

**California State University, San Bernardino**  
**College of Education**  
**Education Doctorate in Educational Leadership**  
**EDUC 720 Advanced Quantitative Methods Course Syllabus**  
**(4 units)**

<b>Course Title and Number: Advanced Quantitative Methods EDUC 720</b>
<b>Instructor: Marita L. Mahoney, Ph.D.</b>
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<b>Year/Quarter: Winter 2015</b>
<b>Time/days/location: Wednesday 6:00 pm to 9:50 pm, CE 336</b>

**Wise Reflective Educator Statement**

The College of Education of California State University, San Bernardino (CSUSB) is dedicated to the development and support of wise, reflective professional educators who will work toward a just and diverse society that embraces democratic principles. The wise teacher:

- Possesses rich subject matter knowledge.
- Applies sound judgment to professional practice and conduct.
- Applies a practical knowledge of context.
- Respects multiple viewpoints.
- Reflects and acts on professional practices and their consequences.

(College of Education *Conceptual Framework*, 2006)

**Program Objectives and Student Learning Objectives**

The following list is extracted from the full list of Student Learning Objectives related to the research track. It identifies the alignment of Student Learning Objectives and Student Indicators addressed. Only some of these objectives are directly addressed in this class.

**Student Learning Objective:**

Designers and users of quantitative and qualifying research to effectuate reform and increase student achievement

**Student Indicators:**

- a. Comprehends the relationship and relevance of various theories of knowledge to the study and application of research methodologies in education.
- b. Knows the differences between quantitative and qualitative research design and how epistemological perspectives are reflected in those research methodologies.
- c. Comprehends how theoretical paradigms and perspective are reflected in those research methodologies.
- d. Recognizes the qualities of an effective research question that expresses a direction for inquiry in precise terms, that is based on a review of the pertinent literature, and that avoids the pitfalls of advocacy.

- e. Knows how to interpret a frequency distribution and other regression/statistical assumption diagnostics.
- f. Knows how to apply the concepts of reliability and validity.
- g. Knows how to calculate and interpret the appropriate central tendency, variability, normal distributions, nonnormal distributions, and can explain how they related to basic probability theory.
- h. Can calculate and interpret effect sizes in evaluation studies for multivariate analyses.
- i. Demonstrates the concepts of Type I and Type II errors, statistical power specifically related to multiple regression, multilevel regression, exploratory factor analysis, and structural equation model. Can conduct and interpret these analyses on SPSS or similar statistical software.
- j. Knows that all of the above tests may be used for predicting one variable from another and looking at relationships among variables.

**Student Learning Objective:**

Agents of change in education

**Student Indicators:**

- k. Is cognizant of the benefits and effectiveness of the instructional program and is willing to alter the components when necessary
- l. Demonstrates visionary leadership.
- m. Maintains a current knowledge base in instructional practices in order to identify necessary changes.
- n. Maintains positive, meaningful, and sustaining relationships among colleagues and constituents to being about positive changes

**Student Learning Objective:**

Visionary Leaders

**Student Indicators:**

- o. Develops a shared vision
- p. Plans and implements activities to support this vision.
- q. Provides appropriate staff development to ensure the imp[lamentation of the vision.
- r. Facilitates the stewardship of a vision of learning that is shared and supported by the school community

**Catalog Description**

EDUC 720: Advanced Quantitative Methods - Advanced designs and statistics commonly applied in educational research. Analysis and interpretation of data from designs using covariates (hierarchical regression), mediation and moderation effects, multilevel modeling (nested data), factor analysis, and structural equation modeling. Results writing based on selected data analyses. Prerequisites: EDUC 707, 716 and 718.

