CMST SCOLLARCITY Lesson Plan Template-Lesson Plan using **TI Technologies** (Due Tuesday, July 27th)

Submit as hard copy AND electronically through ANGEL

Name: Douglas Brown
Grade level(s)/Subject taught: 12th grade, AP Statistics
Objectives: (Remember…*How will the modeling tool help the student better learn the objective?)* • To understand the correct order in the process to determine whether linear regression is a suitable model for two sets of data: examine their plots, perform the regression, and then examine their residual plots (the plot of the residuals versus the x-list data). • To understand how to perform linear regression using the TI84+, using these capabilities: plot the data, perform the regression while saving the regression line and noting the correlation coefficient, and create the residual plot. • To understand that examining a plot of data or calculating its correlation coefficient is not sufficient to determine if linear regression is the proper model. An inspection of its residual plot is necessary to make this final assessment.

Items to include in your TI Technologies lesson plan: (use *your* area/discipline/concepts).

For the math teacher:

1. *Write* the Mathematical Concept or "key idea" that TI Technologies will be used to teach:

Students will use mathematical modeling and multiple representations to provide a means of presenting, interpreting, communicating and connecting statistical information and relationships. They will do this by examining four different sets of data. All four sets have approximately the same correlation and the same regression line. However, the four data sets are dramatically different: one is reasonably linear, one has a definite parabolic shape, one is linear with the exception of one outlier, and one is linear with the exception of an influential point. This lesson will impress upon students the importance of doing each step in the process in assessing whether linear regression is an appropriate model.

"...a rich **one-page, typed, single-spaced**, description or a *vision* of your best thinking…"

Prompts:

1. How will you assess the prior knowledge of the student?
2. How will you begin the lesson?
3. What are the teacher and students doing every 5-10 minutes? (Teacher Actions and Student Actions
4. How will you assess the learning for the lesson?
5. How will TI be integrated into your teaching? (i.e. you may want to discuss a problem or describe how you might use the chosen modeling package in your plan. How does the model/tool help the concept(s) to be taught)?

Using the TI84+ graphing calculator, I plan on having my students examine four data sets to determine the appropriateness of using linear regression to model their relationship. The data for this lesson comes from problem 2.46 in the text The Basic Practice of Statistics. In previous lessons the students will have learned how to perform linear regression on the calculator, and how the linearity of data as displayed in a plot can be misleading depending on the window size used. I will assess their recall of the latter by beginning the first five minutes of the lesson with a question on whether we can determine the linearity of a relationship by looking at the plot alone, and probe why this is not so.

In the next 10 minutes, I would break the class into four groups, one for each data set, and have them perform a linear regression on the calculator, noting the correlation coefficient and saving their regression equation. Each group would then report their correlation and equation, which I would record on the board to show that they were all similar. We would discuss if this was sufficient to establish linearity, and understand that we had violated one of our principles – always plot your data. After each group had plotted their data and regression line using the calculator, they would draw a rough graph so the entire class could see all four plots.

For the next 10 minutes, I would help the students understand that to determine whether regression is appropriate, a plot is not sufficient (the window can be misleading), and neither is the correlation (as exhibited by today's four data sets). What then, is necessary? A residual plot!, which displays the differences between the actual data and the regression line. I would then show them how to do this, using the TI84+.

For the next 10 minutes, each group will create and examine their residual plot, and make a determination whether regression is appropriate based on the residual plot. Then, prior to each group actually drawing their residual plot and delivering their assessment, I would have the entire class try to predict what the plot should look like, based on the original plot of data and regression line. After examining the four data sets, we could discuss concepts like the outlier or influential points from sets 3 and 4, and whether it is appropriate to exclude such points in given circumstances.

In the rest of the class, we would discuss the correct order of the linear regression process, and allow the students some time to work with their or another group's data, to gain a richer basis for examining data relationships.

For assessment purposes, the groupwork will be self-assessing as the students guide each other in using the calculator for each step. Students are very comfortable asking classmates for help, and generally enjoy teaching each other. The fact that each group completes each step is evidence that learning and teaching are taking place. Also, the discussion of the groups as they present their findings will help highlight any gaps in their knowledge, which I can then fill in. Finally, homework will also provide another opportunity to practice these skills.

For all lesson plans and within the context of the lesson plan(s) you develop, design (add) a rubric that addresses your objectives AND "guides" your students to success in the modeling arena you choose (AS, Stella, GSP, TI, IP). The rubric should have three or four levels or mastery with the highest level [TARGET], which should detail what you might initially expect of the capabilities from a student doing the best s/he can do. **(etc…)**

Target	Acceptable	Unacceptable
Student uses the TI84 LinReg function to perform a linear regression.	The student performs the regression, records the correlation coefficient and stores the regression equation.	The student does not know what inputs are required for the function, or does not know how to store the equation.
Student uses the TI84 to graph the original data and display the regression equation.	The student's plot accurately displays the data and the associated regression line, using an appropriate window.	The student does not know how to plot the data, the window is inappropriate, or the regression line is missing.
Student uses the TI84 to graph the residual plot.	The student accurately shows the residual plot, using an appropriate window. The regression equation has been turned off.	The student does not know how to graph the residual plot, the window is inappropriate, or the plot is distorted because the regression equation has not been turned off.
Student is very capable of describing the model to a small group of peers and is able to respond meaningfully to questions about the model.	The student can describe within their group and later to the class the results of each step, what it signifies and whether a linear regression model is appropriate given the circumstances.	The student does not understand the order of the steps, cannot describe its objective, or cannot interpret the results that they obtained in the step.
Math Concept thoroughly addressed. Described in rich detail.	In our review discussion, students can correctly identify the steps of the regression process, what to look for in each step, and richly describe why each step is necessary.	Students cannot identify the steps in the correct order, or do not understand the concepts underlying the process and the objective.
Defines exactly how the modeling software "helped" solve the problem.	The student can describe what functions the calculator is performing, why we are using them, and can interpret the results.	The student does not understand what the function used, does not understand the output, or cannot correctly interpret the output and make a conclusion.