

Writing Conclusions

January 24, 2018



****To ask your questions: click 'Raise Hand' or use the chat window****

**Student Research Symposia
Open Office Hours/Webinar**

2018 SRS Locations

Region	Location
Midwest	Wayne State University-School of Medicine, Detroit, MI
Northeast/Mid-Atlantic	Adam's Mark, Buffalo, NY
Northwest	Montana State University, Bozeman, MT
Pacific	NASA Ames, Mountain View, CA
Southeast	University of North Carolina, Charlotte, NC
Southwest	NCAR and University of Colorado, Boulder, CO

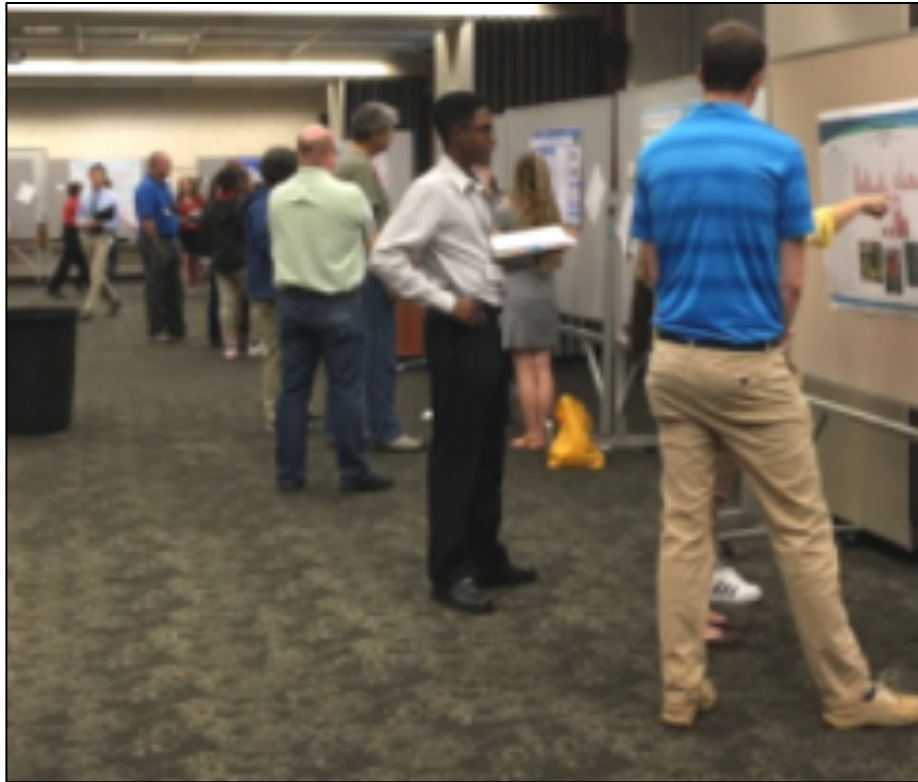
Facilitating Student Research

Webinars and Open Office Hours (7- 8pm EST)

Each webinar will begin with a short presentation on the topic with student examples from past SRS or IVSS. The remaining time will be open office hours for questions on the topic, or other SRS questions. Pre-recorded webinars on each topic are available on the website.

Date	Topic
Tuesday, October 24	Conducting Field Investigations
Monday, November 13	Developing Good Research Questions
Wednesday, December 13	Analyzing Data
Thursday, January 24	Writing Conclusions
Tuesday, February 13	Making a Science Poster
Monday, March 5	Giving a Poster Presentation

RESOURCES FOR STUDENTS AND TEACHERS



NEW this year! Teacher Hotline!

Have a question about the research process or the 2018 SRS?

Fill out [a short google form](#) and you will be connected with an experienced GLOBE teacher who can discuss your question over a brief phone call.

