Name: _____

Geologic Research Project and Presentation

After working on your research project throughout the semester, you will present it as a PowerPoint presentation on April 23/25 in lab.

Deadlines

Date (in lab)	What's Due	Additional Information
February 26/28	Research question	Your research question needs to be typed. You can bring in a couple options if you choose. We will discuss your questions and how to improve them at the beginning of lab.
March 5/7	Questionnaire	Your questionnaire needs to be typed. We will discuss your questionnaire and how to improve it at the beginning of lab. Do not collect data with your questionnaire before we discuss it!
April 2/4	Data analysis	Your data analysis can be handwritten or typed. You should organize it as a table and/or graphs. These can be done on a computer or by hand. We will discuss your analysis and how to interpret your results at the beginning of lab.
April 16/18	Poster draft	Bring in a printout of your poster draft. We will discuss your poster and how to improve it at the beginning of lab.
April 23/25	Poster and presentation!	

Goal of the project

After completing this project, you will have done what scientists do—authentic scientific research! You will learn something new that no one else has ever figured out. To do this, you will complete a scientific study, including 1) asking a question, 2) doing background research, 3) developing methods, 4) collecting data, 5) analyzing data, 6) interpreting data, 7) drawing conclusions, and 8) communicating results via a scientific poster presentation.

End product

You will present your research as a scientific poster presentation, with headings that include an 1) introduction, 2) methods, 3) results, 4) discussion, 5) conclusion, and 6) references cited. The poster and your presentation of it is worth 15% of your grade, so be sure to put time and effort into it.

Although your poster is not due until the week before your presentation, you will find your life much, much easier if you create your poster along the way. For example, as you do background research on the scientific perspective, then create your portion of your poster on that. Do things in the order described in this handout.

While you are creating your poster, make sure that you do not include too many words on it. For example, it is usually better to use bullet points instead of paragraphs. Visuals (pictures, graphs, tables) help to engage the viewer and make them want to learn more.

Steps involved

1. Ask a question

This question is what you are trying to answer in your research study. It needs to be something that you can answer by collecting data. A good question is one of the hardest things to write. In this project, you will focus on how people conceptualize some aspect of geology, and your question will take the form "What do college students think about _____", where you can fill in the blank with any topic that interests you.

Asking a good question is important because it drives your study. If you ask one that is too open, then you will not be able to answer it in a reasonable amount of time, but if you ask one that is too narrow, you will not end up with meaningful results. Example questions are given below. You should think of these questions as a springboard into thinking about your own interests and curiosities. Additional ideas are given later in this document.

- Where do college students think whales came from?
- How do college students understand the formation of granite?
- When do college students think dinosaurs lived compared to the age of the Earth?
- How do college students think fossils form?

2. Do background research

You need to find out what other scientists have already found out about your topic in general. Scientists build their ideas on top of the work of other scientists.

Therefore, you will need to research the basic scientific understanding of your topic (What do scientists think about _____?). For example, you would need to find out the geologic explanation of where whales came from or when dinosaurs lived. Be sure to note where you get your information from, because you will need to include these references on your poster.

3. Creating the "Introduction" section of the poster

The purpose of the introduction is to introduce readers to your study. The introduction consists of several parts.

1. Scientific perspective—what is the geologically accepted explanation about your topic? You need to make sure the audience understands how it really works before you can explain how students in your study understand or misunderstand it. For this study, the scientific perspective will likely take 2-5 main statements with short explanations under them. Remember that posters are most effective if they don't have too many words, the main points are easy to find, and there are visuals that support them.
2. Goal of your study—what research question are you trying to answer? You can write it very succinctly: "My research question is…"

4. Figure out how you will answer your question

How you answer your question depends on what your question is, and this is where scientists commonly need to get creative. In general, there are many ways to collect data, but for this study you will use a questionnaire. Keep in mind how you plan to analyze your data as you are thinking about how to collect it.

There are many different types of questions that can be used on a questionnaire, and some are described below. You will ask 1 or 2 questions. Depending on the question, you may wish to include a follow-up question asking the person to explain why they answered the way they did. Your question on your questionnaire will be similar to your research question, although it will not be exactly the same. Keep your questionnaire simple.

1. Open-ended question—Ask a question people can answer by writing a few sentences or making a list. Make sure it cannot be answered by a simple yes or no. The question can be completely open-ended (e.g. “Write as many things as you can think of describing…”) or more limited (e.g. “Tell me three things about…”)
2. Drawing question—Ask a question people can answer by drawing a labeled sketch. (e.g. “Draw and label a cartoon showing how a fossilized dinosaur bone forms”)
3. Timeline question—Ask a question people can answer by labeling or filling in a blank timeline that you give them as part of the question. The question can be completely open-ended (e.g. “Label as many things as you can think of that happened…”) or you can give them specific directions of what to label (e.g. “Label when dinosaurs went extinct”).
4. Labeling question—Ask a question people can answer by labeling features or processes on a blank diagram or map. The question can be completely open-ended (e.g. “Label as many things as you can think of…”) or you can give them specific directions on what to label (e.g. “Label where melting occurs…”).
5. Multiple choice question—Ask a question people can answer by picking one or more choices you give. Do NOT use a multiple choice question as your main question because you need to predict how people will answer, and that is very tough to do. If you use a multiple choice second question, include an “other” option as a choice. And include a space where you ask students to explain why they chose the answer they did.

