**The Advantages and Disadvantages of Incorporating a Project
in the Introductory Applied Statistics Course
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Abstract: There are numerous pluses and a few minuses when one includes a project in Stat 101. This poster session will describe several successfully-used multi-deliverable projects. These illustrate some ways that a project can be effectively managed. Direct and indirect ways to assess each student's project performance will also be given.

Here is an example of one of the multi-deliverable Stat 101 projects that I used in a recent spring semester:

Project Deliverable 1 (PD1)—Proposal

Each team should submit its first project deliverable via e-mail, as an attachment, by 10:00 p.m. on xx, xx February xxxx. Before that time at least one member of each team should consult with the course instructor during an office hour about the project. Your project proposal should be placed in a well-written one-page document suitable for a business client. The document should be named PD1xx, where xx is your team, e.g., PD1A2. Among the items that should be described in your proposal to analyze an industry's websites from a well-designed sample are the following:

- your population of websites and your population frame
- your simple random sampling procedure to obtain at least 40 observations
- your pretested well-designed five-variable list of website characteristics you propose to analyze, that contains at least one categorical variable and at least one numerical continuous variable
- your well-designed plan of attack to obtain the data from your sample of websites
- your best guess at the average value you will obtain for your numerical continuous variable of most interest

Your proposal should also identify your team, e.g., A2, and its members. The maximum amount of credit for PD1 will be 10 points, out of the 100 points for the entire project. No late PD1s will be accepted.

Each member of your team is expected to contribute to the team effort. At the end of the project each member will be given an opportunity to evaluate the contributions of the other members of his or her team.

Project Deliverable 2 (PD2)—Data Collection

Each team should submit its second project deliverable at the beginning of class on xx, xx March xxxx, in a well-labeled pocket binder. Before that time it is recommended that at least one member of each team should consult with the course instructor during an office hour about the project. This deliverable consists of the following five well-designed exhibits:

- a listing of your population frame including its source
- Minitab output showing your simple-random-sample-based procedure
- a detailed explanation of your well-designed plan of attack to obtain the data from your sample of webpages—this explanation should include operational definitions of each of your five webpage characteristics among other procedural details
- your coding scheme for entering your five webpage characteristics into Minitab
- Minitab output showing the retrieval of your Minitab worksheet (MTW) data file that should be called DATAxx, where xx is the name of your team, e.g., DATAB2, an info summary of your file's contents, and a listing of your coded data

Each exhibit should identify your team, e.g., B2, and its members. The maximum amount of credit for PD2 will be 15 points, out of the 100 points for the entire project. No late PD2s will be accepted.

Each member of your team is expected to contribute to the team effort. At the end of the project each member will be given an opportunity to evaluate the contributions of the other members of his or her team.

Project Deliverable 3 (PD3)—Descriptive Statistics

Each team should submit its third project deliverable at the beginning of class on xx, xx April xx, in a well-labeled pocket binder. Before that time it is recommended that at least one member of each team should consult with the course instructor during an office hour about the project. This deliverable consists of the following:

- Minitab output showing the retrieval of your Minitab worksheet (MTW) data file that should be called DATAxx, where xx is the name of your team, e.g., DATAB2, and an info summary of your file's contents, and listing of your coded data
- Well-chosen and well-designed displays (graphs or tables) for each variable immediately followed by a succinct one-paragraph explanation of that variable (Each paragraph should mention relevant summary statistics, e.g., a mean or a proportion, in addition to describing the display. It should also describe the shape of the data based upon both the display and relevant summary statistics.)
- A one-paragraph discussion of how well your team believes it guessed the average value for your numerical variable of interest based upon the above information
- A four-paragraph discussion concerning the approximate normality of your numerical variable of interest. (The first three paragraphs should contrast the actual and theoretical properties; the last paragraph should interpret a constructed BL normal probability plot. All of these paragraphs should reference Minitab exhibits.)

Each folder should identify your team, e.g., B2, and its members. The maximum amount of credit for PD3 will be 35 points, out of the 100 points for the entire project. No late PD3s will be accepted.

Each member of your team is expected to contribute to the team effort. At the end of the project each member will be given an opportunity to evaluate the contributions of the other members of his or her team.

Project Deliverable 4 (PD4)—Inferential Statistics and Report

Each team should submit a copy of its fourth project deliverable and a well-labeled virus-free disk with only a properly-named Minitab worksheet file containing your data for the beginning of class on xx, xx April xx. Before that time it is recommended that at least one member of each team should consult with the course instructor during an office hour (and possibly the Writing Center) about the project.

The new material in this deliverable consists of the possible identification, and possible elimination, of any outliers in your numerical variable of interest, followed by inference on the same variable, even though that variable may not be normally distributed. In particular, your team should construct a two-sided confidence interval for the variable's population mean, using a seven-step procedure, and perform related two-tailed hypothesis tests, using both 10-step procedures. Based upon these exhibits there should be a one-paragraph discussion of how well your team believes it guessed the average value for your numerical variable of interest.

Each project team should combine this new material with revised material from the previous three deliverables into a well-designed project report. This report should explain how a thorough statistical analysis has been performed on a set of empirically gathered data. It should be a maximum of 10 double-spaced pages, not including a mandatory one-page non-technical executive summary of the statistical investigation. A cover page identifying your team and its members should appear before your executive summary. The report should reference a set of nicely-organized exhibits explaining the entire analysis process. For example, the actual data, along with its source, should be placed in an exhibit. These exhibits may contain computer output that must be professionally prepared. Each exhibit should identify the team and its members. Following the exhibits should be a bibliography identifying any software you have used and any books or articles you have consulted. Each report is to be neat and legible, and clearly written for an audience of managers, not an audience of Ph.D. statisticians. It is required that the report be typed with the use of a word processing package. The entire project report should be done on 11" by 8.5" paper.

The maximum amount of credit for PD4 will be 40 points, out of the 100 points for the entire project. No late PD4s will be accepted.

Each member of your team is expected to contribute to the team effort. Discussion with other individuals is allowed if it is acknowledged. At the end of the project each member will be given an opportunity to evaluate the contributions of the other members of his or her team.

Additional projects, assessment forms, etc. will be available at this session.