Google form is available from the SRS website:

<https://www.globe.gov/web/united-states-of-america/student-research-symposia>

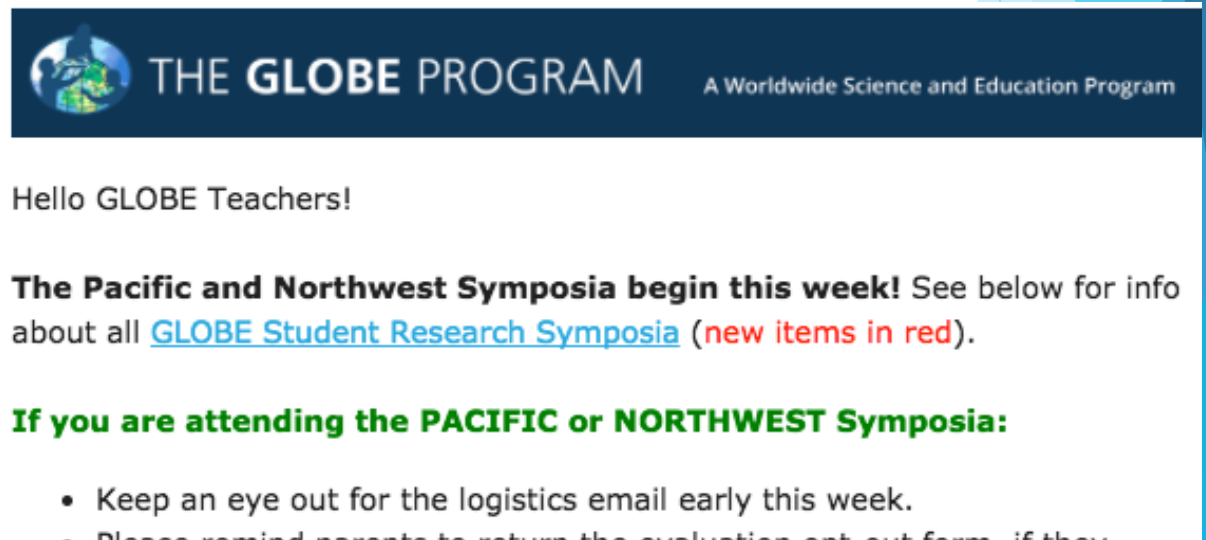
If you are an experienced teacher who would like to join the SRS Hotline team, please contact Haley Wicklein (hwicklein@gmail.com).


SRS Teacher Listserve

If you aren't already on the list,
SIGN UP!

- Stay updated on SRS information and deadlines.
- Find out about webinars and events.
- Direct links to new and exciting teaching resources for student research.

*Sign up link
available on
the SRS
webpage.*



 **THE GLOBE PROGRAM** A Worldwide Science and Education Program

Hello GLOBE Teachers!

The Pacific and Northwest Symposia begin this week! See below for info about all [GLOBE Student Research Symposia](#) (new items in red).

If you are attending the PACIFIC or NORTHWEST Symposia:

- Keep an eye out for the logistics email early this week.
- Please remind parents to return the evaluation opt-out form, if they

GLOBE Student Research Symposia Webinar: “Writing Conclusions”

David Bydlowski, PI-AREN Project

davidbydlowski@me.com

<http://globe.gov/web/aren-project>

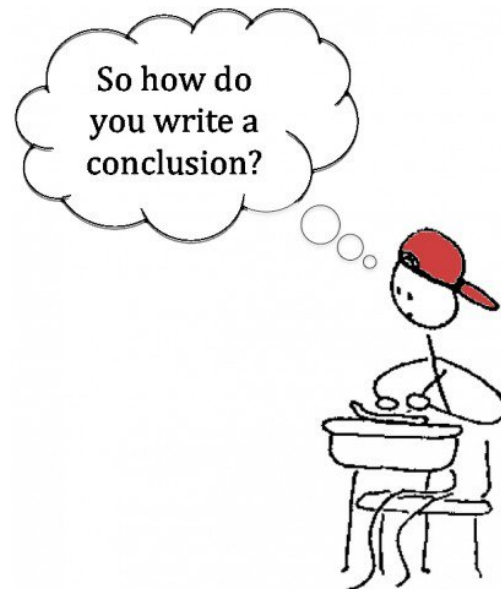
Midwest GLOBE SRS Lead

January 24, 2018



Conclusion

- ▶ Explanation
- ▶ The term conclusion can be confusing to kids.
- ▶ Claim + Evidence + Reasoning = Explanation
- ▶ Correlated to the Next Generation Science Standards





NEXT GENERATION SCIENCE STANDARDS

Practice 1 (Asking Questions) - Draw conclusions from models or scientific investigations.



NGSS Correlation

Practice 3 (Investigations) - Plan a course of action that will provide the best evidence to support the conclusion.