## Course Goals/Objectives

By the end of the course, students will be able to:

1. Explore and screen data for purposes of basic description and assessment of statistical assumptions underlying specific quantitative analyses.
2. Create data illustrations/graphs appropriate for both descriptive and inferential purposes.
3. Select the appropriate statistical test given the hypothesis and the nature and number of variables involved.
4. Conduct, interpret, and report the results of statistical analyses addressed in this class.
5. Use SPSS and EQS statistical software to conduct analyses specific to objectives 1-4.
6. Derive and report logical conclusions concerning the import of results to theory and practice

## Readings

### Required Textbooks:

Mertler, C.A., & Vannatta, R.A. (2010). *Advanced and Multivariate Statistical Methods*. (4<sup>th</sup> Ed.). Glendale, CA: Pyczak Publishing.

Tabachnik, B. G., & Fidell L. S. (2012). *Using Multivariate Statistics*. (6<sup>th</sup> Ed.). New York. Allyn & Bacon.

*Publication Manual of the American Psychological Association* (6<sup>th</sup> Ed.). Washington, DC: American Psychological Association.

### Required Readings:

*These readings are divided into two groups: statistical issues and examples of the technique in the literature. Many of these papers contain multiple analyses. All are available through the library as pdf files.*

#### Statistical Issues

Bentler, P. M., & Yuan, K. –H. (1999). Structural equation modeling with small samples: Test statistics. *Multivariate Behavioral Research*, 34(2), 181-197.

Hu, L-T., Bentler, P. M., & Kano, Y. (1992). Can test statistics in covariance structure analysis be trusted? *Psychological Bulletin*, 112, 351-362.

Jelicic, H., Phelps, E., & Lerner, R.M. (2009). Use of missing data methods in longitudinal studies: The persistence of bad practices in developmental psychology. *Developmental Psychology*, 45, 1195-1199.

Karakostas, K. (2004, September). Interpreting regression diagnostics. *Journal of Educational and Behavioral Statistics*, 29(3), 369-373.

Li, L., & Bentler, P.M. (2011). Quantified choice of root-means-square errors of approximation for evaluation and power analysis of small differences between structural equation models. *Psychology Methods*, 16, 116-126.

MacCallum, R., Browne, M., & Sugawara, H. (1996, June). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130-149.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7, 83-104.

- Schafer, J. L., & Graham, J.W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7, 147-177.
- Schlomer, G.L., Bauman, S., & Card, N.A. (2010). Best practices for missing data management in counseling psychology. *Journal of Counseling Psychology*, 57, 1-10.
- Schochet, P. (2008, March). Statistical power for random assignment evaluations of education programs. *Journal of Educational and Behavioral Statistics*, 33(1), 62-87.
- Ullman, J. (2006). Structural equation modeling: reviewing the basics and moving forward. *Journal of Personality Assessment*, 87(1), 35-50.
- Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods*, 3, 231-251.

### Examples of the Technique

- Compton, D.L., Fuchs, D., Fuchs, L.S., & Bryant, J.D. (2006). Selecting at-risk readers in first grade for early intervention: A two-year longitudinal study of decision rules and procedures. *Journal of Educational Psychology*, 98, 394-409.
- Deluga, R. (1998, June). Leader-member exchange quality and effectiveness ratings: The role of subordinate-supervisor conscientiousness similarity. *Group & Organization Management*, 23(2), 189-216.
- Falconetti, A.M. (2009). 2+2 statewide articulation policy, student persistence, and success in Florida universities. *Community College Journal of Research and Practice*, 33, 238-255.
- Flook, L., Repetti, R., & Ullman, J. (2005, March 1). Classroom Social Experiences as Predictors of Academic Performance. *Developmental Psychology*, 41(2), 319-327.
- Glutting, J.J., Youngstrom, E.A., & Watkins, M.W. (2005). ADHD and college students: Exploratory and confirmatory factor structures with student and parent data. *Psychological Assessment*, 17, 44-55.
- Gorard, S. (2010). School experience as a potential determinant of post-compulsory participation. *Evaluation and Research in Education*, 23, 3-17.
- Handelsman, M., Briggs, W., Sullivan, N., & Towler, A. (2005, January 1). A measure of college student course engagement. *Journal of Educational Research*, 98(3)
- Harkness, S., Blom, M., Oliva, A., Moscardino, U., Zylicz, P.O., Bermudez, M.R., Feng, X., Carrasco-Zylicz, A., Axia, G., & Super, C.M. (2007). Teachers' ethnotheories of the 'ideal student' in five western cultures. *Comparative Education*, 43, 113-135.
- Pedder, D. (2006, June 1). Organizational conditions that foster successful classroom promotion of learning how to learn. *Research Papers in Education*, 21(2), 171-200.
- Soenens, B., Vansteenkiste, M., Lens, W., Luyckx, K., Goossens, L., Beyers, W., & Ryan, R.M. (2007). Conceptualizing parental autonomy support: Adolescent perceptions of promotion of independence versus promotion of volitional functioning. *Developmental Psychology*, 43, 633-646.

