The University of St. Thomas
Ethical Leadership Doctoral Program

EDUC 8363 Research Statistics I
Spring Semester 2018

<table>
<thead>
<tr>
<th>N. Anne Gichuri-E., Ph.D.</th>
<th>Office: Virtual via BB Collaborate/Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>School of Education and Human Services</td>
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<tr>
<td>Date/Time: Jan 18 - May 5, 2018/1:00 – 4:00 PM</td>
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**COURSE SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
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<tbody>
<tr>
<td>January 20th</td>
<td>CSHP Room 147</td>
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<tr>
<td>February 3rd</td>
<td>CSHP Room 147</td>
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<tr>
<td>February 17th</td>
<td>CSHP Room 147</td>
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<tr>
<td>March 3rd</td>
<td>CSHP Room 147</td>
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<td>March 24th</td>
<td>CSHP Room 147</td>
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<td>April 7th</td>
<td>CSHP Room 147</td>
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<td>April 21st</td>
<td>CSHP Room 147</td>
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<tr>
<td>May 5th</td>
<td>CSHP Room 147</td>
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MISSION

The mission is to prepare and influence bold, socially responsible leaders who will transform organizations. Our central role is to ignite the leadership capacity needed to create vital, democratic, and caring institutions and systems. In keeping with this role, the central focus of our Ed.D. in Ethical Leadership are social justice and equity.

COURSE DESCRIPTION

This course provides a survey of fundamental descriptive and inferential statistics through an introduction of basic concepts and terminology, including chi-square, analysis of variance, Pearson correlation, and regression analysis. Using statistical software as an analytical tool, students investigate educational issues and phenomena applying a variety of statistical methods resulting in understanding the difference between significance and meaningfulness of data.

Required Text:


Statistical Computation software: IBM SPSS (Assigned in class).

Suggested:


https://uk.sagepub.com/sites/default/files/upm-binaries/87881_Field___DSUSS___Chapter_1.pdf

https://uk.sagepub.com/sites/default/files/upm-binaries/87882_Field___DSUSS___Chapter_2.pdf


Suggested Statistical Computation software: *JASP 0.8.4* (2017, November). Open source download can be accessed at [https://jasp-stats.org/](https://jasp-stats.org/)

**SOCIAL JUSTICE PRINCIPLES**

Subsidiarity - Educational institutions should be organized and governed as much as possible by the community being served; education should only be controlled at high levels of society when it cannot be done effectively locally.

Dignity and rights of children - Children possess full human dignity and are bearers of rights which should be recognized and upheld in the educational process.

People have a right to an education – All people have a responsibility, for the good of society, to contribute to and foster education.

**PROGRAM GOALS**

1. Ethical Leadership: Develop educational leaders who exhibit and promote trust, respect, integrity, honesty, fairness, equity, justice, and compassion as underpinnings in society, including within their professional relationships.
2. Social Justice: Develop educational leaders versed in providing equal opportunities for all individuals regardless of socio economic status as well as providing and developing skills to become successful academically and economically.
3. Interpersonal Collaboration: Develop greater self-awareness, intentionality of action, and stronger relationships with others that lead to constructive interpersonal collaboration.
4. Catholic Intellectual Tradition: To develop reflective, multifaceted, cultural catalysts who integrate faith and culture in their leadership, who internalize their role as one in service of the mind, heart, and spirit, who understand and live what it means to be Catholic in the modern world, and who intentionally lead with an ability to make connections between faith and reason in a technology-rich society—to lead in service of the gospel.
5. Research: Develop reflective scholar-practitioners who conduct research collaboratively and ethically, thereby contributing to the academic body of knowledge, improving professional practice, and promoting positive systemic change.
### STUDENT LEARNING OBJECTIVES

