

SYLLABUS
767: STATISTICAL METHODS IN RESEARCH
(OpRes-Spring) Core Course
Distance Learning
FACULTY: Paul Thomlinson, PhD
Date Revised: 6/15/10

COURSE DESCRIPTION

The purpose of this course is to review crucial concepts in qualitative and quantitative research methods, to identify the type of research approach (quantitative, qualitative or both) that students would like to use in their dissertation work, then to clarify what steps will be needed to collect and analyze the results. By the end, students are expected to know what methods they will use, which statistical tests will be employed to analyze the data, and how to perform these tests. Students are expected to have prior statistical knowledge at an introductory level to statistics from an undergraduate or graduate course.

FACULTY BIOGRAPHY

Dr. Thomlinson is a licensed psychologist with specialties in organizational, clinical, and experimental psychology, and is the Vice President—Research and Quality Assurance for Burrell Behavioral Health. He earned the MA degree in General/Experimental Psychology, and the PhD in Industrial/Organizational Psychology, both from the University of Southern Mississippi. Subsequently, Dr. Thomlinson completed a post-doctoral re-specialization in Clinical Psychology and holds the license to practice as a psychologist in the state of Missouri. He has been on the faculties of several universities and graduate schools, including Walden University, Webster University, Southwest Baptist University, and Central Michigan University.

FACULTY CONTACT INFORMATION

Faculty Name: Paul Thomlinson, Ph.D.
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COURSE DELIVERY STYLE & PLAN OF ACTION

The course will proceed through lecture, discussion, self-study, directed study, and demonstration via the residential component, email, and telephone conferences.

RESIDENTIAL REGISTRATION

Register with the HU Bursar, Marilyn McGehee (888-272-6109) for the residency portion of the course. There is an additional \$25.00 per day fee for residency classes held at Unity Village.

LEARNING OUTCOMES

Students will:

- Identify and explicate a feasible research question in the interest area of the student.
- Demonstrate mastery of selected concepts of qualitative and quantitative analysis, including statistical power and its relationship to sample size.
- Identify research methods used by other researchers in their area of emphasis.
- Develop an outline of the methods for proceeding with their research dissertation.
- Compare available statistical methods and identify which one(s) they will apply to analyze their data.
- Create a data file in SPSS or Excel.

- Analyze a data set (either pilot data or contrived data) using the method identified.
- Explain and justify why they chose your methodology and data analysis techniques.
- Write a clear and concise narrative summary of the statistical results demonstrated.
- Demonstrate an ability to write results using APA format.

Required Materials and Texts:

Required:

Hinton, P.R. (1995). *Statistics explained: A guide for social science students*. New York: Routledge Press.

Recommended (depending upon your method):

Braud, W., and Anderson, R. (1998). *Transpersonal research methods for the social sciences: Honoring human experience*. Thousand Oaks, CA: SAGE Publications.

Crabtree, B.F., and Miller, W.L. (1999). *Doing qualitative research*. Thousand Oaks, CA: SAGE Publications.

Denzin, N.K., and Lincoln, Y.S. (1994). *Handbook of qualitative research*. Thousand Oaks, CA: SAGE Publications.

Grimm, L.G., and Yarnold, P.R. (1995). *Reading and understanding multivariate statistics*. Washington, DC: American Psychological Association.

Moustakis, C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: SAGE Publications.

Salkind, N.J. (2000). *Statistics for people who hate statistics*. Thousand Oaks, CA: SAGE Publications.

HOLOS FACULTY-STUDENT COMMUNICATIONS POLICY

Students and instructor communicate frequently via email, and phone conferences create a collegial forum for sharing ideas among class participants. Telephone conferences and calls with instructors are the student's expense. Faculty should inform students of any times that they are not available for email or phone communication. Students should inform instructors if they will not be available for scheduled phone conferences. Students should allow three days for a response after emailing an instructor. If you have not received a response after three days, re-send the email, call the instructor and leave a voice message. If you have still not received a response after two more days, forward your email communications with the instructor to the Dean of Faculty. Further action will be determined by the Dean of Faculty.

ASSIGNMENT FORMATS

- All written assignments must be **Microsoft Word** documents sent by email as attached files.
- All papers should be **double-spaced**.
- **FONT:** Times or Times New Roman.
- **E-MAIL SUBJECT LINE:** Always include your name and the Assignment number in the subject line of your E-mail and on the title page of your assigned papers.
- **END NOTES:** All referenced material must be cited using endnotes. Include the Author's name, the publication name, the publisher, the date of publication, and the page number.
- **FILE NAME:** When you "save" your document, you MUST use the following format to name your Word file: Or your file will be returned so that you can add the proper file name and format: The document you attach to your e-mail should be in the following format:

SmithJ_767#1.doc. (Last Name, First Initial_Course #, Assignment#.doc) Use Times, Times New Roman, or Helvetica fonts, 12 pt. and cite all referenced material using *Chicago Manual of Style* endnotes.

