

Statistical Foundations

EDUC – 6600



Fall 2022

Course Instructor

Dr. Mario I. Suárez

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Office Hours

MW 12:15-1:15pm or by [appointment](#)

Broadcast Sections

MB1 – Logan (44560)

NB1 – Orem (49226)

PB1 – Price (49199)

TB1 – Tooele (49200)

BB1 – Brigham City (49153)

CB1 – Southwest Centers (49415)

EB1 – Moab (49339)

KB1 – Kaysville (49263)

Course Dates and Time

Tuesdays 7:15-9:45pm

Location

ECERC 226 or your statewide site

Essential Questions for this Course

- What is quantitative research?
- How does data inform our world?
- How are data analyzed?

IDEA Objectives:

- Gaining factual knowledge (terminology, classifications, methods, trends)
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
- Learning to apply course material (to improve thinking, problem solving, and decisions)

Course Description:

Applied introduction to statistical methods commonly used in educational, social, and health sciences. Coverage of data types, data base creation, data exploration and visualization; use of statistical software to compute descriptive and inferential statistics, including correlation, regression, group comparisons (t-tests, ANOVA), and categorical methods.

Course Outcomes:

- Select and develop an appropriate data collection instrument for conducting social sciences research.
- Discuss the methods to assess issues in validity and reliability of measurement instruments.
- Utilize the appropriate descriptive and/or inferential statistics for analyzing data.
- Using SPSS/PC, run analyses required addressing a given set of research objectives.

- Interpret data and present results about a given set of data.

Course Resources:

- Course Website – We will be utilizing Utah State University’s Canvas system for course management. Assignments, readings, and grades will be posted on Canvas.
- Required textbooks:
 - Cohen, B. H. (2013). *Explaining Psychological Statistics*. Wiley. (E-book available on USU library webpage—you must sign into with your USU credentials)
 - <https://ebookcentral-proquest-com.dist.lib.usu.edu/lib/USU/detail.action?docID=1563061>
 - Publication Manual of the American Psychological Association, 7th Edition.
- Suggested textbooks:
 - Pyrczak, F. & Oh, Deborah M. O. (2018). *Making Sense of Statistics: A Conceptual Overview* (7th Edition). New York: Routledge. ISBN: 978-1-138-89476-1
 - Field, A. (2017). *Discovering statistics using SPSS, 5th edition*. London: SAGE Publications. [book website: <http://www.sagepub.com/field4e/>]
 - Terrell, S. R. (2021). *Statistics translated: A step-by-step guide to analyzing and interpreting data* (2nd ed.). New York: Guilford Press. [book website: <https://www.guilford.com/books/Statistics-Translated/Steven-Terrell/9781462545407>]
 - DeVellis, R. F. (2011). *Scale development: Theory and application* (4th edition). Los Angeles: SAGE Publications. [book website: <https://us.sagepub.com/en-us/nam/scale-development/book246123>]
 - Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th Edition). Los Angeles: SAGE Publications. [book website: <https://us.sagepub.com/en-us/nam/research-design/book255675>]
- Access to SPSS
 - Free access to SPSS: <apps.usu.edu>
 - Purchase student license: https://usu.service-now.com/usu/catalogs_home.do - \$81
 - Purchase student license at <studentdiscounts.com> – can purchase 6 month or longer license for as low as ~\$35

OVERVIEW OF COURSE/EXPECTATIONS AND PROCEDURES

Class Attendance

You should make every attempt to be at every class session. I hope that you will find the activities, discussions, and demonstrations helpful and insightful. Furthermore, the class lectures and activities will be absolutely essential for you to meet the requirements of some of the assignments in this course. However, as human beings, we sometimes get sick or have extenuating circumstances. Please remember, if you are feeling ill to contact the appropriate health services organization.

Class Participation

You are also expected to participate in class activities and discussions. Research demonstrates that the quality of the classroom environment depends on the interaction of the students and the teacher. This class will be highly interactive and discussion-based.

Assigned Readings

You are expected to read all required assignments for the week before class. Class discussions and participation in the group activities will not be effective unless readings are completed.

