

EDRS 811: Quantitative Methods in Educational Research (3 credits)
Spring 2023



Course Time: Monday 4:30-7:10 pm
Course Location: Thompson L014

Instructors

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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 Description: 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 R/R studio, and to provide written report of methodology and results.

Prerequisite: B- or higher and satisfactory completion of EDUC 810 or equivalent required. Successful completion of EDRS 620 (or its equivalent) recommended. *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).*

Learning Outcomes: This course is a one-semester statistics course design to expand students' understanding of ANOVA techniques and an introduction to regression analyses. By the end of the semester, it is expected that you will be able to:

- a. understand the logic of hypothesis testing, type 1 and 2 error, and statistical power;
- b. 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;
- c. Demonstrate via linear equation and explain each of the techniques listed above in terms of the general linear model;
- d. Select and justify an appropriate test statistic for a particular hypothesis;
- e. Explain and examine underlying assumptions of each analysis as well as make recommendations for analysis if the assumptions are not upheld;
- f. Develop R/R studio computer skills necessary for conducting statistical analyses;

- g. Write-up reports of statistical analyses using correct APA format;
- h. Read, understand, and interpret results of all analyses covered in the course.

Course Format: The class sessions will include lecture, small group discussion, and discussion of R output. **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.

Required Materials:

- (1) Lomax, R. G. & Hahs-Vaughn, D. L. (2020) *An Introduction to Statistical Concepts*, 4th Ed. NY: Routledge. ISBN: 978-1-138-65055-8
- (2) Access to R/Rstudio. R software is free download: <https://www.r-project.org/>. There are videos provided on Bb that walk you through the installation and basic usage of R/Rstudio. There are also computer labs on campus that provide access to R/Rstudio. It is the student's responsibility to ensure access to R/Rstudio outside of class time as there will not be sufficient time in class to complete required assignments.
- (3) A simple nonprogrammable calculator that has a square root function. A phone will work fine for homework assignments; however your phone may NOT be used during exams.

Recommended Resource:

American Psychological Association (2020). *Publication Manual of the American Psychological Association (7th edition)*. Washington, DC: APA.

Class Attendance & Participation: Students are expected to come to class on time, complete assignments, and participate in class discussions.

Class Preparation: Information on course assignments, weekly quizzes, and notes for class lectures are available on the course Blackboard site. For assistance with Blackboard students may email courses@gmu.edu, call (803) 993-3141, or go to Johnson Center Rm 311 (office hours: 8:30 am-5 pm). For general technical assistance, students may call (703) 993-8870 or go to the counter in Innovation Hall.

Statistics Study Tips:

- 1 Read widely; then read some more.
- 2 'Google' difficult concepts. There is lots of helpful statistical information on the web.
- 3 Check for understanding frequently. This means that when a formula is presented, take time to see if you can explain how the formula works. If Greek letters are difficult for you, write out what each letter means.
- 4 Develop examples of research questions and hypotheses that are appropriate for each statistical technique.
- 5 Form a study group.
- 6 Start the homework as soon as possible after class; waiting until the night before it is due does not help you process the material.

ASSESSMENT:

- **Online Quizzes (10%):** Each week (beginning class 2) there will be a short quiz posted on Blackboard. The quizzes are composed of short answer and multiple choice items which will cover the basic concepts presented in class and in the textbook. Quizzes are timed (usually 25

minutes) and must be completed during the specified time period. 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 midnight the day before class meets. You are encouraged to take the quizzes soon after the class meeting; the purpose of the quiz is to help you to isolate key concepts from the class period and to focus your study time.

- **Homework Assignments (30%):** You will have 6 homework assignments. Assignments will be posted on Blackboard following the lecture on the homework topic(s). All assignments need to be completed by the beginning of the class on the due date. 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/Rstudio 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 software output to Word**). You may work together on your assignments; however, you should submit your own independent write-up of results.
- **Understanding Research Article Methods/Analysis (10%):** You will respond to a series of questions using an article that has been selected for you early in the semester. Next, you will select one empirical journal article that reports on the results of a quantitative research project that is related to your area of interest for *one of the of methods of analysis* covered this semester: ANOVA (one-way, repeated, factorial, or ANCOVA), or Multiple Regression]. You will read the entire article, identify key components of the methods/analysis and also write a short commentary/critique (**3 pages maximum**) of the Methods, Results & Discussion sections. Helpful hint: *Pay attention to the methods and analyses sections of articles that you are reading for other courses or for research projects. These are great candidates for this course requirement.*
- **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 output. The midterm exam is worth 20% and the final exam is worth 30%.

Grading Scale: 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%		

Final grades are based in the assessments described above. “Extra credit” is NOT available.

Late Assignments: *As a general rule, late papers/homework will not be accepted.* If you believe you have EXCEPTIONAL circumstances and wish to negotiate to have extra time to complete course work, you must discuss this with me before the day the assignment is due. (Negotiating means that you will be sacrificing a portion, perhaps substantial, of your grade for extra time).

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.

Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times.

Core Values Commitment

The College of Education & 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/>.

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

Tentative Course Schedule

Date	Class	Topic	Reading/Due
1/23	1	Review: Data, Descriptives & Central Tendency, Variability Intro to R/Rstudio	Ch. 1-3(up to 3.2) (some 810 review) *1.4, 1.5,2.4, 3.2
1/30	2	Standardized Scores, Distribution of Sample Means	Ch. 3 (3.3-end) Ch. 4
2/6	3	Standard Error, Hypothesis Testing Effect Size	HW #1 Ch. 5-6 (6.1-6.3) *5.2, 6.1
2/13	4	Power, T-tests (single sample)	Ch. 6-7 (start 6.4) *7.1, 7.5
2/20	5	T-Tests (Ind/ Dep)	HW#2 Ch.7 & 11 *11.1, 11.3, 11.6
2/27	6	ANOVA	Ch. 8- 8.2 – end Directed Critique Due
3/6	7	ANOVA (left overs) Catch-up and Review	Ch 12 HW #3
3/13		Spring Break	
3/20	8	Mid-term Exam	
3/27	9	Chi-square	
4/3	10	Factorial ANOVA	Ch. 13 *13.1
4/10	11	Factorial ANOVA (cont.) ANCOVA	Ch. 10 & 17 *10.1, 17.1-17.2 HW #4
4/17	12	Correlation & Simple Regression	Ch. 18 HW#5
4/24	13	Multiple Regression	
5/1	14	Multiple Regression (cont.)	Ch. 14 *14.1
	15	Repeated Measures Catch-up & Review	HW #6 *15.4 only
5/8		Reading Day	Article Results Due
5/15	15	FINAL EXAM	