OUTLINE OF ASSIGNMENTS & PERCENTAGE OF COURSE

Assignment #1: Statement of Research Question	20%
Assignment #2: Journal Article Critique	10%
Assignment #3: Expanded Method/Design Paper	10%
Assignment #4: Summary of Measures	10%
Assignment #5: Discussion of Statistical Test Chosen	10%
Assignment #6: Data Spreadsheet and Data Analysis	10%
Assignment #7: Narrative Report of Results	30%

DETAILS OF ASSIGNMENTS

ASSIGNMENT #1

Due Date: September 24, 2010

Percentage of Grade: 20%

Learning Outcomes of Assignment: Students will:

- Identify and explicate a feasible research question in the interest area of the student.
- Develop an outline of the methods for proceeding with their research dissertation.

Required Texts and/or Materials: Hinton

Assignment Description: Write a brief statement of your research questions, hypotheses and potential methods (2 or 3 pages would be appropriate).

ASSIGNMENT #2

Due Date: October 15, 2010

Percentage of Grade: 10%

Learning Outcomes of Assignment: Students will:

- Identify research methods used by other researchers in their area of emphasis.
- Develop an outline of the methods for proceeding with their research dissertation.

Required Texts and/or Materials: Hinton

Assignment Description: Find two journal articles that relate directly to your research interests. Write a brief description of the methods they used and if you think you might want to use a similar method: why or why not? (3-6 pages approximately).

ASSIGNMENT #3

Due Date: November 5, 2010

Percentage of Grade: 10%

Learning Outcomes of Assignment: Students will:

- Demonstrate mastery of selected concepts of qualitative and quantitative analysis, including statistical power and its relationship to sample size.
- Identify research methods used by other researchers in their area of emphasis.
- Develop an outline of the methods for proceeding with their research dissertation.
- Compare available statistical methods and identify which one(s) they will apply to analyze their data.

Required Texts and/or Materials: Hinton

Assignment Description: Expand on your methodology, research design, and chosen statistical techniques. This is perhaps a 4-6 page summary, with rationale for why you will use your chosen techniques (references should be cited).

ASSIGNMENT #4

Due Date: November 26, 2010

Percentage of Grade: 10%

Learning Outcomes of Assignment: Students will:

- Identify research methods used by other researchers in their area of emphasis.
- Develop an outline of the methods for proceeding with their research dissertation.

Required Texts and/or Materials: Hinton

Assignment Description: Identify and obtain samples of the tests or instruments that you will be using in your dissertation. Also obtain the test manual or information about scoring and interpreting these tests. Write a 1-2 page summary for each measure chosen, including a justification for its use in your study (i.e., reliability and validity information must be provided).

ASSIGNMENT #5

Due Date: December 17, 2010

Percentage of Grade: 10%

Learning Outcomes of Assignment: Students will:

- Demonstrate mastery of selected concepts of qualitative and quantitative analysis, including statistical power and its relationship to sample size.
- Compare available statistical methods and identify which one(s) they will apply to analyze their data.

Required Texts and/or Materials: Hinton

Assignment Description: Identify which statistical test you will be using. Describe why it was chosen and how it will help to answer your research question. Include discussion of power analysis.

ASSIGNMENT #6

Due Date: January 7, 2011

Percentage of Grade: 10%

Learning Outcomes of Assignment: Students will:

- Demonstrate mastery of selected concepts of qualitative and quantitative analysis, including statistical power and its relationship to sample size.
- Create a data file in SPSS or Excel.
- Analyze a data set (either pilot data or contrived data) using the method identified.

Required Texts and/or Materials: Hinton

Assignment Description: Set up a spreadsheet for either real pilot data or fabricated data relevant to your research questions (in SPSS or Excel) and either send to me for analysis or conduct the analysis yourself (we will decide as we progress through the course).

ASSIGNMENT #7

Due Date: January 21, 2011

Percentage of Grade: 30%

Learning Outcomes of Assignment: Hinton

Required Texts and/or Materials: Students will:

- Write a clear and concise narrative summary of the statistical results demonstrated.
- Demonstrate an ability to write results using APA format.

Assignment Description: Write up results and interpretive conclusions from the analysis of your pilot/fabricated data (3-6 pages would be appropriate, more if your analysis is very complex).

PHONE CONFERENCE #1

Phone number: TBA

Access Code: TBA

Date/Time: September 14, 2010/ 1:00-2:00 PM Central

Description of Conference: Orientation to the course, discussion of research questions/methods

Learning Outcomes of Conference: Students will:

- Identify and explicate a feasible research question in the interest area of the student.
- Identify research methods used by other researchers in their area of emphasis.

PHONE CONFERENCE #2

Phone number: TBA

Access Code: TBA

Date/Time: January 25, 2011/ 1:00-2:00 PM Central

Description of Conference: Review of course concepts, review of results of analysis

Learning Outcomes of Conference: Students will:

- Demonstrate mastery of selected concepts of qualitative and quantitative analysis, including statistical power and its relationship to sample size.
- Identify research methods used by other researchers in their area of emphasis.
- Develop an outline of the methods for proceeding with their research dissertation.
- Compare available statistical methods and identify which one(s) they will apply to analyze their data.
- Create a data file in SPSS or Excel.
- Analyze a data set (either pilot data or contrived data) using the method identified.
- Explain and justify why they chose their methodology and data analysis techniques.
- Write a clear and concise narrative summary of the statistical results demonstrated.