Other readings as assigned.

## **Course Evaluation Plan**

### **Evaluation Components**

#### *In-class Reading Discussion*

Students will choose an article or chapter (it can be from the reading list or of your choice) on the weeks' analytical technique. You will provide a brief summary of the article or chapter highlighting: the analytical technique used; evaluation of the methodology, analysis, results & interpretation; and, raise any issues or questions of concern. This is meant to be a discussion with the class, NOT a 'talking head,' presentation.

#### *Results Sections*

To evaluate the ability to conduct analyses and to coherently report the obtained results, students will write **3** Results Sections (APA style). Results Sections will be written for the following analytical techniques: Discriminant Analysis (DA); Logistic Regression (LR); and, Exploratory Factor Analysis (EFA). I will provide the data for these reports. These reports are to be submitted electronically via BlackBoard, with either a .doc or .docx extension, and are due by 6:00 pm on the due date.

#### *Final Presentation*

Students will present **1** Final Presentation to the class. Presentations will be on ONE of the following analytical techniques: Structural Equation Modeling (SEM); or, Multi-level Modeling/Hierarchical Level Modeling (MLM/HLM).

Your final grade will be determined based on the following weightings:

Reading Discussions	30
Results Section	50
Final Presentation	20

The grading scale is given below,

#### **The Grading Scale**

93+	A	80-82	B-	66-69	D+
90-92	A-	77-79	C+	63-65	D
87-89	B+	73-76	C	60-62	D-
83-86	B	70-72	C-	< 60	F

*If you are on financial aid: Please be aware that receiving grades of F, I, NC, and WU may have an impact on your financial aid. It is a student's responsibility to maintain financial aid eligibility.*

### **Class Attendance & Participation**

If you need to miss a class session or need to leave a class session early, please inform the instructor prior to the absence. If you miss a class session, please make arrangements to get notes from a classmate. Students who excel in class participation stay abreast of the readings, engage in content-oriented dialogue, come to class prepared to participate, and turn assignments in on time. Given the nature of the class and the assignments, expect to spend at least 8 to 12 hours a week outside of the class working on the materials.

In consideration of others, all cell phones, pagers, electronic devices, etc., should be turned off or put on mute/vibrate. Use of cell phones, pagers, etc., is not permitted during class session. Although we are in a computer lab, students should be attentive to the class lecture, discussion and demonstrations and not spend time accessing the internet, checking email, etc., unless it is required for the class.

### **Standards**

1. As doctoral students you are expected to attend all classes and to read all assigned readings before each class meeting so you may fully participate in class discussions.
2. All written work is expected to meet standards of academic and professional excellence. All written submissions and oral presentations must be of scholarly, doctoral-level quality. You will lose points for work with excessive errors.
3. Strict adherence to the APA Publication Manual (6<sup>th</sup> edition) is required. APA is the **ONLY** accepted manuscript style and reference citation in this course.

