Advanced Application of Quantitative Methods

George Mason University, Graduate School of Education

Dr. Dimiter Dimitrov Fall**, 2004**
EDRS 821 001
Class Meeting: Innovation Hall, Room 211; Thursday, 4:30 0 – 7:10 PM
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Office Hours: T, TH 10:00 – 11:30 am **E-mail:** ddimitro@gmu.edu
Other hours may be arranged by appointment.

Course Description

This course will provide advanced study of applications of quantitative methods in the practice of educational research and will reinforce and build upon concepts and skills acquired in EDRS 811. It will employ a modular approach and will contain advanced study of techniques appropriate to analysis of data from tests and surveys; group-experimental and quasi-experimental design; selected multivariate procedures and factor analysis. Students will learn through a combination of text reading assignments, critical analysis of professional journal articles, 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 (articles), to collect and analyze data using the Statistical Package for Social Sciences (SPSS), and to provide written reports of methodology and results.

Prerequisites: Successful completion of EDRS 811 (or its equivalent) or permission of instructor.

Course Objectives

Upon successful completion of the course, students should be able to:

1. Analyze test and survey data using appropriate procedures and indexes such as item difficulty, item discrimination, score reliability, and criterion-related validity.
2. Develop univariate factorial designs with between-subjects and within-subjects (repeated measures) factors, conduct the data analysis, and interpret results associated with main and interaction effects.
3. Develop multiple regression models, conduct the analysis, and interpret the results.

4. Develop logistic regression models, conduct the analysis, and interpret the results.
5. Develop multivariate factorial design (for the comparison of two or more groups on a set of two or more dependent variables), conduct the analysis, and interpret the results.
6. Understand the principles of exploratory and confirmatory factor analysis and interpret results obtained trough computer applications in factor analysis.

Course Methodology: This course consists of lectures, large group discussion, in class activities, and individual/group assignments.

Required Texts

Mayers, J. L. & Well, A.D. (2003). Research Design and Statistical Analysis (2nd ed.). Lawrence Erlbaum. ISBN: 0-8058-4037-0

Course Requirements: It is expected that each of you will:
(1) Read all assigned materials for the course.
(2) Participate in classroom activities that reflect critical reading of materials.
(3) Complete two in class assignments and HW assignments.
(4) Design and conduct a pilot research study
(5) Present the pilot research study in class in a poster format.
(6) Write a critical analysis of an article from a professional journal that applies methods discussed in this course.
(7) Attend each class session.

Course Evaluation

1. In class/Homework Assignments: Students will be asked to work individually on homework assignments throughout the semester.

2. Midterm Examination (Closed books and notes)

3. Pilot Research Study: This course requires students to develop and conduct a pilot-research study in an educational setting. This study is intended to reflect what you have learned from this course. It should be written in a way that one would submit for a national professional conference paper presentation. Other requirements for this course are designed to build up bases for the final pilot research proposal. Research papers must be handed in on time and must adhere to the APA Publication Manual Guidelines.

This pilot research study will be divided into 6 sequential parts.

1. Identify broad topic of interest; conduct a literature review; discuss significance of the proposed study; state purpose and hypotheses.

2. Methods- describe sample; identify measures to test hypotheses; discuss procedures and design of the study.
3. Data collection.
4. Data analysis.
5. Write the results section.
6. Discussion and Conclusion.

The presentation of the final paper will take place the last day of class in a poster session format. The pilot research study presentation will follow AERA poster presentation guidelines. Please see guidelines posted on the AERA website, www.aera.net.org. After completing the research study, reflect on that experience. What did you learn from it? How do you think course material helped you carry out the study?

4. Critical analysis of a journal article. The critical analysis should include the following parts: purpose, methods, results, and critical comments as well as your reflections about the article

5. Final Examination: Semi-comprehensive (closed books and notes) examination

6. Class Participation and Attendance Policy: Because of the importance of lecture and discussion to your total learning experience, I wish to encourage you to both attend and participate in class regularly. Attendance, punctuality, preparation, and active contribution to small and large group efforts are essential. These elements of your behavior will reflect the professional attitude implied in the course goals and will account for 10% of your course grade. With reference to the grading scale described later in this syllabus, you will note that this percentage is equivalent to a full letter grade. Students who must miss a class must notify the instructor (preferably in advance) and are responsible for completing all assignments and readings for the next class.

RUBRIC FOR PARTICIPATION AND ATTENDANCE

		LEVEL OF PERFORMANCE		
ELEMENT	**Distinguished (9-10 pts.)**	**Proficient (8 pts.)**	**Basic (7 pts.)**	**Unsatisfactory (6 or less pts.)**
Attendance & Participation	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence, the student actively participates and supports the members of the learning group and the members of the class.	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence; the student makes active contributions to the learning group and class.	The student is on time, prepared for class, and participates in group and class discussions. The student attends all classes and if an absence occurs, the procedure outlined in this section of the syllabus is followed.	The student is late for class. Absences are not documented by following the procedures outlined in this section of the syllabus. The student is not prepared for class and does not actively participate in discussions.

