.” The vocabulary is KEY. Most of the equations are fairly simple and straightforward. There are few that you will be expected to know. The vocabulary is critical to understand what is being asked or to be able to effectively express yourself when communicating about an analysis.

Reading a statistics or math text is not like reading a textbook in other courses. It is important that you follow along with examples. This text has wonderful **Check Your Learning** boxes. Do not believe that you will get through the material faster if you skip those. This is especially true in an independent study course.

It can be difficult to learn to identify data as nominal, ordinal, interval, or ratio, but it is important in selecting appropriate statistics methods. Do not worry if it seems awkward, because it will be carried through the whole course as each new statistic is introduced.

The vocabulary and the basics of research methodology are important, but the details of research methodology comprise a whole course by themselves. For the most part, we will focus on the analysis of data, and we will assume that the data has been collected following good methodology.

After you have read the assigned reading and completed the **Check Your Learning** boxes (with answers in Appendix D), complete the following self-study items from the end of the chapter. You can find the answers in Appendix C. DO NOT submit these items. They are for YOUR learning and review.

Clarifying the Concepts: 1.1; 1.3; 1.5; 1.7; 1.9; 1.11; 1.13

Calculating the Statistics: 1.15; 1.17; 1.19

Applying the Concepts: 1.21; 1.23; 1.25; 1.27; 1.29; 1.31; 1.33

Putting it all Together: 1.35

Written Assignment

Exercises at the end of Chapter 1:

NOTE: These are open-ended items in the printed text, but multiple-choice in Canvas. Sometimes a single “print” item has two or more parts to it. If there is no specification, complete all the parts. Sometimes as multiple-choice, they are further broken down. For example, 1.8 in “print” will be presented to you in Canvas as 1.8a and 1.8b.

Clarifying the Concepts: 1.2; 1.6; 1.8; 1.10; 1.14

Calculating the Statistics: 1.16; 1.20

Applying the Concepts: 1.24; 1.32

Putting it all Together: 1.34