THE STATSWHISPERER

The StatsWhisperer Newsletter is published by Dr. William Bannon and the staff at StatsWhisperer.™ For other resources in learning statistics visit us on the web at: www.statswhisperer.com

The Ideal Statistics Class Syllabus

When teaching a statistics class, instructors often enjoy a complete freedom to teach the class as he or she sees fit. This is often an ideal opportunity for the professor to exercise creative freedom, educate in the manner that best suits his or her teaching approach, and adjust the lessons to the learning style of the students.

However, this same situation may pose several challenges. Specifically, when teaching students the fundamentals of statistical research, there is likely a common set of core concepts that should be taught. Indeed, as with any subject, there are several *must know* facts that should be focused upon if a class is to have value for the student.

Furthermore, a statistics class would benefit from not just presenting facts, but also teaching skills. In a way, statistics class is like a dance class. One does not attend dance class to learn *about* dancing, but to learn *how to* dance. This is a class where the learning has little utility unless it is applied. Similarly, a student benefits somewhat from attending a statistics class to learn *about* statistics. However, he or she would benefit a great deal more from attending a statistics class that instructs on *how to* apply the learning toward conducting an actual statistical study.

If we assume the statements above are true, the question now begs, what are these core concepts and how can this learning be applied in a classroom setting?

Conducting a quantitative study using our textbook **The 7 Steps of Data Analysis** available:

http://www.statswhisperer.com/store/products/the-7-steps-of-data-analysis/
Ideal for personal use, as well as classroom teaching.

Register for our next 6-week webinar class
(Held from April 11, 2016 to May 19, 2016)
The Steps of Data Analysis at:

http://www.statswhisperer.com/courses/the-steps-of-data-analysis-6-week-webinar-class/

"I have taken statistics 4 times and never understood it until taking your webinar. Your examples make sense and your 1hr consultation is great!"
– Recent Webinar Attendee

The current newsletter issue, *The Ideal Statistics Class Syllabus*, will suggest what these core concepts are, as well as a plan for applying the learning. The syllabus uses a single textbook for learning (our text *The 7 Steps of Data Analysis*).

The syllabus is the overview for our new program **The 7 Steps of Data Analysis Teacher's Support Manual**, which provides educators with several videos and written materials to assist in effectively teaching statistical methods as outlined in the syllabus.

Please feel free to present questions on the piece! Also, feel free to email us if you are interested in obtaining more of the written materials and videos in the **Teacher Support Manual**.

The Class Title, Opening Statement, and Scoring System

The primary focus of this newsletter is to present the week to week subject matter and materials to facilitate teaching the must know care concepts, as well as applying the learning, in an introductory statistics class. However, we would be remiss if we did not mention a few details that should be included on the syllabus of such a class, including the class title, opening statement, and scoring system. For example, we might consider a brief and to the point title for the class (unless a course name is already assigned by the school), such as:

The Essential Steps of Data Analysis: Illustration and Application

The opening statement might also be quick and to the point, such as:

"The objective of this class is to define quantitative data analysis, the critical core concepts within the process, and how one may conduct a study a study in a series of clear, logical, and definitive steps. Weekly lessons will be presented that focus upon the progressive steps that must be taken to produce a comprehensive, efficient, and legitimate quantitative research study.

The class operates upon the belief that learning is a product of performing quantitative analysis, not just reading about the process. Therefore, all learning is applied toward completing an actual quantitative study that is guided by the sample study presented in the lessons."

At this point in our opening statement, the instructor would likely mention the scoring system for the course. Subsequently, let's assume this class will be graded upon the criteria: Midterm Assignment: 40%, Final Assignment: 40%, and 6 Quiz Scores: 20%.

Since we are instructing upon applied skills related to conducting quantitative research, **it might be useful to make the midterm and final assignments activities that will be of use after the course has ended**, such as a *Study research proposal* and *Final report upon the study results* written in a peer-reviewed manuscript form (midterm and final, respectively).

