CNE 774
MULTIVARIATE METHODS
SUMMER 2008

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Class Meeting: TEC 115
Times: Tuesdays, 4:30 to 8:50 p.m.

Required Texts:

Links to Online Statistical Sources are below.
http://davidmlane.com/hyperstat/index.html
http://www.statsoft.com/textbook/stathome.html
http://www.onlinestatbook.com/
http://www.socialpsychology.org/methods.htm#onlinetexts
http://wise.cgu.edu/
http://www.statsoft.com/textbook/glosfra.html

American Psychological Association. (2001). *Publication manual of the American Psychological Association* (5th ed.). Washington, DC: Author.

SPSS Inc. (2007). *SPSS 15.0 for Windows.* [Computer software]. Chicago, IL: SPSS Inc. (Student Version available using your SHSU bookstore and through remote access through SHSU).

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Recommended Text(s):

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Publishing.

Prerequisites: Methods of Research and CNE 787(1) Workshop in Counselor Education Statistics

Course Goal: This course is designed to familiarize doctoral students with the logic and dynamics of the research process in education and provide students with the opportunity to develop skills in posing research questions, designing studies, collecting and examining data, and interpreting and reporting research results. In particular, students will be taught how to use a variety of introductory-level statistical techniques to analyze quantitative data in educational research in general and the areas of educational leadership and/or counselor education in particular. A strong focus will be placed on the use of statistical software (e.g., SPSS, GPOWER) to analyze data. The curricula for this course (1) include knowledge of the literature of the discipline and (2) ongoing student engagement in research related to professional practice.

Format for class:
- Mini lectures and demonstrations based on your reading assignments.
- Application of topics discussed using SPSS on the computer.
- Interpretation of statistical analyses.
- Class discussions

ATTENDANCE
Students are to attend and participate in **all** classes. This behavior is expected of all students enrolled in graduate-level classes. The instructors reserve the right to deduct two points for each hour a student is late to class, 10 points for each class missed, and 2 points for each calendar day an assignment is late. Students who miss 20% or more of the classes are subject to dismissal from the course. If you miss additional classes, you must schedule an appointment with the instructor to discuss your continuation in the course. If you have to miss class, come to class late, or leave class early, it is your responsibility to find out what was covered and assigned. Remember, for every lesson that you fail to attend, you will miss coverage of *several course objectives.* Attendance on examination days (including any presentations) is **compulsory.** Non-attendance on examination days without an acceptable reason will result in a score of zero for that examination.

OFF-TASK BEHAVIOR
It is imperative that students **turn off their cell phones** prior to the start of class. Also, students should **refrain from reading or writing email messages** or engaging in any other off-task behaviors at any point during class. Also, please **refrain from engaging in side conversations** during class unless directed to do so by the instructor.

ASSIGNMENTS
All assignments will be given deadlines. Contact me in advance if you are unable to turn in an assignment on time. Students are reminded that plagiarism (including copying work from another student, present or former) is strictly prohibited. Any student against whom evidence of plagiarism is found automatically will fail the course and may have further action taken against them. **THERE WILL BE NO EXCEPTION TO THIS RULE.**

<u>GRADING CRITERIA</u>
<u>ADDITIONAL COMMENTS ABOUT PLAGIARISM AND HONESTY</u>

Using the words, ideas, or conclusions of another person without giving proper credit is a form of intellectual dishonesty known as **PLAGIARISM.** This behavior always has been, and still is, unacceptable and dishonest. Exact quotes must be cited according to the APA style manual (5th Ed.). Paraphrasing means to restate, therefore, the working must be completely changed. Altering a few words or phrases is not sufficient...the entire passage must be restated in **YOUR OWN** words (Tomberlin, 1995). (More about plagiarism in this syllabus).

You are in an elite group having arrived at this place in your educational career through diligent work and your ability to persevere. Do not jeopardize your place in this program by succumbing to the dishonest production of required work--it will be dealt with swiftly.

<u>GENERAL ADVICE</u>

(I) READ the sections to be covered *before* class. READ *all* handouts *carefully*.

(ii) ASK questions if you do not understand the material presented or in the readings. If there is not enough time for questions during the class, please see me after the class, arrange to see me during office hours, or contact me via telephone or e-mail.

(iii) READ and be accountable for all class assignments. **Each assignment covers a specified amount of information that may not be covered in class lectures**; however, the lectures and texts supplement and complement each other. **You are responsible for assigned readings, whether covered in class or not.** Attempt to complete fully *all* the assignments. If you have difficulties in any areas, please let me know.