FINAL ASSIGNMENT:

Complete and return the course evaluation form you will receive a course evaluation form in August and February. You will receive notification of your final course grades only after you have submitted an evaluation for all courses you completed this semester. Students who plan to take an Incomplete in a course must wait until finishing a course before returning the evaluation form for the course.

ADDITIONAL INFORMATION FOR THIS COURSE

Policy Statement on Significance Levels and Power Analysis

Significance levels

In the realm of inferential statistical hypothesis testing, the *p-value* (probability) is a measure of how confident we can be that what we observe in the sample is also true for the population. The p-value is usually given as the probability that what we found in the sample *does not* reflect the population from which the sample is drawn. So, if the p-value is .10, there is an 10% probability, or chance, that what we found in the sample is not true for the population. Stated positively, we can be 90% certain that what we found in the sample is true of the population. If we were to draw repeated samples from the population, then 90% of the time we would expect to find a value at least as great as the one we found in the sample we are using.

The *alpha level* is the p-value that we as researchers decide to accept before we will be confident enough to release a finding. This is our *predetermined* acceptance level. The alpha level is not calculated, it is chosen by the researcher(s). In the social sciences, an alpha level of .05 is generally considered "acceptable." Many researchers will not accept a p-value greater than .10. This means that only if the researcher is 90 (p-value = .10) to 95% (p-value = .05) sure of their findings will they submit the findings to a journal or release the information to a newspaper, etc.

Though the academic world seems to regard a .01, .05 or .10 level as one of the "sacred" markers of statistical significance, it really depends on the situation. In some cases, such as medical research being used to support release of a potentially dangerous treatment, we might want a more stringent level. On the other hand, "medical-legal certainty" of a disability claim uses a less stringent definition of "reasonable probability," which is defined as 51% or greater certainty (Bennett, R.M., 1995, *The Journal of Rheumatology* Vol. 22, No. 2, pp. 273-274).

The upshot of this is that not all research projects are created equal, and there must be allowance for this in staking out an alpha level. However, in general and in order to have the best chance of producing publishable results, *an alpha level of .05 or less should be used for HUGS dissertations*. But, as noted above, there may be legitimate arguments that a calculated p-value of .10 equates to statistical significance, especially with smaller samples, in pilot tests, and in new areas of study.

Power analysis

HUGS research projects should strive for rigor and excellence, and in order to do that, it is imperative that any statistical tests evaluating intervention research have adequate *statistical power*. Power is essentially the probability that your statistical test will detect a true departure from the null hypothesis—i.e., it will find a difference if there actually is one in the population. Power is heavily related to the question of minimum sample size, a question frequently raised by researchers. These topics are briefly addressed below.

The main goal of *statistical power analysis* and *sample size estimation* is to allow you to decide, while in the process of designing your study: (a) how large a sample is needed to enable statistical judgments that are accurate and reliable, and (b) how likely your statistical test will be to detect effects of a given size in a particular situation. Performing power analysis and sample size estimation is an important aspect of experimental design, because without these calculations, sample size may be *too high* or *too low*. If sample size is too low, the experiment will lack the precision to provide reliable answers to the questions it is investigating. If sample size is too large, time and resources will be wasted, often for minimal gain.

Calculating Power. Properly designed experiments must ensure that power will be reasonably high in order to detect departures from the null hypothesis. Otherwise, an experiment is hardly worth doing. Elementary textbooks contain detailed discussions of the factors influencing power in a statistical test. These include:

1. What kind of statistical test is being performed. Some statistical tests are inherently more powerful than others (e.g., parametric tests are more powerful than non-parametric tests, in general).
2. Sample size. In general, the larger the sample size, the larger the power. However, generally increasing sample size involves tangible costs, both in time, money, and effort. Consequently, it is important to make sample size "large enough," but not wastefully large.
3. The size of experimental effects. If the null hypothesis is wrong by a substantial amount, power will be higher than if it is wrong by a small amount. That is, if you expect your intervention to have a large impact on your participants, power is higher than if your intervention is expected to have a small or marginal impact.
4. The level of error in experimental measurements. Measurement error acts like "noise" that can bury the "signal" of real experimental effects. Consequently, anything that enhances the accuracy and consistency of measurement can increase *statistical power*.

Across a wide variety of analytic situations, Power analysis and sample size estimation involve steps that are fundamentally the same:

1. The type of analysis and null hypothesis are specified.

2. Power and required sample size for a reasonable range of effects is investigated.
3. The sample size required to detect a reasonable experimental effect (i.e., departure from the null hypothesis), with a reasonable level of power (usually at least 80%), is calculated, while allowing for a reasonable margin of error.

It is important to note that many journal editors and grant funding agencies now require power analysis be part of any research manuscripts published or research grant proposals accepted. With all of the foregoing in mind, it is the policy of HUGS that *dissertation writers conducting experimental research include a basic power analysis to ensure that their studies have adequate sample sizes necessary to achieve adequate statistical power.*