Through making the papers described about the midterm and final, students are introduced to the crucial skills and techniques associated with producing these important products (i.e., a research proposal and peer-reviewed manuscript based upon a quantitative study). The 6 quizzes might be brief (e.g., 10-items a piece) tests to test retention of the course subject matter. If we decided to grade in this fashion, our opening statement might conclude with the text:

"Special attention is also paid to constructing a research proposal for the quantitative study implemented by the student, which serves as the mid-term assignment. For the final assignment, each student will draft a peer-review journal style manuscript that presents the results of his or her quantitative study. There will also be 6 graded quizzes administered throughout the semester."

The following pages will illustrate these material laid out in an actual syllabus form, as well as the teaching in a week by week fashion.

Course Name:

The Essential Steps of Data Analysis: Illustration and Application

The objective of this class is to define quantitative data analysis, the critical core concepts within the process, and how one may conduct a study a study in a series of clear, logical, and definitive steps. Weekly lessons will be presented that focus upon the progressive steps that must be taken to produce a comprehensive, efficient, and legitimate quantitative research study.

The class operates upon the belief that learning is a product of performing quantitative analysis, not just reading about the process. Therefore, all learning is applied toward completing an actual quantitative study that is guided by the sample study presented in the lessons.

Special attention is also paid to constructing a research proposal for the quantitative study implemented by the student, which serves as the mid-term assignment. For the final assignment, each student will draft a peer-review journal style manuscript that presents the results of his or her quantitative study. There will also be 6 graded quizzes administered throughout the semester.

Finally, students will be instructed on how to present their quantitative study in a powerpoint presentation. Although the powerpoint presentation will not be graded, students are required to submit their powerpoint presentations to the instructor.

Grading for the semester will be based upon the following scoring system:

Midterm Assignment: 40%

Final Assignment: 40%

6 Quiz Scores: 20%

Textbook

The central textbook for this course will be:

Bannon, Jr., W. M. (2013). *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study*. StatsWhisperer Press: NY, NY.

Available at the bookstore or at:

http://www.statswhisperer.com/7-steps-data-analysis-textbook/

Weekly Assignments

Week 1: Introduction to Data Analysis and a Model for Conducting Statistical Research

The focus of week one is to provide an overview and definition of the process known as data analysis. Next, a model will be presented that details the precise steps needed to be taken to perform data analysis effectively.

This session will also broach the discussion regarding the project(s) students will use to apply their learning. This discussion will consider the use of a universal class project versus the decision to conduct a series of individual student projects. The class will also suggest ideas for topics of study, research questions, and hypotheses. The choice to gather primary data versus using a secondary data will also be examined. Students will be encouraged to ponder these topics and return with thoughts and suggestions for the subsequent class where these decisions will be finalized. [This discussion gets students in the mindset and feel like a collaborative researcher, not just a student in class]

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Part 1: Introduction (pages 1-12)

Part 2: A Model for Conducting Statistical Research (pages 13-33)

Week 2: The Data Analysis Concepts You Need to Know & Step 1: Study Map

The focus of week two is to learn the *must know* concepts that are pivotal for a researcher to absorb in order to perform data analysis. The topics covered include the levels of variable measurement (e.g., continuous/categorical), variable type (e.g., independent/dependent), inferential vs. descriptive statistics, parametric vs. non-parametric statistics, and composite vs. single item scales. The factors of statistical significance, effect size, and directionality as each relates to examining the relationship between variables are discussed. Lastly, other important issues such as how to structure an effective hypothesis are also discussed.

Selection of the class or individual projects

The class will also come to a final decision regarding the selection of the quantitative study that will be used to enhance their learning over the semester, as well serve as the subject for their midterm and final assignments. Essentially, the class will need to consider the following two options:

Option 1: Gathering original data as a class

If gathering original data, we will select survey items for each class member to present to potential study participants. There can be a few or several items gathered. The class may study one research question as a group or several research questions may be considered.