Assignment Deadlines

Assignments are due on the date they are listed in this syllabus unless officially changed by the instructor. All changes in assignment due dates will be confirmed via e-mail to all students. **No late work will be accepted.** If you have an extenuating circumstance, please notify the instructor prior to due dates. (Note: Some writing assignments may require multiple submissions. The new date listed on the feedback will count as the next deadline for that assignment.)

SYLLABUS RESOURCES

Faculty may include the following policies and procedures in their class syllabi and are encouraged to share them with their students

COVID-19 Classroom Protocols

While not mandated, USU encourages and welcomes the wearing of masks in all university buildings, especially within 6 feet of others. Furthermore, it is strongly encouraged to take measures to mitigate risk as recommended by federal and state public health officials. These measures include getting fully vaccinated, staying home if you are sick (even with mild symptoms), and maintaining good hygiene including frequent hand washing. Testing will be provided, without charge, throughout the semester and the [USU COVID Webpage](#) will provide up-to-date information. Please remember; COVID can have significant impact on the health and safety of those around you so remain vigilant and respectful.

Academic Freedom and Professional Responsibilities

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility. [USU Policy 403](#) further defines academic freedom and professional responsibilities.

Academic Integrity - "The Honor System"

The University expects that students and faculty alike maintain the highest standards of academic honesty. The Code of Policies and Procedures for Students at Utah State University ([Student Conduct](#)) addresses academic integrity and honesty and notes the following:

Academic Integrity: Students have a responsibility to promote academic integrity at the University by not participating in or facilitating others' participation in any act of academic dishonesty and by reporting all violations or suspected violations of the Academic Integrity Standard to their instructors.

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". Violations of the Academic Integrity Standard (academic violations) include, but are not limited to cheating, falsification, and plagiarism.

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 use 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.

Course Fees

Instructors that utilize course fees should identify the amount and explain the purpose of the course fee on the syllabus. Course fees are listed in the catalog.

Grievance Process

Students who feel they have been unfairly treated [in matters other than discipline, admission, residency, employment, traffic, and parking - which are addressed by procedures separate and independent from the Student Code] may file a grievance through the channels and procedures described in the Student Code: [Article VII Grievances](#)

Discrimination and Sexual Misconduct

USU strives to provide an environment for students and employees that is free from [discrimination](#) and [sexual misconduct](#). If you experience sexual misconduct or discrimination at any point during the semester inside or outside of class, you are encouraged to contact the [USU Title IX Coordinator](#) via Old Main room 161 in Logan, [435-797-1266](#), titleix@usu.edu, or at equity.usu.edu/report. You can learn more about the USU resources available for individuals who have experienced sexual misconduct at sexualrespect.usu.edu. Resources for individuals who have experienced discrimination are listed at equity.usu.edu.

Required Reporting of Sexual Misconduct

The instructor is designated by USU as a "[reporting employee](#)." This means that if you share information about [sexual misconduct](#) (sexual harassment, sexual assault, relationship violence, or sex-based stalking) with the instructor, they *will report* that information to the [USU Title IX Coordinator](#). The instructor is also required to tell you about [designated confidential resources](#), [supportive measures](#), and [how you can file a report](#) with the USU Title IX Coordinator.

Students with Disabilities

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn

101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Withdrawal Policy, "I" Grade Policy and Dropping Courses

If a student does not attend a class during the first week of the term or by the second class meeting, whichever comes first, the instructor may submit a request to have the student dropped from the course. (This does not remove responsibility from the student to drop courses which they do not plan to attend.) Students who are dropped from courses will be notified by the Registrar's Office through their preferred e-mail account.

Students may drop courses without notation on the permanent record through the first 20 percent of the class. If a student drops a course following the first 20 percent of the class, a W will be permanently affixed to the student's record (check General Catalog for exact dates). Students with extenuating circumstances should refer to the policy regarding Complete Withdrawal from the University and the Incomplete (I) Grade policy in the General Catalog.

No-Test Days Policy

For classes that meet for a full semester, a five-day period designated as "no-test" days precedes final examinations. During this time, no major examinations, including final examinations will be given in order that students may concentrate on classwork, the completion of special assignments, writing projects, and other preparation for duly scheduled final examinations. Approved exceptions include final papers, weekly chapter quizzes, quizzes, projects, and examinations associated with a lab that does not meet during final examinations. This policy does not apply to classes that meet only during the second 7-week session of the semester or to classes offered during the summer term. Complete information related to Final Examination Policies can be reviewed in the General Catalog.

