George Mason University
College of Education and Human Development
Educational Psychology and Research Methods

EDRS 811.002 – Quantitative Methods in Educational Research
3 Credits, Fall 2022
Mondays, 4:30-7:10 PM
Thompson Hall L014

Faculty

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Prerequisites/Corequisites

B- or higher and satisfactory completion of EDRS 810. Successful completion of EDRS 620 (or its equivalent) or permission of instructor. *Note: The first few weeks of the semester will be a review of material that you have already been exposed to (principles of research, descriptive statistics, normal distribution, hypothesis testing).*

University Catalog Course Description

Emphasizes advanced methods of conducting research using quantitative methods of data collection, and analysis appropriate for research in education. Includes design of experimental and quasi-experimental research studies, and methods of analysis appropriate to these studies, including analyzing variance and multiple linear regression.

Course Overview

The purpose of this course is to develop students' understanding of statistical ideas and procedures required for conducting statistical analyses and applications of quantitative methods in the practice of educational research. The course will reinforce and build upon concepts and skills acquired in EDRS 620. Students will learn through a combination of reading assignments, hands-on experience in using a computer program for data analysis, and application activities. Students will be expected to identify and report on quantitative methods used in published research (i.e., journal articles), to analyze data using the R software, and to provide written report of methodology and results.

Course Delivery Method

The class sessions will include lecture, small group discussion, and discussion of R outputs. Questions are encouraged. The lab portion of the class will provide time for hands-on computer work that is directly related to the homework and course goals.

Learner Outcomes or Objectives

This course is designed to enable students to do the following:
(1) Understand the logic of hypothesis testing, type 1 and 2 error, and statistical power;
(2) Demonstrate a conceptual understanding of the following statistical techniques: one-way, two-way, and three-way ANOVA, part and partial correlation, ANCOVA, and simple and multiple regression;
(3) Demonstrate via linear equation and explain each of the techniques listed above in terms of the general linear model;
(4) Select and justify an appropriate test statistic for a particular hypothesis;
(5) Explain and examine underlying assumptions of each analysis as well as make recommendations for analysis if the assumptions are not upheld;
(6) Develop R computer skills necessary for conducting statistical analyses;
(7) Write-up reports of statistical analyses using correct APA format;
(8) Read, understand, and interpret results of all analyses covered in the course.

Professional Standards

Not Applicable

Required Texts

(1) Hahs-Vaughn, D., Lomax, R. (2020). *An Introduction to Statistical Concepts* (4th ed.). New York: Routledge, https://doi-org.mutex.gmu.edu/10.4324/9781315624358

(2) Access to R software (https://www.r-project.org). R is free and open source. R can be installed on almost any computer with any operating system (e.g., Windows, Mac, Linus). There are also computer labs on campus that provide access to R. [You will get information about how to access and download R in class.] Also, R Studio (https://www.rstudio.com/products/rstudio/download/).

(3) A simple nonprogrammable calculator that has a square root function.

Recommended Resource

American Psychological Association (2019). Publication Manual of the American Psychological Association (7th Ed.). APA.

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, Tk20, hard copy).

- **Assignments and/or Examinations**
  - **Online Quizzes (10%)**: There will be a short quiz posted on Blackboard after the meetings. The quizzes are composed of short answer and multiple-choice items which will cover the basic concepts presented in class and in the textbook. These quizzes are designed to provide you (and me) with feedback about your course

progress. Your quiz score cannot lower your overall course grade (unless you have received 0's on quizzes due to failure to complete them). You must complete the online quiz by Sundays at midnight.

- **Homework Assignments (20%)**: You will have 6 homework assignments. Assignments will be posted on Mondays. All assignments need to be completed by Sundays at midnight. No late assignments will be accepted. Some questions will ask you to explain statistical concepts, some will ask you to work out problems, and others will require you to run analyses using R and interpret results. You should show all of your work for any problem that you complete and include appropriate computer printouts (please cut and paste from R to Word). You may work together on your assignments; however, students should submit their own independent write-up of results.
- **Exams (50%)**: The two exams will cover the material from the class and textbook and include multiple choice and short answer questions as well as interpretation of SPSS/R output. The midterm exam is worth 25% and the final exam is worth 25%.
- **Understanding Research Article Methods/Analysis (10% each -- 20%total)**: Students will complete two article critiques with a particular emphasis on the research questions, methods, analysis, and results. For the first article critique, students will respond to a series of questions using an article that has been selected by the instructor. For the second article critique, each student may select from options provided by the instructor or identify an empirical journal in the student's area of interest that includes the required statistical tests. Students will read the entire article, identify key components of the methods/analysis and write a short commentary/critique (3 pages maximum) of the Methods & Analysis section. Helpful hint: Pay attention to the methods and analyses sections of articles from other courses or research projects. These are great candidates for this course requirement.