You will want to test your questions out on someone else before collecting data. Give it to a friend or family member to make sure your question is as clear as possible.

You will want to collect at least 15 questionnaires. You will ask your question to other college students (unless you talk to me about having a different group you want to study). Figure out how you will choose who to ask. Options include students in your other classes, students in the cafeteria, students in an empty classroom waiting for their class to start, etc. Keep in mind that how you choose the students may influence your results. For example, if you only ask your question to students who have taken geology, you probably will not find out what the majority of college students think about your research question.

Put a number on the questionnaire and do NOT collect student names. You want everything to be anonymous. Use this number to identify questionnaires throughout your analysis.

5. Creating the “Methods” section

The purpose of the methods is to explain what you did to answer your question. The methods consists of several main statements with explanations beneath them.

1. A justification—what type of question did you pick and why? First, you’ll need to say which type of question you picked, and then you’ll need to say why that question type is the best way to answer your research question. How did you analyze student responses (see below)?
2. Your study instrument—what exactly was the question you asked?
3. Your study population—who did you study? How many people? How did you choose them?

6. Collect your data

Now that you have a plan for collecting your data, go out and collect it! Make sure you are clear and consistent in your instructions for the questionnaires and you tell student to write what they think and not to look up the answer.

7. Analyze your data

Now that you have your data, you will want to analyze it to try to answer your research question. There are different ways to analyze data, depending on the data you collected. Pick the method(s) below that best fit your data and your question.

1. Look for themes—Are students writing/labeling/drawing similar things? They might have different details, but is the big picture the same? Or, is the big picture the same but the details are different? Are students consistently matching or not matching the scientific perspective?
2. Count and graph results—Count how many times students use a particular perspective. Count how many times an area on a timeline is chose, or how many times a label is used or is placed correctly/incorrectly.
3. Compare results—Can students be grouped based on their results? How many students can be grouped based on different themes? Place all students' results on a single timeline or diagram.

As you analyze data, it is important to keep in mind how you will display your results. How you present it depends on your type of data and what story you want your data to tell (what you want to emphasize). Will you have a table with themes you found? Will you include example quotes or drawings? Will you include bar graphs or pie charts? What is the best way to present the data to answer your question? Remember that you shouldn't include lots of words on a poster, so you will need to figure out the quickest way to tell the story of your data.

8. Creating the "Results" section

The purpose of the results is to summarize the data you collected. You are not yet discussing why it's important or what it means. The results consists of one main part.

1. Summarizing results—what did you find out? The focus will be your data in tables and figures. You will likely have either one or two tables or figures, and they should use labels that are meaningful to the audience (not Q1, Q2, A, B, C, etc.). You will need to be able to clearly summarize your results in a few sentences.

9. Interpret your data

What do your results mean? This is the fun part! Think back to your research question and figure out how your results answer your question. Did student perspective match the scientific perspective? Was there anything that surprised you? Why are your results interesting?

10. Creating the "Discussion" section

The purpose of the discussion is to answer your research question by making sense of your results. The discussion is the main point of your poster—it explains the answer to your research question and what that answer means. Therefore, put effort into your discussion! The discussion should be 3-5 main statements with short explanations and evidence that supports your interpretation under them. Questions to consider while writing your discussion are:

1. What do your results mean? How do you interpret them? How do they answer your research question?
2. Why are the results interesting?
3. How does it relate to the bigger picture (beyond college students, beyond your specific topic)?
4. What are your speculations about where students' ideas come from?
5. What are recommendations for how things might be changed based on your results?
6. How might you change or build on your study to answer new and related questions? What would you do differently if you did it again? What new things do you want to learn?

You will not answer all of these questions during your presentation, but you should answer at least three of them.

11. Creating the "Conclusion" section

The purpose of the conclusions is to summarize your main findings. You want to highlight the big picture of what your results mean. This is mostly a summary of your discussion section, answering your research question, summarizing the main points, explaining why they are important, and making recommendations. Make sure your conclusions match the research question, not the scientific perspective given in the introduction. You should not present new information in your conclusion. There should be only a few sentences, preferably as a list.

12. References Cited

Because you had to look up ideas that were not your own for your introduction, you need to reference them. You will be required to include a reference section at the bottom right of the poster with at least two references. If you reference a website, need to include three pieces of information: 1) name of the website, 2) its url, and 3) date you accessed it (for example, Geologic History of Cape Cod, http://pubs.usgs.gov/gip/capecod/, accessed June 9, 2017).

