

George Mason University
College of Education and Human Development
Ph. D. in Education and Human Development

EDRS 811 - 002: Quantitative Methods in Educational Research
(3 Credits), Spring 2022
Thursday 10:30am - 1:10 p.m. Thompson Hall L014 (Fairfax Campus)

Instructor: Marvin Powell, Ph. D.

Office Hours: by appointment

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Prerequisite: B- or higher and satisfactory completion of EDUC 810 or equivalent required. Successful completion of EDRS 620 (or its equivalent) recommended or permission of instructor. *Note: The first few weeks of the semester will be a review of material that you have already been exposed (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 Statistical Package for Social Sciences (SPSS) and/or R Environment 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 SPSS and/or 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.

Learning Objectives: 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 SPSS and/or R 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.

Required Materials:

- (1) Hahs-Vaughn, D. L. & Lomax, R. G. (2020). *An introduction to statistical concepts* (4th Ed.). Routledge. ISBN: 978-1-315-62435-8
- (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, Linux). There are also computer labs on campus that provide access to R. Also R Studio (<https://www.rstudio.com/products/rstudio/download/>).
- (3) A simple nonprogrammable calculator that has a square root function.
- (4) Access to SPSS software. There are computer labs on campus that provide access to SPSS. You can access SPSS software through GMU's virtual computer library at www.vcl.gmu.edu. Information about how to use the virtual computer library is available at http://itservices.gmu.edu/services/view-service.cfm?customel_dataPageID_4609=5689. It is the student's responsibility to ensure access to SPSS outside of class time as there will not be sufficient time in class to complete required assignments.

Recommended Resource:

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

Course Performance Evaluation:

Online Quizzes (10%): Each week (beginning week 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. 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 (20%): 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 SPSS 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 in APA format**). You may work together on your assignments; however, you should submit your own independent write-up of results.

Understanding Research Article Methods/Analysis (15%): You will also 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 *each* of 2 categories of methods of analysis covered this semester. [5% each-i. Directed Critique (article provided), ii. ANOVA (one-way, repeated, factorial, or ANCOVA), and iii. Multiple Regression]. You will read the entire article, identify key components of the methods/analysis and write a short commentary/critique (**2 pages maximum**) of the Methods & Analysis section. 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 (55%): 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 and/or R output. The midterm exam is worth 25% and the final exam is worth 30%.

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 (9703) 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 Complete as many questions/problems as possible at the end of the chapters.
- 5 Develop examples of research questions and hypotheses that are appropriate for each statistical technique.
- 6 Form a study group.
- 7 Start the homework as soon as possible after class; waiting until the night before it is due does not help you process the material.

Grading Scale: Grades will be assigned based on the following:

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|----|---------|----|--------|---|-----------|
| A+ | 98-100% | B+ | 88-89% | C | 70-79% |
| A | 93-97% | 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).

Professional Dispositions: Students are expected to exhibit professional behaviors and dispositions at all times. See <https://cehd.gmu.edu/students/policies-procedures/>

Tentative Course Schedule

| Date | Class | Topic | Reading/Due |
|-------|-------|--|--|
| 01/26 | 1 | Review: Data, Descriptives & Sampling Distributions Intro to R | Ch. 1-3 *1.4, 1.5, 2.4, 2.6, 3.2-3.3, 3.5 |
| 02/02 | 2 | Review: Distributions & Standardized Scores Intro to R | Ch. 4 |
| 02/09 | 3 | Standard Error, Hypothesis Testing, Power | HW #1 Ch. 5-6 *5.2, 6.1, 6.3-6.6 |
| 02/16 | 4 | Effect Size, Confidence Intervals, T-test (single, independent, dependent) | Ch. 7 |
| 02/23 | 5 | T-Tests (cont.) & Chi-square | HW #2 Ch. 7 & 8 *8.1,8.2,8.4, 8.8 |
| 03/02 | 6 | ANOVA | Ch. 11 *11.1, 11.3,11.5-11.6 Directed Critique Due |
| 03/09 | 7 | Review & Catch-up | HW #3 |
| 03/16 | 8 | SPRING BREAK | |
| 03/23 | 9 | Mid-term Exam | |
| 03/30 | 10 | Multiple Comparison Factorial ANOVA | Ch. 12-13 *12.1,12.3,12.4 13.1,13.5,13.8 |
| 04/06 | 11 | ANCOVA | HW #4 Ch. 14 *14.1,14.3,14.5-14.6 |
| 04/13 | 12 | Correlation & Simple Regression | Ch. 10 & 17 *10.1, 10.3,10.6, 17.1-17.2, 17.4, 17.6-17.7 Article Results ANOVA Due |
| 04/20 | 13 | Multiple Regression | HW #5 Ch.18 *18.1-18.2,18.4,18.6,18.7 |
| 04/27 | 14 | Repeated Measures Catch-up & Review | Ch. 15 *15.4, 15.7, 15.10 HW #6 |
| 05/04 | 15 | 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 <http://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 <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursesupport.gmu.edu/>.
- 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 information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

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