- **Other Requirements**
  - **Participation**: Students are encouraged to ask their own questions or reply back to the instructor's comments, or share their thoughts on other students' questions on BB Discussion Board at least once every week.
- **Grading**

  Grades will be assigned based on the following:

A+	98-100%	B+	88-89%	C	70-79%
A	93-100%	B	83-87%	F	below 70%
A-	90-92%	B-	80-82%		

Professional Dispositions

See https://cehd.gmu.edu/students/polices-procedures/

Class Schedule

Date	Class	Topic	Reading/Due
8/22	1	Review of ▪ Data ▪ Descriptives & Central Tendency ▪ Introduction to SPSS/R/RStudio	▪ Ch. 1-3 (up to 3.2) (some 810 review) ▪ *1.4, 1.5, 2.4, 3.2 ▪ Quiz posted
8/29	2	▪ Variability ▪ Standardized Scores	▪ Ch. 3 (3.3-end) ▪ Ch. 4 ▪ Quiz posted
9/5		*Labor Day (University Closed)*	
9/12	3	▪ Distribution of Sample Means ▪ Standard Error ▪ Hypothesis testing	▪ Ch. 5-6 (6.1-6.3) ▪ *5.2, 6.1 ▪ Quiz posted ▪ Homework 1 posted
9/19	4	▪ Effect Size, Power, Confidence Intervals ▪ T-tests (single-sample)	▪ Ch. 6-7 (start 6.4) ▪ *7.1, 7.5 ▪ Quiz posted
9/26	5	▪ T-tests (two-sample independent and dependent)	▪ Ch. 7 & 11 ▪ *11.1, 11.3, 11.6 ▪ Quiz posted ▪ Homework 2 posted
10/3	6	▪ ANOVA	▪ Ch. 8 (8.2-end) ▪ Quiz posted ▪ Homework 3 posted ▪ Article Critique 1: I'll share an article with you **(Due is 10/30)**
10/11 (Online Asynchronous)	7	▪ ANOVA (left overs) ▪ Chi-square	▪ Ch. 12
10/17	8	▪ Catch-up & Review	
10/24	9	***Midterm Exam***	
10/31	10	▪ Factorial ANOVA	▪ Ch. 13 ▪ *13.1 ▪ Quiz posted
11/7	11	▪ Factorial ANOVA (cont.) ▪ Correlation and Regression	▪ Ch. 10 & 17 ▪ *10.1, 17.1-17.2 ▪ Homework 4 posted ▪ Quiz posted ▪ Article Critique 2: Send me an article you selected for my review/approval **(Due is 12/4)**
11/14	12	▪ Multiple Regression	▪ Ch. 18 ▪ *10.1, 17.1-17.2 ▪ Quiz posted
11/21	13	▪ Multiple Regression (cont.)	▪ Ch. 18 ▪ Quiz posted ▪ Homework 5 posted
11/28	14	▪ ANCOVA	▪ Ch. 14 ▪ *14.1 ▪ Quiz posted ▪ Homework 6 posted
12/5	15	▪ Repeated Measures ▪ Catch-up & Review	▪ *15.4 only
12/12		***Final Exam***	

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: http://cehd.gmu.edu/values/.

GMU Policies and Resources for Students

Policies

- Students must adhere to the guidelines of the Mason Honor Code (see https://catalog.gmu.edu/policies/honor-code-system/).
- Students must follow the university policy for Responsible Use of Computing (see https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see https://ds.gmu.edu/).
- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to VIA should be directed to viahelp@gmu.edu or https://cehd.gmu.edu/aero/assessments . Questions or concerns regarding use of Blackboard should be directed to https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/.
- For information on student support resources on campus, see https://ctfe.gmu.edu/teaching/student-support-resources-on-campus

Notice of mandatory reporting of sexual assault, sexual harassment, interpersonal violence, and stalking:

As a faculty member, I am designated as a "Non-Confidential Employee," and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, and stalking to Mason's Title

IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance or support measures from Mason's Title IX Coordinator by calling 703-993-8730, or emailing titleix@gmu.edu.

For additional information on the College of Education and Human Development, please visit our website https://cehd.gmu.edu/students/ .