Please note: I care very much about your future development. I will do EVERYTHING I can to prepare you to be an effective researcher and practitioner.

Course Goal: To learn how to manage, analyze, and interpret multivariate data related to counselor education themes at the doctoral level.

Objectives:
By the end of the semester, it is expected that the student will be able to:
- Identify basic measures of distributional shape (e.g., skewness, kurtosis) through the use of SPSS.
- Test assumptions to determine whether parametric or non-parametric statistics should be used.
- Using SPSS, graph data (e.g., bar charts, histograms, pie charts).
- Use Statistical Package for Social Sciences (SPSS) for entering, coding, analyzing, and interpreting data.
- Use SPSS for making charts of analyzed data.

- Develop null and alternative hypotheses for all analyses.
- Write research questions for all analyses.
- Test the assumptions for multivariate statistics -Multivariate Analysis of Variance (MANOVA), Multiple Regression, Discriminant Analysis, and Factor Analysis.
- Analyze data using a Multivariate Analysis of Variance (MANOVA) procedure.
- Interpret data from the use of a MANOVA procedure.
- Writeup in APA style reports in which a MANOVA procedure was performed.
- Analyze data using a multiple regression procedure.
- Interpret data from the use of a multiple regression procedure.
- Writeup in APA style reports in which a multiple regression procedure was performed.
- Analyze data using a discriminant analysis procedure.
- Interpret data from the use of a discriminant analysis procedure.
- Writeup in APA style reports in which a discriminant analysis procedure was performed.
- Analyze data using a factor analysis procedure.
- Interpret data from the use of a factor analysis procedure.
- Writeup in APA style reports in which a factor analysis procedure was performed.
- Analyze the psychometric quality of survey items using Cronbach's coefficient alpha.
- Interpret the results of using Cronbach's coefficient alpha.
- Writeup in an APA style report the use of an internal consistency procedure.
- Develop research questions of a multivariate nature; collect own data to address research questions; analyze data appropriately to address research questions; and writeup in APA style a report in which findings are addressed.
- Conduct an "a priori analysis", power analysis for determining the sample size needed to reduce possibility of making a Type II Error through use of gpower.
- Interpret practical significance using effect size.
- Present a professional presentation to peers of research project.

Format for class:

The format consists of primarily demonstration with instructor at the computer guiding students through analyses. Additionally the class will consist of mini-lectures, small and large group discussions, and computer work outside of class.

Tentative Class Schedule

June 3

- Introductions
- Syllabus
- Review of the statistical procedures covered in the initial statistics course: parametric and nonparametric correlations; parametric and nonparametric independent samples t-tests; parametric and nonparametric dependent samples t-tests; parametric and nonparametric oneway ANOVAs; and Chi-square.
- SPSS work

Readings:
http://www2.chass.ncsu.edu/garson/pa765/signif.htm

<u>June 10</u>
- Complete review of the statistical procedures covered in the initial statistics course: parametric and nonparametric correlations; parametric and nonparametric independent samples t-tests; parametric and nonparametric dependent samples t-tests; parametric and nonparametric oneway ANOVAs; and Chi-square.
- Review twoway ANOVAs.
- On writing statistical results congruent with APA style. http://www.nova.edu/library/dils/lessons/apa/
- SPSS work.

    <u>**Assignment for Next Week:**</u>
    Parametric correlation assignment (nongraded)
    Parametric independent samples t-test (nongraded)
    Parametric dependent samples t-test (nongraded)
    Parametric one-way analysis of variance (nongraded)
    Chi-Square assignment (nongraded)

June 17

- Complex factorial ANOVAs.
- Multivariate Analysis of Variance (MANOVA).
- SPSS work

    Readings
    http://www.statsoft.com/textbook/stathome.html?stanman.html&1
    http://www2.chass.ncsu.edu/garson/pa765/manova.htm
    http://facultystaff.richmond.edu/~pli/psy538/MANOVA/index.html

    <u>**Assignment Due:**</u>
    Nonparametric correlation assignment (nongraded)
    Nonparametric independent samples t-test (nongraded)
    Nonparametric dependent samples t-test (nongraded)
    Nonparametric one-way analysis of variance (nongraded)

<u>June 24</u>

- Reliability Analysis
- Checks for Assumptions Being Met:
- Orthogonality
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/orthog_e.html
- Skewness
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/normality_e.html