Grading Policy

Class Participation and Attendance Individual Homework Assignments	10 pts. 10 pts.
Critical Analysis of a Journal Article	15 pts
Pilot Research Study	30 pts
Midterm Examination	15 pts.
FINAL EXAMINATION	20 pts.
TOTAL	**100 pts**

Letter grades will be assigned as follows:

A+	98-100%	A	93-97.49%	A-	90-92.49%
B+	88-89.49%	B	83-87.49%	B-	80-82.49%
C	70-79.49%	F	below 70%		

Honor Code

All evaluations and homework will be taken under the GMU Honor Code. Students are expected to abide by the honor code set forth in the current edition of the Student Handbook. All exams, assignments and papers are honor work. That means that students must not give nor receive any unauthorized assistance. While members of a team may collaborate on written paper assignments, they may not give or receive assistance from other teams. Plagiarism is also a violation of the honor code. The University's Honor Code guidelines for academic honesty are at: http://mason.gmu.edu/~montecin/plagiarism.htm

Learning Disabilities

Students with any type of documented disability that may interfere with their learning in this class may negotiate a reasonable accommodation with the instructor. If you have not contacted the Office of Disability Services, and you have a disability please make sure to register for services.

GSE Statements of Expectations

The Graduate School of Education (GSE) expects that all students abide by the following:

Students are expected to exhibit professional behavior and dispositions. See gse.gmu.edu for a listing of these dispositions.

Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#TOC_H12 for the full honor code.

Students must agree to abide by the university policy for Responsible Use of Computing. See http://mail.gmu.edu and click on Responsible Use of Computing at the bottom of the screen.

Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

EDRS 810: Tentative Course Organization and Schedule

DATE	TOPIC	ASSIGNED READING	MODULE
Sept. 2	Introduction; discussion of syllabus; Basic statistical and measurement concepts (scales, distributions, transformations, hypothesis testing, confidence intervals)	Chapters 1 & 2.	**Module 1**: Analysis of data from tests or surveys
Sept. 9	Item analysis for tests and surveys. Score Reliability Validity.	Handouts	Module 1
Sept. 16	Hypothesis testing: Comparison of two (independent or dependent) groups). SPSS applications.	Chapters 5 & 6	**Module 2**: Experimental and Quasi-Experimental Design
Sept. 23	Between-subjects designs: one (fixed or random) factor. Contrast among means	Chapters 8 & 9	Module 2
Sept. 30	Contrasts among means (cont.) Trend analysis.	Chapters 9 & 10	Module 2
Oct. 7	Two-way and three-way analysis of variance (ANOVA) with fixed factors, random factors, or both (fixed and random) factors.	Chapter 11 Handouts	Module 2
Oct. 14	Repeated measures designs	Chapter 13 Handouts	Module 2
Oct. 21	**MIDTERM EXAMINATION**		
Oct. 28	Analysis of covariance	Chapter 15	Module 2

Nov. 4	Correlations. Multiple linear regression analysis.	Chapters 18 & 19 Handouts	Module 2
Nov. 11	Multivariate analysis of variance (MANOVA)	Chapter	**Module 3**: Selected Multivariate Procedures
Nov. 18	Principles of exploratory factor analysis	Handouts	Module 3
Dec. 2	Principles of confirmatory factor analysis.	Handouts	Module 3
Dec. 9	RESEARCH PROJECT PRESENTATION		
Dec. 16	**FINAL EXAMINATION**	Semi-comprehensive	

Additional References

Textbooks:

Stevens, J. P. (2002). Applied multivariate statistics for the social sciences (4th ed.). Lawrence Erlbaum. Mahwah: NJ. ISBN: 0-8058-3777-9.

Journal articles:

Busemeyer, J.R. (1980). The importance of measurement theory, error theory, and experimental design for testing the significance of interactions. *Psychological Bulletin, 88,* 237-244.

Chow, S.L. (1988). Significance test or effect size? *Psychological Bulletin*, *103*, 105-110.

Dimitrov, D. M., & Rumrill, P. (in press). Multivariate methods in rehabilitation research. *WORK: A Journal of Prevention, Assessment, & Rehabilitation. (Handouts)*

Dimitrov, D. M., & Rumrill, P. (2003). Pretest-posttest designs in rehabilitation research. *WORK: A Journal of Prevention, Assessment, & Rehabilitation, 20(2)*, 159-165.

Dimitrov, D.M., Fitzgerald, S., & Rumrill, P. (2000). Multiple regression in rehabilitation research. *WORK: A Journal of Prevention, Assessment, & Rehabilitation, 15(3)*, 209-215.

Hedges, L.V. (1982). Estimation of effect size from a series of independent experiments. Psychological Bulletin, 92, 490-499.

Huberty, C. J., & Morris, J.D. (1989). Multivariate analysis versus multiple univariate analyses. *Psychological Bulletin, 105(2),* 302-308.

Maxwell, S.E., Delaney, H. D., & Dill, C.A. (1984). Another look at ANCOVA versus blocking. *Psychological Bulletin, 95*, 136-147.

Mutua, K., & Dimitrov, D.M. (2001). Parents' expectations about future outcomes of children with mental retardation in Kenya: Differential effects of child's gender and severity of mental retardation. *The Journal of Special Education, 35(3)*, 172-180.

Mutua, K., & Dimitrov, D.M. (2001). Prediction of school enrollment of children with intellectual disabilities in Kenya: The role of parents' expectations, beliefs, and education. *International Journal of Disability, Development, and Education, 48*, 179-191.