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Addressed in This Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 Examine obstacles that polarize discussion and undermine effective action, and ineffective or one-dimensional approaches to organizational and cultural change.</td>
<td>B</td>
</tr>
<tr>
<td>2.4 Develop/expand awareness towards diverse, multicultural ideologies ranging from the advocacy for all children including societal relationships.</td>
<td>B</td>
</tr>
<tr>
<td>3.4 Apply systems thinking, chaos/complexity theory, and a collaborative change process (e.g., action research) to guide/influence social, organizational, and/or cultural change.</td>
<td>B</td>
</tr>
<tr>
<td>4.2 Participate in rigorous, relevant contemporary scholarship to create environments that improve the academic performance of all students, in particular the marginalized, and that genuinely engage and nurture the spiritual development of the learning community--students, their parents, staff, and faculty.</td>
<td>C</td>
</tr>
<tr>
<td>5.1 Assess, interpret, and synthesize the work of others by critically reading the literature from multiple sources and disciplines to develop a holistic view of a topic.</td>
<td>B</td>
</tr>
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A-Acquisition; B- Application; C-Assimilation; D-Adaptation

### THEMATIC QUESTIONS

1. Which statistics are appropriate for each research design, and what do the statistical results tell you (SLO 5.1)?
2. Given a real-world dataset, what statistics would be appropriate to test hypotheses you have developed (SLO 4.2 and SLO 5.1)?
3. What statistics will you use in your dissertation, and why (SLO 4.2 and 5.1)?

### MAJOR ACTIVITIES

1. Journal article data interpretation activity (SLO 5.1)
2. Group project on statistical concepts and SPSS applications (SLO 4.2 and SLO 5.1)
3. Development of data analysis plan for quantitative data (SLO 4.2)
CONTENT ASSESSMENTS

1. Individual data analyses and interpretation summaries of multifaceted quantitative research articles from dissertation’s literature review and from class assigned readings.

2. Facilitated collaborative group discussions of quantitative data analyses and interpretation summaries of multifaceted quantitative research articles from class assigned readings and supplemental resources that will include content derived from statistics guest experts and practitioners’ class visit speeches and interactions.

3. Individual dissertation’s quantitative data analysis and reporting plan. (SLO 4.2)

ACADEMIC INTEGRITY

Taking credit for any thought, idea, or work that is not your own is plagiarism. Any instance of academic dishonesty will be documented and reported to the Dean of the School of Education. Students will be informed of this action and must submit a written response to the charge. The instructor has the right to fail the student for the specific project or entire course. When writing any paper or project, reference your information, websites, books, etc. that is not your own.

STUDENT ACCOMMODATIONS

If you have a documented disability that may impact your performance in this class, please contact me to discuss your needs. Additionally, you will need to register with the Counseling and Disability Services Office in Crooker Center, 713.525.6953 or 3162.

USE OF UST EMAIL ACCOUNTS

All email correspondence will be through the my.stthom email system. Please check your email through your my.stthom account daily for correspondence and announcements.

Helpful numbers:

1. UST Technology Help Desk: 713-525-6900
2. Blackboard help: 713-525-3153
3. Doherty Reference Librarian
4. Doherty Computer Lab

COURSE REQUIREMENTS (10%)

Participation In-Class (5%) and After-Class (5%): This course is based on a collaborative and applied learning model that incorporates both face-to-face and virtual learning encounters and activities.

A fundamental course expectation is that you come to class meetings: 1) informed and well versed on assigned course readings; 2) prepared to either participate or facilitate discussion in your Think Tank group, Think-Pair-Share group, other ad hoc assigned groups, and during guest
expert/practitioner visits both within class and in follow-through applied discussions and simulation activities after class; and 3) work independently on application of the main course concepts and skills to your dissertation study.

Assigned work, both in-class and after-class, is geared to enhance dialogue, engender authentic learning, and simulate real-world application of research concepts and statistical tools addressed. Nature and quality of participation/facilitation and submitted assignments will be commensurate with doctoral-level standards.

**COURSE ASSIGNMENTS (60%)**  
Formulating Quantitative Research Questions and Developing Hypothesis/Prediction  
Quantitative Description of Research Setting and Participants  
Describing How Data is Collected and Organized  
Describing How Data is Analyzed and Reported - Descriptive Statistics  
Describing How Data is Analyzed and Reported – Inferential Statistics  
Describing How Validity and Reliability are Addressed (Data collection and analysis)

**CHAPTER III OF DISSERTATION PROPOSAL (30%)**  
Using the Ed.D. program’s Dissertation Template as guide, address all components of Chapter III and support your discussion with research literature citations.

