The BeAM Project: Rubric and Instructions for Part 5

Part 5: BeAM Lesson, Experiment, and Presentation (10% of final grade, due in class the week of April 16)

Description: This part of the project has 3 parts.

The lesson is a teacher's guide to using your model to complete an experiment. It is a document that accompanies your model and describes how to use it to learn about geoscience.

The lesson should include the following:
1. **Learning objectives:** What will this experiment teach your students?
   a. *if you need help with learning objectives, you can look at the L.O.s for the labs we've completed this semester, or look at the L.O.s for K-12 science on the BeAM Project page on Sakai.*
2. **Materials list:** What materials would a teacher need in order to complete this lesson/experiment in the classroom?
3. **Context:** What grade is this intended for? What information do students need to know prior to doing this lesson/experiment?
4. **Background:** What information does the teacher need to convey to the students directly before starting the lesson/experiment?
5. **Instructions:** Write the methods needed to complete the experiment in detail.
6. **Conclusion questions:** A few questions the instructor could ask to make sure the students learned the learning objectives.

The experiment is what you did with your model to collect data to answer your research question. While you'll have to do your experiment prior to class the week of April 16 so that you know what the data looks like, you can also do your experiment again in class as part of your presentation. The experiment portion of your final project includes the model/experimental set-up, as well as any data you've collected and the interpretation of that data.

The experiment should include the following:
1. The research question you're answering
2. The "raw data" you've collected- e.g., direct observations from the experiment. This may be presented in table or graphical form.
   a. *Note: If your model was unsuccessful, you can "make up" the data- but you will have to justify your data set in the "interpreted data" section*

3. The "interpreted data" – this may be a reformulation of the data, and will also include a description of:
   a. How the data answers the research question
   b. What your original hypothesis was, and whether or not the data supports this hypothesis.
   c. How accurately the model/experimental data can be applied to a 'real-world' context
   d. *If you made up the data, you need to justify how you came up with it. This should be supported with citations of primary literature and/or published data sets. Talk to Dr. Plenge or your TA for details/help.*
4. A set of pictures or video that demonstrate the experiment in action
5. The actual physical model used in the experiment, and/or a detail plan and the failed model.

The presentation is what you'll do in class the week of April 16th. During the presentation, you will share with the class the question your group chose to answer, the model you designed to answer this question, and the experiment you did using your model. If possible, you'll perform the experiment in class, or show a brief video of the experiment in action. Finally, you'll discuss the experimental results.

The presentation should include the following:
1. An 8-minute presentation in which all group members play a role
2. A *visual* presentation of your lesson, model and experiment, that must include:
   a. A brief introduction, including
      i. How the experiment could be incorporated into a k-12 class
      ii. The goal of the experiment (what question you're answering)
   b. The actual model you created
   c. A video, series of pictures, or real live demonstration of your experiment
   d. A tabular or graphical representation of your data set
   e. A set of conclusions or implications for your experiment
3. Each group will also have 2 minutes to answer questions.

The rubric for each part is on the next page.

Point Break Down: 100 points total

- ➢ **Lesson: 25 points**
  - o **7.5 points:** The learning objectives can be achieved by completing the experiment, and are assessable using the conclusion questions written
  - o **2.5 points:** A complete materials list is provided.
  - o **2.5 points:** Context and intended grade level are included and appropriate
  - o **5 points:** Sufficient background is included
  - o **7.5 points:** Detailed instructions that could be used to complete the experiment independently are included
- ➢ **Experiment and Model: 55 points**
  - o **2.5 points:** State your research question. *Graded based on the strength of your research question. It must be testable/falsifiable, and narrow enough for a single experiment to give a "real" answer.)*
  - o **12.5 points:** The raw data. *Must be presented in a readable way, e.g. the grader must be able to understand the data by looking at the tables or graphs you present. There must be enough data, e.g., you have collected sufficient data to answer your question adequately. If the data set was created rather than collected, citations supporting your created data set must be included.*
  - o **20 points**: The interpreted data. *Must be presented in a readable way, e.g. the grader must be able to understand the data by looking at the information presented. The data must be contextualized so that the reader can easily see that the data answers the questions and definitively supports or denies the hypothesis presented, and the real-world context must be clear and compelling.*
  - o **10 points:** The videos, pictures, or real-life demonstration of the experiment, *which should show how the data was collected.*
  - o **10 points:** The actual model
- ➢ **Presentation: 20 points**
  - o **2.5 points:** The presentation is timed correctly (e.g. 8 minutes long)
  - o **5 points:** Each member is part of the presentation, and is knowledgeable and clear in what they present *(This will be graded differently for each individual)*
  - o **2.5 points:** A clear and concise introduction, including K-12 class incorporation and the goal of the experiment is included
  - o **5 points:** The model and experiment are both explained well and presented so that it is easy to understand how the data was collected and see how the model was used
  - o **2.5 points:** Data is presented in an easy to read and comprehend way
  - o **2.5 points:** The conclusions align well with the goals, experimental methods, etc.