### **Portfolios**

Students are reminded to select required and optional artifacts from this course for submission to their Portfolio. Each Portfolio will contain the following elements:

1. Statement of Purpose in the Ed.D. program.
2. Current (updated) resume.
3. Examples of coursework reflecting the Student Learning Outcomes and core concepts (e.g., papers submitted, tests completed, projects completed, etc.) with an indication of how each element submitted is relevant to their dissertation topic and research activities.
4. Summary of research and dissertation activities. Students should submit a summary (no longer than one page for each element submitted) as to work they have completed on their dissertation. Organization of this section of the portfolio should align with the dissertation chapters: a) Research Question; b) Literature Review; c) Methodology; d) Results; and, e) Conclusions. The portfolio, over its development, should provide longitudinal evidence of activities related to completion of the dissertation. Additionally, students may also submit a summary regarding any research activities that may be in addition to their dissertation.

Additionally, students may include optional elements, such as, but not limited to:

5. Conference participation and/or presentations
6. Manuscript/publication drafts
7. Additional noteworthy course work/projects
8. Professional work samples

Portfolios are to be submitted each summer quarter for evaluation. It is the student's responsibility to ensure they are creating and maintaining their Portfolio throughout the year.

**Course Requirements & Course Calendar** (this is tentative and may be modified as necessary)

Date	Topic	Readings	Assignments Due
Week 1 01/14	Intro to Multivariate Statistics, Review of Analytic Techniques	Mertler & Vannatta Chapter 1 Mertler & Vannatta Chapter 2 Tabachnick & Fidell Chapter 1 Tabachnick & Fidell Chapter 2 Tabachnick & Fidell Chapter 3	
Week 2 01/21	Data Screening & Missing Data	Mertler & Vannatta Chapter 3 Tabachnick & Fidell Chapter 4  Jelicic, H., Phelps, E., Lerner, R.M. (2009). Use of missing data methods in longitudinal studies: The persistence of bad practices in developmental psychology. <i>Developmental Psychology, 45</i> , 1195-1199. Schafer, J. L., & Graham, J.W. (2002). Missing data: Our view of the state of the art. <i>Psychological Methods, 7</i> , 147-177. Schlomer, G.L., Bauman, S., & Card, N.A. (2010). Best practices for missing data management in counseling psychology. <i>Journal of Counseling Psychology, 57</i> , 1-10. Schochet, P. (2008, March). Statistical power for random assignment evaluations of education programs. <i>Journal of Educational and Behavioral Statistics, 33</i> (1), 62-87.	Reading Discussion
Week 3 01/28	Multiple Regression (MR)	Mertler & Vannatta Chapter 7 Tabachnick & Fidell Chapter 5  Deluga, R. (1998, June). Leader-member exchange quality and effectiveness ratings: The role of subordinate-supervisor conscientiousness similarity. <i>Group &amp; Organization Management, 23</i> (2), 189-216. Handelsman, M., Briggs, W., Sullivan, N., & Towler, A. (2005, January 1). A measure of college student course engagement. <i>Journal of Educational Research, 98</i> (3). Karakostas, K. (2004, September). Interpreting regression diagnostics. <i>Journal of Educational and Behavioral Statistics, 29</i> (3), 369-373.	Reading Discussion
Week 4 02/04	Multiple Regression (MR) (continued)	Mertler & Vannatta Chapter 7 Tabachnick & Fidell Chapter 5  Deluga, R. (1998, June). Leader-member exchange quality and effectiveness ratings: The role of subordinate-supervisor conscientiousness similarity. <i>Group &amp; Organization Management, 23</i> (2), 189-216.	Reading Discussion