**GRADING SCALE**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>% Final Grade</th>
<th>Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-class Participation</td>
<td>5%</td>
<td>0 - 2 (50)</td>
</tr>
<tr>
<td>After-Class Participation (Journals, Dis. Board, Collaborate)</td>
<td>5%</td>
<td>0 - 2 (50)</td>
</tr>
<tr>
<td>Quantitative Research Questions and Hypothesis/Prediction</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Description of Research Setting and Participants</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Describing How Data is Collected and Organized</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Describing Data Analysis - Descriptive Statistics</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Describing Data Analysis - Inferential Statistics</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Describing How Validity and Reliability are Addressed</td>
<td>10%</td>
<td>100%</td>
</tr>
<tr>
<td>Chapter III of the Dissertation Proposal - Quantitative</td>
<td>30%</td>
<td>300 Points</td>
</tr>
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**COURSE OUTLINE**

Session 1 – CHSP 146, January 20, 1:00 – 4:00 PM

Course overview and orientation: Syllabus, Collaborative Learning, Applied Learning

Introduction to statistics: (1) Why Statistics? (2) Basic Concepts

Preparing Data for Analysis: (1) Scoring procedures; (2) Tabulation and Coding procedures; and (3) External and internal validity concerns

Guest speaker: Ms. Loan Nguyen - UST Doherty Library’s Reference and Electronic Resource Librarian. Ms. Nguyen has multiple publications in the *Journal of Family Practice*; as well as
numerous presentations on a wide range of topics. She received the MLA Research Award in 2007. She will speak about resources and research-support opportunities available to us through Doherty Library. She will also take questions and share her insights as a researcher and successful author of multiple peer reviewed empirical journal articles.

**Assignment:**

1) Collaboratively formulate your dissertation’s quantitative research questions.

2) Create your dissertation code book, which will classify your research variables, participants, and research questions’ variables and target data’s categories.

3) Identify a peer reviewed journal article that either used your desired research design, or data collection instrument, or conducted research on a topic relatable to yours.

4) Based on your code table, create a simulated mini Excel frequency distribution (data spreadsheet) based on relatable data from the peer reviewed study you selected in (2) above, and identify potential validity and reliability concerns. (Content Assessment #1, #3).


Describing and Exploring Data - Reducing data into interpretable form: Graphical description; Measures of central tendency; Measures of variability; and Graphical representation of dispersion.

The Normal Distribution – Normality of a sample, drawing inferences about observations: calculating $z$ scores and sampling error.

Sampling Distributions and Hypothesis Testing – Theory of hypothesis testing, null hypothesis, Type I and II errors, One- and two-tailed tests, and effect size.

Analyzing Data using Graphical Description and Descriptive Statistics 1) Complete computations; 2) Report, interpret, and critique result reporting based on APA reporting guidelines.

Guest speaker: Dr. Carl Scott – In addition to his contributions to our course textbook, for which he is acknowledged by the author (p. xviii), Dr. Scott is an expert in Psychology, Perception, Educational Performance, and Statistical Analysis. Dr. Scott’s areas of research focus include applied psychology, health and educational performance, and improving research methods. He will speak to us on statistical analysis, research methods, and perception. More on Dr. Scott can be retrieved from [https://www.stthom.edu/Faculty/Faculty-Directory.aqf?Faculty_ID=122297](https://www.stthom.edu/Faculty/Faculty-Directory.aqf?Faculty_ID=122297)

**Assignment**

2.1) In collaborative groups, use the frequency distribution data spreadsheet created in Session I, or other relatable data, to (a) create and analyze a histogram, stem-and-leaf, and box plot display; (b) calculate and report the mode, median, mean, range, standard deviation, and quantiles, with mention of your degrees of freedom; (c) set up your null hypothesis and significance level. Discuss their significance in research, in view of Type I or Type II errors. (Content Assessment #1, #3). (SLO 4.2).

2.2) Critique descriptive statistical analyses, conclusions and recommendations reported in a peer reviewed journal article that is relatable to your dissertation topic, on the basis of statistical concepts practiced above. (Content Assessment #1).