- Residuals
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/residual_plots_e.html
- Homoscedasticity
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/homosced_e.html
- Checking for Outliers
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/outliers_e.html
- Multicollinearity and Singularity
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/multicol_e.html
  Readings:
  http://www2.chass.ncsu.edu/garson/pa765/reliab.htm
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/screen_e.html

July 1

- Regression Analysis
  Readings:
  http://davidmlane.com/hyperstat/prediction.html
  http://www.statsoft.com/textbook/stathome.html?stgrm.html&1
  http://cheval.vet.gla.ac.uk/kvass/stats/InetPub/wwwroot/MultiBook/mlt06.htm
  http://cheval.vet.gla.ac.uk/kvass/stats/InetPub/wwwroot/MultiBook/mlt07.htm
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/regression_e.html

  Assignment Due:
  Parametric Complex ANOVA
  Internal Consistency

July 8

- Catch up on powerpoints and readings not yet covered
- SPSS work

  Assignment Due:
  MANOVA 1
  MANOVA 2

July 15

- Factor Analysis.

  Readings:
  http://www.statsoft.com/textbook/stathome.html?stfacan.html&1
  http://www2.chass.ncsu.edu/garson/pa765/factor.htm
  http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/pca_fa_e.html

  Assignment Due:
  Regression 1
  Regression 2

July 22

- Discriminant Analysis
    Readings:
    http://www.statsoft.com/textbook/stathome.html?stdiscan.html&1
    http://www2.chass.ncsu.edu/garson/pa765/discrim.htm
    http://www.pfc.cfs.nrcan.gc.ca/profiles/wulder/mvstats/discrim_e.html

July 29

No formal class meeting
Assignment Due:
Factor Analysis 1
Factor Analysis 2

Assignment for WEEK 10:
Complete Quantitative Research Report
Prepare for Oral Presentation of Quantitative Research Report
Complete Discriminant Analysis Assignments 1 and 2

August 5

Final Examination:
    Oral Presentation of Quantitative Research Report
    Assignment Due:
    Quantitative Research Report
    Discriminant Analysis 1
    Discriminant Analysis 2

EVALUATION GUIDELINES

The final course total comprises three components. Each is described below.
1. Each student will maintain a statistics notebook that will be handed in electronically as scheduled on the course syllabus. In total, the following 10 statistics procedures will be assigned: (1) parametric complex ANOVA, (2) MANOVA 1, (3) MANOVA 2, (4) multiple regression 1, (5) multiple regression 2, (6) factor analysis 1, (7) factor analysis 2, (8) discriminant analysis 1, (9) discriminant analysis 2, and (10) internal consistency. Each statistical assignment must be written in APA style. A scoring rubric will be used. Each statistics notebook assignment is worth 20 points. You are expected to complete 100% of your assignments by yourself. Do NOT copy the works of other students in the course. You are also expected to modify the wording provided to you in any sample writeups. Students are reminded that plagiarism **(including copying work from another student, present or former, or copying any sample writeups)** is strictly prohibited. Students against whom evidence of plagiarism is found automatically will fail the course and may have further action taken against them. **THERE WILL BE NO EXCEPTION TO THIS RULE.**

3. Each student (or in small groups) will submit one research report using real data. *It is strongly encouraged that archival data be used*. Each research report is worth 100 points. The goal is to allow you practice in collecting, analyzing, and interpreting quantitative data. That is, the research report should contain the following major elements of a traditional published research article: title page; abstract; research questions; method; results; references; tables; and appendices. It is expected that, upon completion of the report, students will be familiar with the statistical analytical part of the research process, particularly the use of an advanced statistical technique. A scoring rubric will be used. The research report, valued at 100 points, should be completely written in APA style. Each APA error will result in a reduction in the grade you receive.

4. Each student will conduct a 20-minute professional presentation of his/her research report. The goal is to give you an opportunity to present your research findings in a formal setting. Detailed feedback will be given via a scoring rubric. Your presentation, valued at 50 points, must be scholarly and professional in nature. Points will be deducted from your presentation and course grade for presentations that are sufficiently less than expectations.

GRADES

A = 350-315
B = 314.99-280
C = 279.99-245

FOR YOUR INFORMATION

✓ **Students with Disabilities Policy**: Please see **http://www.shsu.edu/syllabus/.** If you are a student with a disability that may affect your academic performance, please contact the professor as soon as possible or you may contact the Director of the Counseling Center as chair of the Committee for Continuing Assistance for Disabled Students at 294-1720.

