

THE UNIVERSITY OF TENNESSEE AT MARTIN
DEPARTMENT OF EDUCATIONAL STUDIES
COURSE SYLLABUS
Fall 2003

BASIC INFORMATION

Subject, Course Number, Section Number

Educational Statistics, Ed Eval 710, Section 001

Course Title

Educational Evaluation 710

Credit and Contact Hours

Three (3) Semester hours

Course Prerequisites and/or Co requisites

Admission to a graduate program/ graduate status

Instructor's Name James Petty

Instructor's Office Address, E-mail Address, Office Hours, and Office Phone Number

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T 10:00-11:00 and 1:00-2:00

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Textbooks and Other Required Materials

Lomax, Richard G. *An Introduction to Statistical Concepts for Education and Behavioral Sciences*. Lawrence Erlbaum Associates, Publishers. New Jersey: 2000

Field, Maurice H. *Statistics for Master Research Projects. Martin, Tennessee: Center for Environmental and Conservation Education, 1998 (Draft)*.

COURSE PURPOSE, GOALS, AND OBJECTIVES

Course Description

An elementary course in methods applied to educational problems; resolution of assigned or chosen problems in educational statistics. Statistical approaches dominate educational research. The learner lacking this expertise is greatly limited in justifying chosen directions in educational methodology, as well as, assuming the role of a collaborative leader and mentor or as an enhancer of human development. In addition, the desire to keep abreast in a particular field can be seriously hampered by lack of knowledge of statistical procedures and terminology.

General Course Objectives

A. Cognitive

The participant will:

1. recognize problems which are suitable for statistical resolution (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

2. define the problem through the statement of a hypothesis (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

3. distinguish between parametric and non-parametric indicated data (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

4. identify statistical procedures which are available (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

5. determine which statistical procedure best suits a particular problem (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

6. apply the selected statistical procedure to assist in the statistical analysis of data appropriate to investigations involving gender diversity, learning styles, teaching models, values, etc.(Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

7. analyze the statistical results (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

8. propose a norm to which the statistical results may be compared (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

9. compare the statistical results to the norm in order to accept or reject the original hypothesis (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985).

B. Affective

The participant will:

1. accumulate the material presented in the course by class attendance and attention (Conceptual Framework: T.A, T.D, C.B, C.G)(References: Bloom, 1968; Field, 1996).

2. practice on a regular basis the statistical procedures which are assigned (Conceptual Framework: T.A, T.D, C.B, C.G)(Bloom, 1968; Field, 1996).

3. desire increase measurable proficiency in computation and application of statistical procedures (Conceptual Framework: T.A, T.D, C.B, C.G)(Bloom, 1968; Field, 1996).

4. organize the material included in the course to better attain matching of statistical procedures with specific problematic situations while maintaining computational accuracy (Conceptual Framework: T.A, T.D, C.B, C.G)(Bloom, 1968; Field, 1996).

5. solve problems statistically when such application is sound (Conceptual Framework: T.A, T.D, C.B, C.G)(Bloom, 1968; Field, 1996).

Teaching Initial Licensure and Counseling Models

The UT-Martin Teacher Education Program is designed to develop educators who are collaborative leaders and mentors. There are four components which represent descriptors essential to a superior leader and mentor which are integral parts of a conceptual framework that has been derived from current research and best practice. The four components with those receiving significant attention in this course being bold struck are:

- T.A. Educational Inquiry**
- T.B. Instructional Processes**
- T.C. Curricular Design**
- T.D. Ethical Behavior**

The UT-Martin Counseling Program is designed to develop counselors who are enhancers of human development. There are seven components which represent descriptors essential to a superior counselor which are integral parts of a conceptual framework that has been derived from current research and best-

practice.. The seven components with those receiving significant attention in this course being bold struck are:

- C.A. Historical Development of Counseling
- C.B. Assessment and Appraisal of human Needs and Resources
- C.C. Counseling approaches, Interventions, or Treatment
- C.D. Counseling: Content, Process, and practice
- C.E. Career Development and Awareness
- C.F. Social and Cultural Foundations
- C.G. Research in Counseling

Course Outline and Content

A. Course Content

1. Things you should know from class discussions or readings
 - a. Symbols for Populations and Samples
 - b. Population
 - c. Sampling
 1. Simple Random Sampling
 2. Cluster Sampling
 3. Stratified Sampling
 - d. Variables
 - e. Measurements
 1. Interval Scale
 2. Ordinal Scale
 3. Nominal Scale
2. Measures of Central Tendency
 - a. Mean for Ungrouped Data
 - b. Discrete and Continuous Data
 - c. Real Limits
 - d. Interval Size
 - e. Midpoints
 - f. Graphing
 1. Histogram
 2. Frequency Polygon
 3. Cumulative Frequency Polygon
 - g. Mean for Grouped Data
 - h. Median for Ungrouped Data
 - i. Median for Grouped Data
 - j. Mode for Ungrouped Data
 - k. Mode for Grouped Data
3. Measures of Variability
 - a. Variance and Standard Deviation for Ungrouped Data
 - b. Variance and Standard Deviation for Grouped Data