3) Quantitative Methodology Journal entry on statistical data analysis integration into Chapter III of dissertation study. Reflection on course experience and collaborative learning experience (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1)


### Session 3 – CHSP 146, February 17, 1:00 – 4:00 PM

Basic Concepts of Probability – Rules and terminology; Discrete/Continuous variables; Permutations and combinations; Bayes Theorem; Binomial and multinomial distributions

Categorical Data and Chi-Square – Chi-Square Goodness-of-Fit test; Chi-Square for ordinal data; Dependent/Repeated measures; Likelihood ratio tests; Mantel-Haenszel statistic; Effect sizes; and Measures of agreement.

### Assignments

1) Collaboratively apply triangulated descriptive and inferential statistics of frequency and categorical data that is relatable to your research questions (Content Assessment #1, #3). (SLO 4.2).

2) Collaboratively, draft a data analysis report of a simulated Chi-Square Goodness-of-Fit test, Chi-Square for ordinal data, Dependent/Repeated measures, Likelihood ratio tests, and Mantel-
Haenszel statistic. Align the draft report with APA research reporting guidelines (Content Assessments #1, #2) (SLO 4.2).

3) Collaboratively critique either the descriptive and/or inferential statistics and/or conclusions reported by other peer group. Make note of potential validity and reliability concerns, as well as alignment with APA guidelines. (Content Assessment #1).

2) Collaboratively critique empirical peer reviewed journal on statistical analysis; treatment of validity and reliability, and on its alignment with APA requirements. (Content Assessment #1).

3) Quantitative Methodology Journal entry on statistical data analysis integration into Chapter III of dissertation study. Reflection on course experience and collaborative learning experience (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1)


Session 4 – CHSP 146, March 3, 1:00 – 4:00 PM

Hypothesis tests Applied to Means – Sampling distribution of the Mean; One-sample t test; two matched sample t test; two independent samples t test; and the Behrens-Fisher problem.

Power – Basic concept and factors affecting power; Power calculations for one-sample, to independent samples, and matched –sample t tests; and the use of G*Power to simplify calculations.
Assignments

1) Collaboratively analyze data relatable to your dissertation research questions or design, using the one-sample, matched sample, and independent samples t test; then compute the corresponding power calculations. (Content Assessment #1, #3). (SLO 4.2).

2) Collaboratively draft a data analysis report of the simulated statistical computations; in compliance with APA research reporting guidelines (Content Assessments #1, #2) (SLO 4.2).

3) Critique descriptive or inferential statistical analyses, conclusions and recommendations reported in an empirical peer reviewed journal article relatable to your dissertation topic. Make note of validity and reliability concerns. (Content Assessment #1).

4) Quantitative Methodology Journal entry on statistical data analysis integration into Chapter III of dissertation study. Reflection on course experience and collaborative learning experience (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1)


**Session 5 – CHSP 146, March 24, 1:00 – 4:00 PM**

Correlation and Regression – Scatterplot; Representing Relationship between variables; Covariance; Pearson’s $r$ test; Confidence intervals, role of Assumptions; and Power calculations for Pearson’s $r$

Alternative Correlation Techniques – Correlation Coefficients for Ranked data; Analysis of Contingency Tables with Ordered data; and Kendall’s Coefficient of Concordance.

Simple Analysis of Variance (One-Way ANOVA: Independent) – Logic, calculations, and reporting of results; Unequal sample sizes and violations of assumptions; Transformations, fixed versus random models; Experimental effect size and power.

**Assignments**

1) Collaborative application of statistical analyses on relationships between variables using Pearson’s $r$ and Spearman’s rho; covariance; confidence intervals, power calculations for Pearson’s $r$; the scatterplot; contingency tables with ordered data; Kendall’s Tau, ANOVA: Independent (simple analysis of variance), Experimental effect size, and power. Include scatterplots, the power calculations for Pearson’s $r$, and Kendall’s $\tau$. (Content Assessment #1, #3). (SLO 4.2).

2) Collaborative report and justification of group’s analyses, with reflective feedback to other collaborative team reports issues on validity and reliability concerns, and APA reporting guidelines (Content Assessments #1, #2) (SLO 4.2).

