

Steps to a Successful Student Research Paper for the 2014 GLOBE Learning Expedition (GLE)

Suggestions for Teachers

I. Support students to design a student-led investigation

- a. Have students develop a research plan with specific steps to guide them in their investigation, including which students will be responsible for each part of the project.
- b. Help students identify the community resources available to them (e.g. local scientists, community members, organizations, etc.).
- c. Help students define time and space scales in which to work.
- d. Have students determine how many of the team members will be needed for each step and who will be involved in each task.
- e. Ask students to determine which pieces of data they will need to collect to answer the question(s) they are asking.

II. Identify research question(s) about the environment to be answered by the student's project.

- a. Create opportunities for students to 'brainstorm' questions they wish to investigate.
- b. Help students to identify one or more of the questions they would like to investigate which are
 - i. Of interest to them and may be of local interest;
 - ii. Able to be addressed using GLOBE data, partially or fully, or GLOBE Protocols; and
 - iii. Of a reasonable scope, answerable in the time available.
- c. Encourage students to revisit these questions throughout the course of the project, as necessary.

III. Explore the environment using GLOBE data or measurements to expand students' range of topics to conduct research

- a. Teach students to use GLOBE protocols to collect their own environmental data and enter them into the GLOBE database.
- b. Teach students to use the GLOBE data archive and to access other data sources to obtain additional data.

IV. Gather Data with GLOBE Protocols

- a. Have students use GLOBE protocols to take the necessary measurements for the appropriate time period and location(s).
- b. Help students integrate GLOBE data with other data sources, both real time and archived, to obtain the additional data they need to address their research question(s).

V. Visualize and Analyze Data

- a. Help students identify and perform the appropriate mathematics to analyze the data they have collected. Analysis should be focused on using all data used to answer their stated research question(s).

VI. Data Summary: Use of Tables and/or Graphics for Data Display

- a. Have students create tables and graphs to display their data in a clear and concise format.

VII. Draw Conclusions

- a. Ask students to draw conclusions from their data analysis. Can they answer their original research question(s)?
 - i. If the students cannot answer their question(s) with the data they collected and the analysis they have performed, get them to understand ‘Why?’ - can they collect more data, do a different type of analysis or revise their original questions?
 - ii. Ask the students to explain other approaches they might have taken that would have led them to an answer to their question.

VIII. Discussion of Measurement Limitations

- a. Guide students to explore the limitations of the data and/or analysis

IX. Communicate Results; Written Report Should

- a. Be no more than 2,500 words in length;
- b. Include an abstract 200 words or less in length;
- c. Be clearly typed in 12 point font and double spaced;
- d. Be spell-checked and grammatically correct;
- e. Organize work according to 2014 GLE Student Investigation Report and Poster Format

VIII. Communicate Results; Visual Display Should

- a. Be able to be attached to a wall or panels;
- b. Have a simple and accurate title;
- c. Include graphics and/or photographs documenting important parts or phases of the research;
- d. Be organized sequentially.

Additional Resources:

- The Implementation Guide in the GLOBE Teacher’s Guide is a helpful resource for teachers (http://www.globe.gov/documents/10157/380993/ig_intro.pdf).
- The GLOBE Student Zone is a helpful resource for students, including more information about the steps of the scientific process and sample reports from other students (<http://www.globe.gov/explore-science/student-zone/be-a-scientist/steps-in-the-scientific-process>).