- c. Standard Deviation and Normal Curve
- d. z scores (population and a single point of interest)
- e. Standard Scores
- f. Standard Error of the Mean
- g. Quartile Deviation
- h. Semi-interquartile Range
- i. Range

4. Research Terminology

- a. Hypothesis Testing
- b. Probability and Level of Significance
- c. Type I and Type II Error
- d. Sampling Distribution

5. How to Choose Statistical Models

- a. Level of Measurement
- b. Number of Groups
- c. Number of Categories
- d. Category Size
- e. Nature of Groups
- f. Data
- g. Parametric and Nonparametric Models

6. Interval Models

- a. t-Test for one group
- b. t-Test for unpaired (independent) data
- c. t-Test for paired (related) data
- d. One-way Analysis of Variance

7. Interval Correlation Model

- a. What is Correlation?
 1. How to Construct a Scattergram
 2. A perfect positive correlation
 3. A perfect negative correlation
- b. Pearson Product-Moment Coefficient

8. Ordinal Models

- a. Wilcoxon Signed-Ranks
- b. Mann-Whitney U Test
- c. Kruskal-Wallis Test
- d. Friedman Test

9. Ordinal Correlation Model

- a. What is Correlation?
 1. How to Construct a Scattergram
 2. A perfect positive correlation

- 3. A perfect negative correlation
- b. Spearman Rank Coefficient

10. Nominal Tests

- a. Chi Square 2 X 2
- b. Chi Square 2 X 3

11. Tables

- a. Probabilities Associated with Values as Extreme as the Observed Values of z in the Normal Distribution
- b. Critical Values of t
- c. 1 Percent and 5 Percent Points for the F-Distribution
- d. Critical Values of Chi Square

B. Learning Activities

Specifically the learner will perform the following learning activities using both calculator and computer based procedures (StatView) where applicable:

1. ranking of data (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
2. location of high and low score (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
3. location of mode(s) (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
4. computation of range (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
5. mean for ungrouped data (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
6. mean for grouped data (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
7. percentiles for group data to include median (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
8. standard deviation for ungrouped data (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
9. standard deviation for grouped data (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)

10. z scores and other standard scores (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
11. quartile deviation (Conceptual Framework: T.A, C.B, C.G)(References: Field, 1996)
12. t-test for one group samples (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1992; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)
13. t-test for two group samples (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)
14. F-ratio (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985)
15. t-test when data is related (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)
16. analysis of variance (one way) (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985)
17. Pearson r coefficient (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Coladarci and Coladarci, 1980; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985)
18. regression analysis (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985)
19. Spearman Rho Coefficient (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Coladarci and Coladarci, 1980; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)

20. t-test for comparison of correlation coefficients (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Field, 1996; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982)
21. Chi Square (contingency tables) (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Glasnapp and Poggio, 1985; Hinkle, Wiersma, and Jurs, 1988; Kachigan, 1982; Thorne, 1989; Wike, 1985)
22. Wilcoxon Test (large size) (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)
23. Mann-Whitney U Test (large size) (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Hinkle, Wiersma, and Jurs, 1988; Wike, 1985)
24. Kruskal-Wallis Test (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Cohen and Holliday, 1982; Field, 1996; Hinkle, Wiersma, and Jurs, 1988; Thorne, 1989; Wike, 1985)
25. Friedman Test (Conceptual Framework: T.A, T.B., T.C, T.D, C.B, C.G)(References: Clayton, 1984; Clayton and Holliday, 1982; Field, 1996)

List of References

- Bloom, Benjamin S., J. Thomas Hastings, George F. Madaus. Handbook On Formative And Summative Evaluation Of Student Learning. New York: McGraw-Hill, 1971.
- Bloom, Benjamin S. (Ed). (1965). Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. New York: David McKay Company, Inc.
- Bloom, Benjamin S. (Ed). (1968). Taxonomy of Educational Objectives, Handbook I: Affective Domain. New York: David McKay Company, Inc.
- Clayton, Keith N. (1984). An Introduction to Statistics. Columbus: Charles E. Merrill.
- Cohen, Louis and Michael Holliday. (1982). Statistics for Social Scientists. London: Harper and Row.
- Coladarci, Arthur and Theodore Coladarci. (1980). Elementary Descriptive Statistics. San Francisco: Wadsworth, Inc.
- Field, Maurice H. (1996). Statistics for Science Projects. Martin, Tennessee: Center for Environmental and Conservation Education.

Glasnapp, Douglas R. & John P. Poggio. (1985). Essentials of Statistical Analysis for the Behavioral Sciences. Columbus: Charles E. Merrill.

Haycock, Keith A., Jay Roth, Jim Gagnon, William F. Finzer, & Charles Soper. (1992). StatView: The Ultimate Integrated Data Analysis & Presentation System. Berkley, California: Abacus Concepts, Inc.

Hinkle, Dennis E., William Wiersma, & Stephen G. Jurs. (1988). Applied Statistics for the Behavioral Sciences. Boston: Houghton Mifflin Company.