Assumption of Risk

All classes, programs, and extracurricular activities within the University involve some risk, and some involve travel. The University provides opportunities to participate in these programs on a voluntary basis. Therefore, students should not participate in them if they do not care to assume the risks. Students can ask the respective program leaders/sponsors about the possible risks a program may generate, and if students are not willing to assume the risks, they should not select that program. By voluntarily participating in classes, programs, and extracurricular activities, students do so at their own risk. General information about University Risk Management policies, insurance coverage, vehicle use policies, and risk management forms can be found at <http://www.usu.edu/riskmgmt/>.

Mental Health

Mental health is critically important for the success of USU students. As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. Utah State University provides free services for students to assist them with addressing these and other concerns. You can learn more about the broad range of confidential mental health services available on campus at [Counseling and Psychological Services \(CAPS\)](#).

Students are also encouraged to download the [“SafeUT App”](#) to their smartphones. The SafeUT application is a 24/7 statewide crisis text and tip service that provides real-time crisis intervention to students through texting and a confidential tip program that can help anyone with emotional crises, bullying, relationship problems, mental health, or suicide related issues.

Land Acknowledgement Statement

As a land-grant institution, Utah State University campuses and centers reside and operate on the territories of the eight tribes of Utah, who have been living, working, and residing on this land from time immemorial. These tribes are the Confederated Tribes of the Goshute Indians, Navajo Nation, Ute Indian Tribe, Northwestern Band of Shoshone, Paiute Indian Tribe of Utah, San Juan Southern Paiute, Skull Valley Band of Goshute, and White Mesa Band of the Ute Mountain Ute. We acknowledge these lands carry the stories of these Nations and their struggles for survival and identity. We recognize Elders past and present as peoples who have cared for, and continue to care for, the land. In offering this land acknowledgment, we affirm Indigenous self-governance history, experiences, and resiliency of the Native people who are still here today.

For more information on syllabus resources, please contact:

Paul J. Barr

Vice Provost

Phone: (435) 797-0718

Email: paul.barr@usu.edu

WRITING EXPECTATIONS

This course assumes graduate-level competency in expression through writing. The course requires students to demonstrate proficiency in writing content and mechanics. Peer review and proofing among students is encouraged. *All assignments are expected to be word-processed.*

COURSE ASSIGNMENTS and EXPECTATIONS		Percent of Final Grade
Participation and Professionalism		10
Research Grid		10
Mid-term examination		15
T-Test/ANOVA Homework		10
Correlation Homework		10
Regression Homework		10
Dataset Review		10
Research Proposal		10
Final Examination		15
TOTAL		100

ASSIGNMENT DESCRIPTIONS

Participation and Professionalism (10% of your grade)

Attendance and in class participation are important. However, occasions arise where other activities take priority. If you plan to miss a class, please contact the instructor prior to class (unless it is an emergency). Frequent absences will be dealt with on a case-by-case basis. Assignments due on expected absences are still due on that due date. Excessive absences and lack of in class participation will result in an up to 10% reduction in professionalism. *Class participation and keeping up with course content is important. There may be times when in-class exercises will be assessed or (short) pop quizzes are given.*

Dataset Review (10% of your grade)

A major advantage of quantitative research is the ability to conduct secondary analysis of existing datasets. Oftentimes researchers develop a dataset to address specific research questions, but the resulting data can be used to conduct further and more contextual analysis. For example, if the American Cancer Society gathers data and publishes a report connecting smoking and lung cancer, a researcher conducting secondary analysis could get the same dataset and test whether the link was as strong for women as for men, or low-SES versus high-SES, or low-SES men/low-SES women. The possibilities are endless.

For this assignment find a freely available dataset and address the bullet points below.