By the end of class each student has will have a survey copy to present to a certain number of study participants. We will need to determine the number of interviews each student needs to complete to generate an adequate sample size for quantitative analysis.

The data gathered will be entered into SPSS databases in the next class session. These individual student databases will be merged by the professor to create one large class SPSS database for use in the class or individual projects. [See manual for how to merge files]

If original data are being gathered, we will need to address the role and necessity of contacting the school IRB for approval to conduct this project.

Option 2: Using Secondary Data

Alternately, quantitative data analysis might be based upon the use of secondary data, which are data already gathered by another researcher. The class may peruse the secondary dataset to select a class or individual research questions based upon the variables contained within the secondary dataset.

If the class opts to use a secondary dataset, data entry will involve entering the original study surveys into an SPSS database to replicate the secondary dataset. The number or surveys entered per student will depend on the number of students in class (alternately, the database may be partially replicated).

If individual student databases will be used for analysis, all smaller databases will be merged by the professor to create one large class SPSS database for use in the class or individual projects.

If secondary data are being employed for this study, we will need to address the role and necessity of contacting the school IRB for approval to conduct this project.

Keep in mind, regardless if option 1 or 2 is selected, each student will have data via survey hard copies for entry into an SPSS software database by the next class.

Quiz 1 is Administered after this lesson

Implementing Step 1: Study Map

After the topics of study are specified for the class or individual projects, the variable relationships being examined will be modeled as a function of Step 1 of The 7 Steps of Data Analysis, known as the **Study Map**.

The reading assignment within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* for this week is:

Part 3: The Data Analysis Concepts You Need to Know (pages 35-59)

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.1: What Will this Section Tell Us? (page 61) and part 4.2: Step 1: Study Map (page 62).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.1: What Will this Section Tell Us? (page 241-242) and part 5.2: Step 1: Study Map (page 243).

Week 3: Data Entry

The goal of week three is to illustrate how to prepare and enter the data from survey hard copies into a software database in preparation of statistical analysis (using the SPSS software as an example). Specifically, students will first be instructed on how to create an actual software database based upon all study variables, in which study data may be entered. Students will also be instructed on how to create a data dictionary that lists all the variables names and labels ascribed to variables within the database. All data provided by study participants will then be entered into the newly constructed database.

After data are entered into the SPSS software database, the process of "cleaning" the data will be reviewed, where attendees are shown how to examine the data to assure the values are legitimate and have been entered in the database accurately. Lastly, other important means of preparing the data for use, such as how to recode variables, will be reviewed.

Quiz 2 is Administered after this lesson

The reading assignment within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* for this week is:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.3: Step 2: Data Entry (pages 62-85).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.3: Step 2: Data Entry (pages 244-248).

Week 4: Checks of data integrity: Statistical Power & Test Assumptions

The focus of week four will be to begin instruction on how to perform critical checks of data integrity that to assure that data are appropriate for statistical analysis. The first check of data integrity examined will be determining if a study incorporates sufficient statistical power (check 1) for an analysis (the power analysis procedure is reviewed). Next, attendees are instructed on how to identify if the requisite test assumptions (check 2) have been met relative to the statistical procedure employed. These assumptions include topics such as normality, undue influence of outlier scores, homoscedasticity, multicollinearity, and linearity.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.4: Step 3: Checks of Data Integrity (pages 85-144).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.4: Step 3: Checks of Data Integrity (page 248-253).

Week 5: Checks of data integrity: Missing Data & Measurement Tools

Week five will present the second installment of the necessary checks of data integrity needed to assure that data are appropriate for statistical analysis. First, students will be introduced to the concept and consequences of missing data (check 3). Specifically, students will be instructed on how to identify the amount of missing data within a dataset, patterns of missing data, and how to account for missing data. Second, attendees are instructed on how to assess the quality of the measurement tools (check 4) employed within the study in terms of validity and reliability. Emphasis is placed upon explaining the computation and meaningfulness of assessing internal consistency via the Cronbach's alpha.