Date	Topic	Readings	Assignments Due
		<p>Handelsman, M., Briggs, W., Sullivan, N., &amp; Towler, A. (2005, January 1). A measure of college student course engagement. <i>Journal of Educational Research</i>, 98(3).</p> <p>Karakostas, K. (2004, September). Interpreting regression diagnostics. <i>Journal of Educational and Behavioral Statistics</i>, 29(3), 369-373.</p>	
Week 5 02/11	Discriminant Analysis (DA)	<p>Mertler &amp; Vannatta Chapter 10 Tabachnick &amp; Fidell Chapter 9</p> <p>Falconetti, A.M. (2009). 2+2 statewide articulation policy, student persistence, and success in Florida universities. <i>Community College Journal of Research and Practice</i>, 33, 238-255.</p> <p>Harkness, S., Blom, M., Oliva, A., Moscardino, U., Zylicz, P.O., Bermudez, M.R., Feng, X., Carrasco-Zylicz, A., Axia, G., &amp; Super, C.M. (2007). Teachers' ethnotheories of the 'ideal student' in five western cultures. <i>Comparative Education</i>, 43, 113-135.</p>	Reading Discussion
Week 6 02/18	Logistic Regression (LR)	<p>Mertler &amp; Vannatta Chapter 11 Tabachnick &amp; Fidell Chapter 10</p> <p>Compton, D.L., Fuchs, D., Fuchs, L.S., &amp; Bryant, J.D. (2006). Selecting at-risk readers in first grade for early intervention: A two-year longitudinal study of decision rules and procedures. <i>Journal of Educational Psychology</i>, 98, 394-409.</p> <p>Gorard, S. (2010). School experience as a potential determinant of post-compulsory participation. <i>Evaluation and Research in Education</i>, 23, 3-17.</p>	Reading Discussion  DA Results Section
Week 7 02/25	Exploratory Factor Analysis (EFA)	<p>Mertler &amp; Vannatta Chapter 9 Tabachnick &amp; Fidell Chapter 13</p> <p>Pedder, D. (2006, June 1). Organizational conditions that foster successful classroom promotion of learning how to learn. <i>Research Papers in Education</i>, 21(2), 171-200.</p> <p>Velicer, W. F., &amp; Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. <i>Psychological Methods</i>, 3, 231-251.</p>	Reading Discussion
Week 8 03/04	Exploratory Factor Analysis (EFA) (continued)  Data Visualization	<p>I have selected 3 videos for you to watch and for the class to discuss. You may watch all 3 videos and then comment on each, or you may comment after you watch each video.</p> <p>Please address the following components in your comments: a) General Impressions; b) key take-away themes/messages; c) impact on how you'll interpret &amp; manage your research data; and, d) impact on being a "consumer" of research. You are also to comment on EACH of your classmate's and my comments. I'd like for there to be a running discussion of the videos and the topics</p>	Online Discussion, Videos  LR Results Section



Date	Topic	Readings	Assignments Due
		<p>they cover.</p> <p>The videos are:</p> <ol style="list-style-type: none"> <li>1. Factor Analysis Visualized (<a href="http://www.youtube.com/watch?v=ehDjYR_8b0M">http://www.youtube.com/watch?v=ehDjYR_8b0M</a>) by dutcheconomist found on You Tube.</li> <li>2. The Best Stats You've Ever Seen (<a href="http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html">http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html</a>) by Hans Rosling on Ted Talks.</li> <li>3. The Beauty of Data Visualization (<a href="http://www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization.html">http://www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization.html</a>) by David McCandless on Ted Talks</li> </ol>	
Week 9 03/11	Exploratory Factor Analysis (EFA) (continued)  Confirmatory Factor Analysis (CFA)	Mertler & Vannatta Chapter 9 Tabachnick & Fidell Chapter 13  Glutting, J.J., Youngstrom, E.A., & Watkins, M.W. (2005). ADHD and college students: Exploratory and confirmatory factor structures with student and parent data. <i>Psychological Assessment, 17</i> , 44-55. Pedder, D. (2006, June 1). Organizational conditions that foster successful classroom promotion of learning how to learn. <i>Research Papers in Education, 21</i> (2), 171-200. Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. <i>Psychological Methods, 3</i> , 231-251.	Reading Discussion
Week 10 03/18	Structural Equation Modeling (SEM)  MLM/HLM	Tabachnick & Fidell Chapter 14 (Ullman) Tabachnick & Fidell Chapter 15  Bentler, P. M., & Yuan, K. -H. (1999). Structural equation modeling with small samples: Test statistics. <i>Multivariate Behavioral Research, 34</i> (2), 181-197. Flook, L., Repetti, R., & Ullman, J. (2005, March 1). Classroom social experiences as predictors of academic performance. <i>Developmental Psychology, 41</i> (2), 319-327. Hu, L-T., Bentler, P. M., & Kano, Y. (1992). Can test statistics in covariance structure analysis be trusted? <i>Psychological Bulletin, 112</i> , 351-362. Li, L., & Bentler, P.M. (2011). Quantified choice of root-means-square errors of approximation for evaluation and power analysis of small differences between structural equation models. <i>Psychology Methods, 16</i> , 116-126. MacCallum, R., Browne, M., & Sugawara, H. (1996, June). Power analysis and determination of sample size for covariance structure modeling. <i>Psychological Methods, 1</i> (2), 130-149.	Reading Discussion  EFA Results Section