✓ Academic honesty is expected in this class. **Plagiarism is a violation and will result in course failure.** Academic work submitted by you (such as papers, assignments, reports, tests) shall be your work alone and referenced in part or in whole to its correct source. Submission of commercially prepared (or group prepared) materials as your own work is unacceptable. Moreover, you shall encourage honesty in others by refraining from providing materials or information with knowledge that these materials or information will be used improperly. Violation of these academic standards may result in program removal or failure. Academic Policy Statement 810213. See also **http://www.shsu.edu/syllabus/**

- ✓ <u>Attendance.</u> Spring & Fall attendance policy. Students are permitted to miss one class (3 hours) with no penalty, but a call to the professor of the class is expected. A second absence will require that the student submit a letter to the Department of Educational Leadership & Counseling Faculty explaining the circumstances of the absence. The faculty will decide if the second absence should be excused. If it is not excused, a deduction of a letter grade for the course will occur. Subsequent absences will result in automatic letter grade reductions. Summer attendance policy is different. You will be permitted <u>one </u>excused absence (one class period). Subsequent absences will result in a deduction of one letter grade per absence.

- ✓ Religious Holidays. An institution of higher education shall excuse students from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student whose absence is excused under this subsection may not be penalized for that absence and shall be allowed to take an examination or complete an assignment from which the student is excused within a reasonable time after the absence. A student who plans to miss a class or required activity to observe a religious holy day should inform the professor in writing prior to planned absence.

- ✓ Late assignments will be penalized by one letter grade for each 24-hour- period they are not turned in.

- ✓ The syllabus is subject to change pending notification.

- ✓ **University Policies**: Graduate students are governed by the SHSU's policies related to student conduct. Any student with questions about grievances, ethical behavior, etc. should review the SHSU Graduate Catalog and the Texas State University System Rules and Regulations. See: http://www.shsu.edu/~vaf_www/aps/stualpha.html

PLAGIARISM: WHAT IT IS

The following comments are taken verbatim from Campbell, Ballou, and Slade's (1986) book entitled, <u>Form and Style Theses, Reports, Term Papers</u> (7th ed.).

"Quotations in a research paper, thesis, or dissertation can be of two types: indirect (paraphrased or summarized), or direct (verbatim). Both indirect and direct quotations must be documented. That is, you must indicate the source either with parenthetical documentation accompanied by a list of works cited...

Plagiarism-the use of another person's ideas or wording without giving proper credit-results from the failure to document fully and accurately. Ideas and expressions of them are considered to belong to the individual who first puts them forward. Therefore, when you incorporate ideas or phrasing from any other author in your paper, whether you quote them directly or indirectly, you need to be honest and complete about indicating the source to avoid plagiarism. When intentional or unintentional, plagiarism can bring serious

consequences, both academic, in the form of failure or expulsion, and legal, in the form of lawsuits. Plagiarism is a violation of the ethics of the academic community.

Any fact or opinion that you read in one of your sources, whether you first discovered the idea there or have assimilated it so thoroughly that it seems to be your own, should be documented in your paper. Two exceptions are facts that are common knowledge (e.g., John Hancock signed the Declaration of Independence) and facts that can be verified easily and would not differ from one source to another (the headquarters of the Common Market are in Brussels, Belgium). Under most circumstances, these kinds of materials would not need to be documented. On the other hand, material available in only one source or a limited number of sources (a fact about changes in the birth rate in China) should usually be documented." (p. 59).

In reference to note taking, Campbell, Ballou, and Slade (1986) state: "When you write a summary during note taking, you must be careful to avoid inadvertently using the author's wording. Changing an occasional word or reversing the order of phrases or sentences does not result in an adequate summary. A good discipline is to try to write a summary without looking at the source. After writing a summary, look at the original and make a critical comparison, checking for duplication of wording and accuracy in statement of the ideas. If you find that you have used more than two consecutive words from the original (with the exception of articles or prepositions), place them in quotation marks. Carelessness in writing a summary can result in unintentional plagiarism...Even though the summary contains your own words, you will want to give credit for the ideas if you use them in your paper. Be as careful about recording the author's name and page numbers for a summary or paraphrase as you would be for a direct quote." (p. 14-15).