- Overview
 - Who collected this data? Why was the data collected?
 - What previous secondary research has been conducted with the data
 - Ideally you would briefly review 3-5 studies if they are available
 - What is the unit of analysis (e.g., students, teachers, schools, adults, parents, principals)
 - What limitations and/or implications for research/practice are there for this data?
- Research Design
 - Identify four variables or composite variables that you would be interested in exploring further (must deal with a topic of interest to you in PK-12 or higher education)
 - Come up with a plausible research question based around these four variables
 - Ideally you would support this question with scholarship (i.e., review of literature, theory, etc.)
 - Consider how you could extend this question based on contexts available within the dataset (e.g., gender, race, community type, socioeconomic status)

Possible sources for data (you may find your own, but check with me for approval):

- Inter-university Consortium for Political and Social Research (ICPSR)
<https://www.icpsr.umich.edu/web/pages/ICPSR/index.html>
- Centers for Disease Control and Prevention (CDC)
 - Behavioral Risk Factor Surveillance System (BRFSS)
<https://www.cdc.gov/brfss/index.html>
- The General Social Survey (GSS) <https://gss.norc.org/>
- The National Longitudinal Study of Adolescent to Adult Health (Add Health)
<https://addhealth.cpc.unc.edu/>
- OECD Data <https://data.oecd.org/>

- Programme for International Student Assessment (PISA)—Literacy, mathematics, and more
- Teaching and Learning International Survey (TALIS)
- National Center for Educational Statistics (NCES) <https://nces.ed.gov/datatools/>
- International Association for the Evaluation of Educational Achievement <https://www.iea.nl/data-tools/repository>
 - International Civic and Citizenship Study (ICCS)
 - International Computer and Information Literacy (ICILS)
 - Progress in International Reading Literacy Study (PIRLS)
 - Trends in International Mathematics and Science Study (TIMSS)

Homework Assignments (10% each x 3)

Throughout this semester you will be asked to complete three homework assignments using SPSS to analyze existing datasets. You may conduct the analysis with the datasets and scenarios provided or use a dataset you are working with to run and report the analysis conducted in the homework assignment.

Research Grid (10% of your grade)

In this class, you should begin to understand the methods and finding sections of research publications within your area of interest. You must find a minimum of ten journal articles in your field with a quantitative component (look for numbers). Create a grid (on excel) that states the author, year, journal, major research questions, the major constructs (IV or DV), the different statistical methods, and brief summary of findings. Finally, write a roughly one-page response on how the statistical information provided an insight into the research questions (in other words, what did we learn within these studies that we didn't already know?).

Research Proposal (10% of your grade)

In order to use the information beyond the course, you will need to develop and write a research proposal merging many of the central concepts of the paper. Make sure to use the APA Manual 7th Edition Chapter 3 guidelines for reporting quantitative research. The paper should include at least the following:

- Brief Literature Review/Theoretical Framework
 - What will this research accomplish? How will it inform the literature? What gap(s) are you trying to fill?
- Testable research questions/Hypothesis (with brief description relating to literature review)
- Methods Section
 - Describe the dataset (and why this is useful to answer your research questions)
 - What is your population, ideal sample size, unit of analysis, how you could collect the data (or describe your data if it is secondary analysis)
 - Which variables are you using (identify DV and IV(s)), how are they coded, what is the prompt
 - What is the latent variable(s) you are exploring (if applicable)?
 - If this is not a secondary analysis, follow the basic guidelines put forth by DeVellis up until you have to actually collect the data.
 - Which statistical methods are you going using and why? Write a data analysis plan. You can use graphs, means, crosstabs, or any of the inferential statistics.

- Provide a justification for the methods you are using and how you would interpret them
- Brief Discussion and Conclusion
 - This section should connect your results back to your literature review. How might your results inform the pre-existing literature? What do you have to teach the world?

Examinations (15% for Mid-term and 15% for Final)

This course will have two examinations. The first will take occur at the mid-point of the semester and the second will be a final comprehensive examination. They will take place on Canvas using Proctorio, USU’s secure proctoring system. If you need to use the USU Testing Center or Disability Resource Center, please let me know at least a week in advance.

Final examination opt-out: A student may produce a research study manuscript based on the data they reviewed earlier in the semester. This will require you to conduct actual data analysis, interpretation, and write-up, along with a literature review (use APA Manual 7th Edition). This can incorporate aspects of your data review, homework, and research proposal. If this is something you want to do, talk to Dr. Suárez for approval—you must select a journal you want to submit the paper to for review and seek approval from me.