Kachigan, Sam Kash. (1982). Multivariate Statistical Analysis: A Conceptual Introduction. New York: Radius Press.

Thorne, B. Michael. (1989). Statistics for the Behavioral Sciences. Mountainview: Mayfield Publishing Company.

Wike, Edward L. (1985). Numbers: A Primer of Data Analysis. Columbus: Charles E. Merrill.

COURSE REQUIREMENTS/EXPECTATIONS

Grading Procedures

A. Attendance Policy

Regular Attendance is Expected

B. Examinations - Final Taken During Final Examination Week

1. Matching Models to Scenarios
2. Matching Scenarios to Models
3. Table Readings

C. Portfolio Submitted at the Final Examination

1. Calculator Solutions to Assigned Problems
2. Computer Solutions to Assigned Problems

Any student eligible for and requesting academic accommodations due to a disability is requested to provide a letter of accommodation from P.A.C.E. or Student Academic Support Center within the first two weeks of the semester.

OTHER RESOURCES

Anderson, Alan J. B. (1989). Interpreting data: a first course in statistics. London; New York: Chapman and Hall.

Blommers, Paul J. (1977). Elementary statistical methods in psychology and education. Lanham, Md.: University Press of America.

Bohrstedt, George W. (1988). *Statistics for social data analysis*. Itasca, Ill. F.E. Peacock Publishers.

Bowen, Earl K. (1982). *Basic statistics for business and economics*. New York: McGraw-Hill.

Bruning, James L. (1987). *Computational handbook of statistics*. Glenview, Ill.: Scott, Foresman.

Casley, D. J. (1988). *The collection, analysis, and use of monitoring and evaluation data*. Baltimore: Published for the World Bank, the John Hopkins University Press.

Couch, James V. (1982). *Fundamentals of statistics for the behavioral sciences*. New York: St. Martin's Press.

Cox, C. Philip (Charles Philip). (1987). *A handbook of introductory statistical methods*. New York: Wiley.

Downing, Douglas. (1989). *Statistics the easy way*. New York: Barron's.

Everitt, Brian. (1983). *Advanced methods of data exploration and modelling*. London, Exeter, N.H.: Heinemann Educational Books.

Ferguson, George Andrew. (1989). *Statistical analysis in psychology and education*. New York: McGraw-Hill.

Freund, John E. (1982). *Elementary business statistics : the modern approach*. Englewood Cliffs, N.J.: Prentice-Hall.

Hamburg, Morris. (1983). *Statistical analysis for decision making*. New York: Harcourt Brace Jovanovich.

Hoel, Paul Gerhard. (1990). *Basic statistics for business and economics*. New York: Wiley.

Hooke, Robert. (1983). *How to tell the liars from the statisticians*. New York: M. Dekker.

Jaeger, Richard M. (1990). *Statistics : a spectator sport*. Newbury Park, Calif.: Sage Publications.

Kazmier, Leonard J. (1984). *Basic statistics for business and economics*. New York: McGraw-Hill.

Kenny, David A. (1987). *Statistics for the social and behavioral sciences*. Boston: Little, Brown.

Knapp, Rebecca Grant. (1985). *Basic statistics for nurses*. New York: Wiley.

Kurtz, Norman R. (1983). *Introduction to social statistics*. New York: McGraw-Hill.

Lapin, Lawrence L. (1982). *Statistics for modern business decisions*. New York: Harcourt Brace Jovanovich.

Mandel, B. J. (Benjamin J.). (1977). *Statistics for management : a simplified introduction to statistics*. Baltimore: Dangary Pub. Co.

McWilliams, Thomas P. (1989). *How to use sequential statistical methods*. Milwaukee, Wis.: American Society for Quality Control.

Moore, David S. (1985). *Statistics : concepts and controversies*. New York: W.H. Freeman.

Ostle, Bernard. (1988). *Statistics in research : basic concepts and techniques for research workers*. Ames: Iowa State University Press.

Patchett, Isabel S. (1982). *Statistical methods for managers and administrators*. New York: Van Nostrand Reinhold.

Plane, Donald R. (1986). *Business and economic statistics*. Plano, Tex.: Business Publications.

Rothstein, Anne L. (1985). *Research design and statistics for physical education*. Englewood Cliffs, N.J.: Prentice-Hall.

Rowntree, Derek. (1981). *Statistics without tears: a primer for non-mathematicians*. New York: Scribner.

Sirkin, R. Mark. (1995). *Statistics for the social sciences*. Thousand Oaks, Calif.: Sage Publications.

Snedecor, George Waddel. (1989). *Statistical methods*. Ames : Iowa State University Press.

Sprinthall, Richard C. (1990). *Basic statistical analysis*. Englewood Cliffs, N.J.: Prentice Hall.

Summers, George William. (1981). *Basic statistics in business and economics*. Belmont, Calif.: Wadsworth Publishing Company.

Zuwaylif, Fadil H. (1984). Applied business statistics. Reading, Mass.: Addison-Wesley Publishing Company.