2014 GLOBE Learning Expedition (GLE) Student Investigation Report and Poster Format

Sharing your findings with your peers and your community is a very important step in the scientific process. This part of the scientific method allows your peers to review the work and build on the results. The guidelines below will help you prepare your report for sharing with the GLOBE community. If you are submitting a poster, you can follow the same report guidelines, but abbreviated to fit a poster.

Note: The scientific process steps are outlined on The GLOBE Program website (http://www.globe.gov/explore-science/student-zone/be-a-scientist/steps-in-the-scientific-process). Students can refer to this as a guide for planning their investigations.

Sample GLOBE Student Projects can also be found on the website (https://www.globe.gov/explore-science/student-zone/project-spotlights).

Components of Report

A. Title Page (Page One)

The Title Page should have the report title, the names of the students (if parental consent has been obtained), the school, teacher, and date.

B. Table of Contents (Page Two)

The Table of Contents should outline the report and include page numbers. There should also be an "Acknowledgements" statement which credits those who assisted in the research, including individuals, businesses, and educational or research institutions, if appropriate.

C. Body of the Report:

The Body of the Report should include the following sections (1 – 10)

1. **Abstract**

   The abstract should be a brief description (200 words or less) that summarizes the entire contents of your report. A good abstract tells the reader what the research problem is about, what questions you asked, what objectives you set, which data and methods you used to research your question, and what conclusions you made from your research and recommendations for a way forward.

   Abstract follows this format:

   ABSTRACT TITLE
   (Capital Letters Bold and Centered)

   Name of the Authors (Centered)
   Presenting Author(s) Underlined
   School name, Country

   The abstract body should contain no more than 200 words.

Example abstract:

ASSESSING SATELLITE-BASED AEROSOL RETRIEVALS AND GROUND TRUTH VALIDATION FOR TERRA'S MODIS SENSOR OVER URBAN AREAS USING THE GLOBE PROGRAM'S HANDHELD SUN PHOTOMETERS

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Abstract
The Edmund Burke School collected numerous GLOBE measurements from 2002 to the present. Working with David Brooks in his scientist, teacher, student partnership concept, Gianna D'Emilio, a Burke ninth grade student, expanded her 9th grade science fair project into a much larger undertaking. Gianna and three other students took aerosol measurements coinciding with the times of overflights of the Earth-observing spacecraft TERRA because "ground truth validation" is an essential component of any program that attempts to use space-based measurements to study Earth's atmosphere. The MODIS measurements collected on TERRA were used to calculate aerosol optical thickness (AOT) at several wavelengths. The team of students completed nine months of AOT measurements, refined the GLOBE Aerosol Protocol and has established a data analysis protocol to be used by another team of trained students as part of their long-term science education. The results presented in this paper are inconclusive due to a number of unknown variables. Although GLOBE's ground validation yielded values 0.64 - 4.08 standard deviations below the MODIS AOT values, we cannot be sure whether this is due to procedural (systematic), or random discrepancies.

2. **Research Question(s)**

This section should contain a clear statement of student-led research question(s) ***concerning some aspect of Earth's environment*** that is (are) asked that will provide significant insight into both the topic of investigation and the research process. It should include what led you to ask the question(s), any background information that helps the reader understand the research question(s), and discussion about why the question(s) is (are) important and interesting. Answering the question(s) requires an advanced understanding of the subject matter.

3. **Hypothesis**

Science is about finding answers to our questions about the world around us. Part of finding the answer is to test a hypothesis. A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon, event or scientific problem that can be tested by further investigation. A useful hypothesis is a **testable, measurable** statement. The rest of the scientific process then helps us test if our hypothesis is supported by the data, or not.

4. **Investigation Plan**

The investigation plan should clearly describe the student-led research process. The student-led research group should include up to a maximum of four students. The plan will distinctly define the roles of each student involved and the collaboration team (scientists, teachers, additional students or support from another GLOBE school).

Additionally, the plan should include the steps to complete the project and the collaboration process.

5. **Research Method** (Materials and Method)
The research method section focuses on how you preformed your data collection and analysis in order to answer your research question(s). Full advantage is taken of GLOBE protocols and a direct link is provided to answering the research question (e.g. the research question was answered using a combination of multiple GLOBE protocols). It should describe what GLOBE protocols you used, what GLOBE data you gathered, as well as other data used, and how the protocols and data are useful in answering your question(s). Describe the scope of your research (e.g., time period, geographic area, or specific sites involved). How the data were analyzed should also briefly be explained, including what analysis methods have been applied and what tests were carried out.

6. **Data**
6a. GLOBE Data and Data Entry
The data you collected should be presented in this section. Please note that to achieve a "superior" score (4) in the 2014 GLE rubric, you must include GLOBE data you collected yourself as well as GLOBE data from other schools. Make sure to cite the sources of any data that you didn't collect yourself.

6b. Data Summary: Use of Tables and/or Graphics for Data Entry
All plots, graphs, and tables should be numbered and include a title and a caption. All axes should be labeled and include units.

7. **Data Analysis**
Present a summary of the analysis that you performed on your data. Be sure to describe the methods you used to analyze your data and explain any mathematics that you performed. If you used an equation in your analysis, you should provide and explain the equation in the analysis. Be sure to account for, and discuss, the uncertainties or limitations present in your dataset.

8. **Conclusion(s)**
This section should present the conclusion(s) you reached about your research question(s). Make sure to explain how you arrived at the conclusion(s) based on your methodology and data analysis. Describe your reasoning.

9. **Discussion of Measurement Limitations**
This section allows you to put your conclusion(s) in context, to discuss the strengths and weaknesses of your approach and results, and to outline what you or others should do to extend or improve your research. If your research had impacts related to the GLE theme you may wish to discuss them in this section.

10. **Bibliography/Citations**
Include citations for all references and materials you used in your investigation in a uniform manner, including any graphics, tables, or figures not created by students. This is extremely important, as failure to adequately cite the work of others is plagiarism.

Requirements

The following requirements must be met to submit a research project for the GLE. For those participating in the US GLE Competition, the written report must be submitted to the following email address: science@globe.gov

Written Report Should:

I. Be no more than 2,500 words in length;
II. Include an abstract of 200 words or less in length;
III. Follow the format outlined above;
IV. Be clearly typed in 12 point font and double spaced;
V. Be spell-checked and grammatically correct;
VI. Be a Word document or similar format

If the research is accepted for presentation at the GLE, the following criteria should be followed:

A Poster should:

I. Be able to be attached to a wall or panels;
II. Have a simple and accurate title, names of students, school, teacher, and acknowledgements if applicable;
III. Include graphics and/or photographs documenting important parts or phases of your research;
IV. Be sequentially and logically organized;
V. Presentations that are presented in person will require either a poster (dimensions: approx. 91 cm (36 in.) high by approx. 120 cm (48 in.) wide) or a printed version of the PowerPoint presentation.

A Presentation should:

I. Be a PowerPoint, Prezi, or some similar presentation software;
II. Contain the information from the research report;
III. Have a simple and accurate title, names of students, school, teacher, and acknowledgements if applicable;
IV. Include graphics and/or photographs documenting important parts or phases of your research;
V. Should take no longer than 20 minutes to present with an additional 10 minutes for a Question and Answer session.