GRADING SCALE (Percent)

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 dividing the student’s total points earned by the total number of possible points:

93 – 100%	A	80 – 82.9%	B-	67 – 69.9%	D+
90 – 92.9%	A-	77 – 79.9%	C+	60 – 66.9%	D
87 – 89.9%	B+	73 – 76.9%	C	0 – 59.9%	F
83 – 86.9%	B	70 – 72.9%	C-		

COURSE OUTLINE AND SCHEDULE

Course schedule is subject to change due to availability of resource persons and students' learning needs.

Wk.	Date	Class Objective/Topic	Readings and Assignments
1	August 30	Course Introduction <ul style="list-style-type: none"> • Models of Quantitative Research • Data use in the real world 	Cohen Ch. 1 Creswell (On Canvas) Gillborn (On Canvas)
2	September 6	Introduction to Statistical Terminology <ul style="list-style-type: none"> • Generating hypotheses, collecting data, analyzing data, sampling, reporting data, the structure of quantitative article research. 	<ul style="list-style-type: none"> • Cohen Ch. 2 • DeVellis Ch. 2
3	September 13	Statistical Terminology Continued <ul style="list-style-type: none"> • Hypothesis testing, Populations and samples, descriptive vs. inferential statistics, effect sizes, confidence intervals, validity and reliability. • Understanding Statistical Tables and Figures 	<ul style="list-style-type: none"> • Cohen Ch. 3 • Pyrczak Part C. (On Canvas)
4	September 20	Reviewing Research <ul style="list-style-type: none"> • Reviewing research questions • Understanding measures • Types of tables • Understanding findings 	<ul style="list-style-type: none"> • Bring your articles! • <i>Research Grid Due</i> • DeVellis Ch. 5 • Cohen Ch. 8 (Statistical Power)
5	September 27	Introduction to the SPSS Environment: <ul style="list-style-type: none"> • Variable Set-up, Labeling, Transformations, Inclusions/Exclusions • Introduction to Creating Tables and Text for Manuscripts • Working with syntax (For serious people) 	<ul style="list-style-type: none"> • Cohen Ch. 4 (A little here) • Cohen Ch. 5 (Mostly here)
6	October 4	Testing Assumptions with SPSS <ul style="list-style-type: none"> • Standardized Scores • Measures of Central Tendencies and Variability: the 3 M's, Standard Deviation, Distribution, Graphs/Plots • Cronbach's Alpha 	<ul style="list-style-type: none"> • Field Ch. 5 (One of the most important chapters of the course) • Cohen Ch. 6 • <i>Dataset Review Due</i>
7	October 11	Correlations	<ul style="list-style-type: none"> • Cohen Ch. 9 • Pyrczak Part D
8	October 18	Midterm Examination	Midterm exam on Proctorio
9	October 25	Linear Regression <ul style="list-style-type: none"> • Review of Hypothesis Testing and Errors 	<ul style="list-style-type: none"> • Cohen Ch.10 • <i>Correlation Homework Due</i> • Pyrczak Part E
10	November 1	T-tests <ul style="list-style-type: none"> • Non-parametric comparisons: Mann-Whitney, Wilcoxon signed-rank 	<ul style="list-style-type: none"> • Cohen Ch. 7 • Cohen Ch. 11
11	November 8	Analyses of Variance: ANOVA, ANCOVA, <ul style="list-style-type: none"> • MANOVA, etc • Post-hoc Analyses • Kruskal-Wallis test, Friedman's ANOVA 	<ul style="list-style-type: none"> • Cohen Ch. 12, Ch. 13 • Pyrczak Part F. • <i>Regression Homework Due</i>

Wk.	Date	Class Objective/Topic	Readings and Assignments
12	November 15	• Research proposal – Individual Meetings (No class meeting)	• Sign up beforehand for a time slot
13	November 22	Thanksgiving Break	
14	November 29	Longitudinal data analysis/Repeated Measures	• Cohen Ch. 15 <i>T-test/ANOVA Homework Due</i>
15	December 6	Categorical Data Analysis - Chi-square, assumptions, loglinear, logistic regression Research proposal roundtables	• Cohen Ch. 20 • <i>Research proposal due</i>
F	December 13	Final Examination	Final Exam on Proctorio

** check Canvas weekly for additional readings