Quiz 3 is Administered after this lesson

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.4: Step 3: Checks of Data Integrity (pages 144-182).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.4: Step 3: Checks of Data Integrity (page 253).

Week 6: Drafting a research proposal for your study (midterm assignment)

The focus of this week will be drafting an official proposal for conducting your research study. Your research proposal will serve as your mid-term assignment. The skills learned though this assignment will facilitate your drafting a research proposal for any project your will be required to structure and implement (e.g., research proposals for Capstone, dissertation, and/or research studies) over your research career.

Specifically, you will learn how to take your research question, and build supporting evidence regarding why the topic should be studies via a solid literature review. Additionally, you will learn how to structure a Methods section, which illustrates how the study will be conducted, as well as a Data Analysis Plan to guide data analysis.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.8: Step 7: Write-Up & Report (pages 220-234).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.8: Step 7: Write-Up & Report (pages 278-286).

Week 7: Univariate & bivariate analysis for a study with a Continuous Dependent Variable

The focus of week seven is instructing upon how to select and perform the appropriate statistical procedures for the univariate and bivariate phases of statistical analysis when conducting a quantitative study with a **continuous dependent variable**. Student are instructed on how to perform frequencies (univariate analysis) toward reporting the appropriate descriptive statistics the categorical and continuous study variables. Next, students are instructed upon how to perform statistical procedures that examine the bivariate relationship between predictor variables (i.e., covariate and independent variables) and the continuous dependent variable. The bivariate tests applied include the independent samples t-test, One-Way ANOVA, and Pearson's r zero order correlation. Students are taught how to perform each procedure in SPSS, as well as how to interpret the statistical output.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.5: Step 4: Univariate Analysis (pages 182-187) and part 4.6: Step 5: Bivariate Analysis (pages 187-203).

Week 8: Univariate & bivariate analysis for a study with a Categorical Dependent Variable

The focus of week eight is instructing upon how to select and perform the appropriate statistical procedures for the univariate and bivariate phases of statistical analysis when conducting a quantitative study with a **categorical dependent variable**. Again, student are instructed on how to perform frequencies (univariate analysis) toward reporting the appropriate descriptive statistics the categorical and continuous study variables. Additionally, students are instructed upon how to perform statistical procedures that examine the bivariate relationship between predictor variables (i.e., covariate and independent variables) and the categorical dependent variable. The bivariate tests applied include the independent samples t-test and chi-square. Students are taught how to perform each procedure in SPSS, as well as how to interpret the statistical output.

 Quiz 4 is Administered after this lesson

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.5: Step 4: Univariate Analysis (page 254) and part 5.6: Step 5: Bivariate Analysis (pages 154-268).

Week 9: Multivariate analysis for a study with a Continuous Dependent Variable

The focus of week nine to provide instruction reading how to use multivariate analysis to examine the joint effect of several predictor variables (i.e., covariate and independent variables) upon a **continuous dependent variable**. The multivariate procedures introduced in this week is multiple linear regression, which is the appropriate regression model for analysis of a continuous dependent variable. Specifically, in the context of multiple linear regression, students will be introduced to how to interpret the results of a linear model in terms of the standardized beta, unstandardized beta, r-square, p-levels, and effect size estimates. An emphasis is placed on how to interpret the results of the multivariate statistical analysis toward identifying which predictor variable is the most powerful predictor of the dependent variable.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.7: Step 6: Multivariate Analysis (pages 203-220).

Week 10: Multivariate analysis for a study with a Categorical Dependent Variable

The focus of week ten to provide instruction reading how to use multivariate analysis to examine the joint effect of several predictor variables (i.e., covariate and independent variables) upon a **categorical (dichotomous) dependent variable**. The multivariate procedures introduced in this week is binary logistic regression, which is the appropriate regression model for analysis of a categorical (dichotomous) dependent variable. Specifically, in the context of binary logistic regression, students are introduced to how to interpret the results of a logistic regression model in terms of odds ratios, 95% confidence intervals, and beta values. An emphasis is placed on how to interpret the results of the multivariate statistical analysis toward identifying which predictor variable is the most powerful predictor of the dependent variable.