2) Collaboratively critique an empirical peer reviewed journal on statistical analysis; how it addresses validity and reliability concerns, and how well it aligns with APA requirements. (Content Assessment #1)

3) Quantitative Methodology Journal entry on statistical data analysis integration into Chapter III of dissertation study. Reflection on course experience and collaborative learning experience (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1)


**Session 6 – CHSP 146, April 7, 1:00 – 4:00 PM**

Multiple Comparisons among Treatment Means – Error rates, Apriori comparisons, Confidence intervals and effect sizes for contrasts, Post Hoc comparisons, Tukey’s test, and Trend analysis

Factorial Analysis of Variance – Structural models and expected Mean squares, Power analysis for factorial experiments, Alternative experimental designs, Measures of association and effect size, Unequal sample sizes, Higher-order factorial designs

Repeated-Measures Design – Structural model, F Ratios, Covariance matrix, Contrast and effect sizes, Intraclass correlations, Mixed methods for repeated-measures designs

Guest speaker: **Dr. Catherine Barber** – Accomplished and highly recognized for her outstanding work in fine-tuning and expanding our School of Education’s Research Department and the Graduate Success Center, Dr. Barber won the 2017 Blackboard Exemplary Course Program
Achievement award for innovative leadership in online and hybrid graduate education and advancement. Also the 2012 recipient of the St. Edith Stein Excellence in Research award, Dr. Barber continues to impact student learning through her teaching, *YouTube* research tutorial videos, and research publications. Dr. Barber joins us today as our expert practitioner in the area of learning communities, education research, and statistics. More on Dr. Barber can be retrieved from [https://www.stthom.edu/Faculty/Faculty-Directory.aqf?Faculty_ID=00131280](https://www.stthom.edu/Faculty/Faculty-Directory.aqf?Faculty_ID=00131280)

**Assignments**

1) Collaborative application of multiple comparisons among treatment means, factorial analysis of variance, and repeated-measures designs to analyze data simulation that is relatable dissertation research questions or design. Discuss the findings of the data analyses (Content Assessment #1, #3). (SLO 4.2).

2) Collaborative analysis and critique of empirical peer reviewed journal articles on at least four inferential statistical analyses learned today; in terms of appropriateness of fit, nature of execution, and effectiveness of reporting. Attention to validity and reliability concerns, as well as alignment to APA reporting requirements is encouraged, (Content Assessment #1).

3) Quantitative Methodology Journal entry on one point of self-awareness, which today’s session raised. Why it was significant and how it applies to refinement of Chapter III of the dissertation (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1).


Session 7 – CHSP 146, April 21, 1:00 – 4:00 PM

Multiple Regression – Standard errors and tests of regression coefficients, Multiple correlation coefficients, Partial and semi-partial correlation, Suppressor variables, and Logistic regression

Analyses of Variance and Covariance as General Linear Models- General linear model, Factorial design, One-way and Factorial analysis of covariance, Use of multiple covariates and Alternative experimental designs

Meta-Analysis and Single-Case Designs – Effect size measures, Standardized mean differences, and Piecewise regression

Assignments

1) Collaboratively apply multiple regression, analyses of variance and covariance, Meta-analysis, and Single-case design by analyzing data relatable to your dissertation research questions or research design. Discuss your report of findings from your data analyses (Content Assessment #1, #3). (SLO 4.2).

2) Collaboratively critique an empirical peer reviewed journal on statistical analysis; how it addresses validity and reliability concerns, and how well it aligns with APA requirements. (Content Assessment #1)

3) Quantitative Methodology Journal entry on statistical data analysis integration into Chapter III of dissertation study. Reflection on course experience and collaborative learning experience (Content Assessments #2, #3). (SLO 3.4, 4.2, 5.1)


http://www.tandfonline.com/eprint/tsHFkzJIGWdRIz68Z/full

Session 8 – CHSP 146, May 5, 1:00 – 4:00 PM

Resampling and Nonparametric approaches to data – Bootstrapping, Resampling, Wilcoxon’s Rank-sum test and Matched-pairs Signed-Rank test, the Sign test, Kruskal-Wallis one-way analysis of variance, and Friedman’s test for \( k \) correlated samples.
Assignment

Synthesized Chapter III of your dissertation with a comprehensive descriptive and inferential quantitative data collection, analysis, and reporting plan. (Content Assessments #2, #3). (SLO 4.2).