Commenting about paraphrasing, Campbell, Ballou, and Slade (1986) add: "Your paraphrase or summary should represent the source's ideas accurately, avoiding distortion through misstatement or improper emphasis. At the same time, your summary should be stated entirely in your own words. Avoid imitating sentence structure, rearranging words and phrases, and borrowing phrases even of two or three words, since these constitute plagiarism. If you find that you cannot avoid using a phrase from the original, place the words in quote marks. Even when you have restated a passage completely in your own words, indicate that you encountered the information in your reading by" (p. 59-60) citing the reference and including the reference on your reference page.

Automated Plagiarism Detection Service

Sam Houston State University has an account with an automated plagiarism detection service that allows instructors to submit student assignments to be checked for plagiarism. We reserve the right to (a) request that assignments be submitted as electronic files and (b) electronically submit assignments to Turnitin. Assignments are compared automatically with a database of journal articles, web articles, and previously submitted papers. The instructor receives a report showing exactly how a student's paper was plagiarized. For information about plagiarism in SHSU's website, go to http://www.shsu.edu/students/guide/dean/codeofconduct.html (see section 5.31 and 5.32

of the Code of Student Conduct and Discipline) and
http://www.shsu.edu/~vaf_www/aps/documents/810213.pdf (see section 5.31 and 5.32 of
the Academic Policy Statement 810213)

If there are any questions about **Turnitin**, please e-mail or call Jess Nevins
(lib_jjn@shsu.edu or 4-3587)

- ✓ Late assignments will be penalized by one letter grade for each 24-hour- period they
  are not turned in.

- ✓ The syllabus is subject to change pending notification.

CACREP OBJECTIVES:

1. Professional Identity – Studies that provide an understanding of all of the following
aspects of professional functioning
   > K1b; professional roles, functions, & relationships with other human services
   > providers
   > K1d; Professional organizations, primarily ACA
   > K1e; professional credentialing, including certification, licensure, and
   > accreditation
   > K1h; ethical standards of ACA and related entities, and applications of ethical
   > and legal considerations in professional counseling

2. Social and Cultural Diversity – Studies that provide an understanding of the
   cultural context of relationships, issues and trends in a multicultural and diverse
   society related to such factors as culture, ethnicity, nationality, age, gender,
   sexual orientation, mental and physical characteristics, education, family values,
   religious & spiritual values, socioeconomic status and unique characteristics of
   individuals, couples, families, ethnic groups, and communities including all of the
   following:
   K2a; Multicultural & pluralistic trends, including characteristics and concerns
   between and within diverse groups nationally and internationally

3. Career Development – Studies that provide an understanding of career
   development and related life factors, including:
   K4a; Career development theories and decision-making models

5. Helping Relationships – Studies that provide an understanding of counseling and
   consultation processes, including all of the following;
   K5a. Counselor and consultant characteristics and behaviors that influence
   helping processes including age, gender, and ethnic differences, verbal and
   nonverbal behaviors and personal characteristics, orientations, and skills

7. Assessment – Studies that provide an understanding of individual and group approaches to   assessment and evaluation, including the following:

> K7a. Historical perspectives concerning the nature and meaning of assessment;
>
> K7b. Basic concepts of standardized and non-standardized testing and other assessment techniques including norm-referenced and criterion-referenced assessment, environmental assessment, performance assessment, individual and group test and inventory methods, behavioral observations, and computer-0managed and computer-assisted methods;
>
> K7c. Statistical concepts, including scales of measurement, measures of central tendency, indices of variability, shapes and types of distributions, and correlations;
>
> K7d. Reliability (i.e., theory of measurement error, models of reliability, and the use of reliability information);
>
> K7e. Validity (i.e., evidence of validity, types of validity, and the relationship between reliability and validity);
>
> K7f. Age, gender, sexual orientation, ethnicity, language, disability, culture, spirituality, and other factors related to the assessment and evaluation of individuals, groups, and specific populations;
>
> K7g. Strategies for selecting, administering, and interpreting assessment and evaluation instruments and techniques in counseling;
>
> K7h. An understanding of general principles and methods of case conceptualization, assessment, and/or diagnoses of mental and emotional status; and
>
> K7i. Ethical and legal considerations.

8. Research and Program Evaluation – studies that provide an understanding of research methods, statistical analysis, needs assessment, and program evaluation, including the following:

> K8a. The importance of research and opportunities and difficulties in conducting research in the counseling profession
>
> K8e. Use of research to improve counseling effectiveness.