Quiz 5 is Administered after this lesson

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.7: Step 6: Multivariate Analysis (pages 268-277).

Week 11: Reporting the results of statistical analysis in manuscript form (final assignment)

The focus of week eleven is how to report the results of the statistical analysis in the proper professional (e.g., APA, AMA) format. APA style is used as an example. The learning focuses upon using the proper scientific language to report the results in text, as well as the proper format to report the results in table form. Examples of each are provided in the context of the sample study.

Quiz 6 is Administered after this lesson

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Within Part 4: A Quantitative Study with a Continuous Dependent Variable, read part 4.8: Step 7: Write-Up & Report (pages 220-239).

Within Part 5: A Quantitative Study with a Categorical Dependent Variable, read part 5.8: Step 7: Write-Up & Report (pages 278-291).

Week 12: Assessing published quantitative research studies

The focus of week twelve is leaning how to judge the quality and validity of a published quantitative research study. The learning focuses upon approaching the article with a checklist of factors that should be found within the article. To the degree that the article reflects these features, confidence is bolstered in the study. A sample peer-reviewed article is presented and critiqued toward illustrating this method.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Read Part 6: Assessing Published Quantitative Research Studies (pages 293-324).

Week 13: Presentation of class or individual projects

The goal of this week is to equip and empower students with the skills to create a professional level powerpoint presentation that will effectively present the results of their quantitative studies. Special focus will be paid regarding the most crucial information to extract from the analysis, as well as how to present these materials in an abbreviated but powerful powerpoint presentation. Students will be offered the opportunity to present study results to the class. This may be a group presentation based upon the class project or solo presentations based upon individual projects. Powerpoint presentations will not be graded, but each student will be required to submit a presentation to the instructor.

Please see the handout provided at the end of class week 12

Week 14: The role & necessity of a standard model of data analysis in quantitative research

The final class will discuss how the research community would benefit from the availability of a standard model of data analysis. Likewise, the discussion will also focus upon how the absence of such a model puts the research community at risk of producing research that is not statistically and methodologically sound. Special attention is paid to discussing how this component might contribute to subsequent generations of researchers.

The reading assignments for this week within the textbook *The 7 Steps of Data Analysis: A Manual for Conducting a Quantitative Research Study* are:

Read Part 7: Conclusion (pages 325-327).

In Summary

When we talk brass tax, certainly there is no one way to structure a course presenting the fundamentals of quantitative research. At best, there are multiple effective approaches and many colleagues sharing and collaborating upon these methods. This newsletter issue has been written with this end in mind.

In fact, this is the end targeted by our new program **The 7 Steps of Data Analysis Teacher's Support Manual**, which is the program outlined by the syllabus. Specifically, this program supports instructors by not only outlining a syllabus, but also though providing written materials and weekly (designed for a 14 week semester) video presentations presenting the materials. These videos may be watched by the instructor and the students, or just by the instructor while he or she designs their own weekly lesson plan.

These videos are based upon the 6-week Steps of Data Analysis webinar class. Specifically, over the past year about 700 people have taken this class. Of those who provided reviews, 95% reported finding the class very/extremely useful. Participant comments also reflected that the course was instrumental in designing and producing original quantitative research studies. Additionally, comments reflected that participants just enjoyed the materials.

In light of garnering such reactions from a statistics program, we have structured **The 7 Steps of Data Analysis Teacher's Support Manual**, to support these same outcomes for other colleagues teaching their own statistics courses in a classroom setting. Please feel free to ask us any questions about the new program of this newsletter issue.

Thanks for your interest in our newsletter!

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