Date	Topic	Readings	Assignments Due
		MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. <i>Psychological Methods, 7</i> , 83-104. Soenens, B., Vansteenkiste, M., Lens, W., Luyckx, K., Goossens, L., Beyers, W., & Ryan, R.M. (2007). Conceptualizing parental autonomy support: Adolescent perceptions of promotion of independence versus promotion of volitional functioning. <i>Developmental Psychology, 43</i> , 633-646. Ullman, J. (2006). Structural equation modeling: Reviewing the basics and moving forward. <i>Journal of Personality Assessment, 87</i> (1), 35-50.  Other readings to be announced.	
Week 11 03/25	<b>Final Presentation</b>		Final Presentation

### **Course Policies**

**Academic Honesty:** “Plagiarism and cheating are violations of the Student Discipline Code and may be dealt with by both the instructor and the Judicial Affairs Officer. Plagiarism is the presentation of one’s own, the ideas and writing of another. Plagiarism is academically dishonest and subjects the offending student to penalties up to and including expulsion. Students must make appropriate acknowledgements of the original source where material written or compiled by another is used” (*CSUSB Bulletin, 2001-2002, p. 57*). In accordance with university policy, instances of plagiarism and/or cheating in this course will result in a reduction of the final grade and may result in a failing grade for the course.

Refer to the General Regulations and Procedures in the CSUSB Bulletin of Courses for the university’s policies on academic honesty, cheating, and course withdrawal.

If a student decides to withdraw from this course, it is the student’s responsibility to do so in accordance with university policies and, if necessary, to notify student financial aid as withdrawal may influence the amount of funds available to the student.

### **Commitment to Diversity**

In our commitment to the furthering of knowledge and fulfilling our educational mission, California State University, San Bernardino seeks a campus climate that welcomes, celebrates, and promotes respect for the entire variety of human experience. In our commitment to diversity, we welcome people from all backgrounds and we seek to include knowledge and values from many cultures in the curriculum and extra-curricular life of the campus community. Dimensions of diversity shall include, but are not limited to, the following: race, ethnicity, religious belief, sexual orientation, sex/gender, disability, socioeconomic status, cultural orientation, national origin, and age. (from the *CSU San Bernardino University Diversity Committee Statement of Commitment to Diversity, 1995*)

*In keeping with the university's Commitment to Diversity, the faculty of the College of Education fully support the Americans with Disabilities Act (ADA). Faculty will provide reasonable accommodation to any student with a disability who is registered with the Office of Services to Students with Disabilities and who needs and requests accommodation. If you are in need of an accommodation for a disability in order to participate in this class, please let me know ASAP and also contact Services to Students with Disabilities at UH-183, (909)537-5238.*

***Cheating/Plagiarism – some specific potential problem areas to avoid***

In addition to the usual forms of cheating/plagiarism there are additional forms of cheating which may occur. More subtle forms of cheating/plagiarism which must be avoided include using other students' computer runs to write your results sections or allowing classmates to use your computer runs to write their results sections. You need to do your own analyses. It is cheating to use prior student's assignments – results sections or analyses as a basis for your assignments. Rule of thumb: if you think you might be cheating or plagiarizing you probably are! See me if you have questions or any concerns.