Evaluation

Your final grade for this presentation will be based on the rubric on the following page. This rubric gives the breakdown of how your grade will be determined as well as what you need to achieve full points. The majority of the grade is based on the poster presentation, however, you will also get points for timely completion of the steps of the project along the way.

Ideas for possible topics

The list below contains ideas to get you started thinking about what you want to research. Feel free to choose something that is not on the list. Simple is usually better. Please look through the textbook, websites about historical geology, etc. to help you think about different options.

What do college students think about _____:

- The geologic history of a planet
- How big/fast/etc. dinosaurs were
- The formation or future of Glacier National Park
- The geologic history of sharks (e.g. *megalodon*)
- Where boulders in RI came from
- Specifics about the theory of evolution
- How coal or oil/natural gas form
- How the Grand Canyon formed
- The history and future of Yellowstone
- Climate in the past or future
- Why extinctions happen
- Dinosaurs and feathers
- When life evolved
- How the moon formed
- Dinosaurs and people
- How Cape Cod formed
- How saber-toothed cats lived
- The Big Bang
- Neanderthals
- How horses evolved

In Summary

Your research question is to find out what students think about a particular topic. It is not to do book or web research about a topic, although that is part of it. To answer your question, you need to actually find out what students think by asking them, via a questionnaire you design. You then analyze the responses on the questionnaire to answer your original research question, what do students think about a topic. You will present your entire scientific research project to the class as a poster at the end of the semester. In this project, you are doing real scientific research and finding out the answer to a question that no one else knows!

Geologic Research Project and Poster Presentation Grading Rubric

Points for Meeting Deadlines before the Poster Presentation

Research question brought to lab and discussed	5 points	0 points
Questionnaire question brought to lab and discussed	5 points	0 points
Data analysis brought to lab and discussed	5 points	0 points

Points for the Poster and Presentation (Rubric)

Topic (# of points)	What you need to do to receive full points	Ways to miss points
Poster (10)	Logically organized with headings (e.g. Introduction, Methods…) used effectively. Includes clear pictures; appropriate amount of words; large enough font. Bullet points used effectively. Images are labeled.	Somewhat difficult to follow the flow of the presentation. Pictures unclear or not labeled, too many words, font too small. Bullet points not used effectively.
Presentation (10)	Succinctly presents main components of poster. Demonstrate you know much more than what was put on the poster. Can clearly answer appropriate questions. Enthusiastic and interesting.	Cannot quickly summarize poster and main findings. Must look at poster for information as presenting. Struggled answering questions. Not enthusiastic or not presented interestingly.
Introduction (10)	Introduction is scientifically accurate and complete. Research question clearly stated. Does not overwhelm poster.	Errors in scientific accuracy. Incomplete information. Missing or unclear question. Too much information included, so that it takes more space than the results and discussion.
Methods (10)	Research question and questionnaire are excellent, appropriate, and match each other. Justification given for type of questionnaire question asked. Questionnaire question included. Study population described. 10+ questionnaires given.	Research question or questionnaire question are not excellent. Questionnaire question does not answer research question, is not justified, or is not included on the poster. Study population not described. Too few questionnaires given.
Results (15)	Data analysis and presentation of results are excellent, appropriate, and match each other and question. Data analyzed and presented in a way to answer the research question. Analysis is sophisticated and thoughtful. Results presented effectively in tables or graphs. Explanation given of how data were analyzed. Example quotes are included.	Data analysis and presentation does not answer the research question. Data analysis performed at a somewhat thoughtful level. Results not presented as tables or graphs, or the tables or graphs are somewhat unclear. Missing information about how data were analyzed. Missing example quotes
Discussion (15)	Discussion is excellent, appropriate, and match the question and results. Discussion is sophisticated and thoughtful. The meaning of the results are clearly interpreted. Answers whether students have the scientific perspective discussed in introduction. Relates to a bigger picture, describes what is interesting, speculates where students' ideas come from, makes recommendations, and/or reflects on changes or potential future plans.	Discussion does not address the research question. Does not match the results or give a clear meaning to them. Presented at a somewhat thoughtful level. Does not refer back to the scientific perspective. Does not include enough about a bigger picture, what is interesting, speculation, recommendations, or reflection.
Conclusion (5)	Clearly and accurately summarizes main findings, highlighting key parts of the discussion. No new results presented.	May not be clear. Focuses on more than the main findings. Includes information that is not in the discussion. Presents new results.
References (5)	Two references, with all citation information given. References from reliable sources.	Less than two refs. Not all citation information given. Refs not from reliable sources
Student interaction (5)	Evaluated 6+ other students. Gave thoughtful and constructive feedback with an appropriate tone. Asked good questions to other students and had thoughtful discussions.	Did not evaluate enough other students. Feedback was basic, not constructive, or inappropriate in tone. Did not ask good questions or have thoughtful discussions.

The following are not listed in the rubric, but they can lose you points:

- Poster topic not appropriate
- Arrived late
- Text is plagiarized from another source
- Content repeats too closely with class material
- Proper grammar and spelling are not used