NGSS Correlation

Practice 6 (Explanations) - Scientific reasoning shows why the data or evidence is adequate for the explanation or conclusion. (MS)

Practice 6 - Scientific reasoning, theory, and/or models link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS)



NGSS Correlation

Practice 7 (Arguments) - Provide or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions to resolve any contradictions. (HS)



NGSS Correlation

Practice 8 (Obtaining, Evaluating, and Communicating Information) - Evaluate conclusions in scientific and technical texts in light of competing information or accounts. (MS)

Practice 8 - Critically read scientific literature adapted for classroom use to determine conclusions to better understand. (HS)



Claim, Evidence, Reasoning

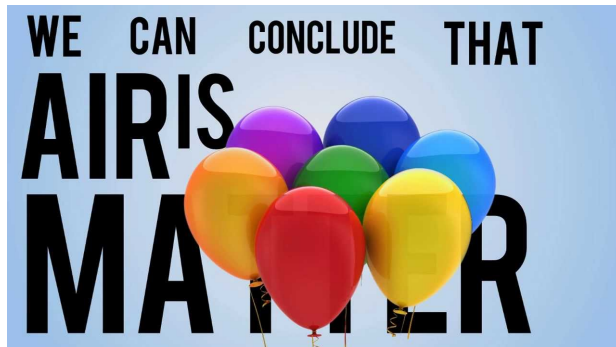
- ▶ A **CER (Claim, Evidence, Reasoning)** is a format for writing about science. It allows you to think about your data in an organized, thorough manner.
- ▶ **Claim** - a conclusion about a problem - answers the original question.
- ▶ **Evidence** - scientific data that is appropriate and sufficient to support the claim.
- ▶ **Reasoning** - justification to show why the data counts as support to the claim and includes appropriate scientific principles.



Example: “Is Air Matter?”

“Edutopia - 2012 (Eric Brunzell-University of Wisconsin, Oshkosh)”

- ▶ Air is matter (**claim**). We found that the weight of the ball increases each time we pumped more air into it (**evidence**). This shows that air has weight, one of the characteristics of matter (**reasoning**).
- ▶ **Problem** - Not much evidence and did not mention the other characteristic of matter - air takes up space.



Help Students Through the Process

- ▶ What are scientists curious about?
- ▶ What kind of data can they collect regarding their curiosity?
- ▶ How will the data help scientists make claims or answer their questions?





- ▶ View the **data** collected.
- ▶ **Claim** - What does the data show?
- ▶ **Evidence** - What evidence does the data provide?
- ▶ **Reasoning** - Connect the evidence to the claim.





Most people make claims, but does the evidence and reasoning support the claim?





- ▶ How much data is sufficient?
- ▶ How appropriate is the data?
- ▶ Is the claim accurate?
- ▶ Is the claim complete?
- ▶ Is the reasoning appropriate?
- ▶ Is the reasoning sufficient?
- ▶ Does the reasoning relate to the claim (Therefore.....)?
- ▶ Are scientific principles used?



CER Statements for Class Discussion

realsciencechallenge.com

- ▶ Red Jellybeans are the best ones.
- ▶ Television is the best invention of the 20th century.
- ▶ Gas prices are lower in developing (third world) nations.
- ▶ Tea is the most popular drink in the world.
- ▶ Taylor Swift is the greatest performer of all time.
- ▶ Chicken soup is a good remedy for a cold.



- ▶ **Claim** - Red Jellybeans are the best ones!
- ▶ **Evidence** - We should give a survey seeing what color jellybeans people prefer. If the survey showed that more people like red jellybeans, this would support our claim. We could ask jellybean companies for their annual sales numbers. If the numbers showed that the color purchased most is red, this would support our claim.
- ▶ **Reasoning** - People may prefer red more than other colors because it represents love. People may prefer the taste of red jellybeans and therefore, most red jellybeans are purchased. This is assuming red jellybeans are flavored. Red may stand out to the human eye more than other colors. Thus, more red jellybeans would be eaten since they are the first to be seen. More red jellybeans are purchased yearly because of holidays that use red. The popularity of red is due to marketing.



Example: Ignobel (Ig Nobel) Prize from Harvard (makes people laugh)

<https://www.improbable.com/ig>

- ▶ 2015 - Michael L. Smith
- ▶ *Research Question - Which part of the body does a honey bee sting hurt the most?*
- ▶ **Claim** - The nostril is the most painful location for a honey bee sting. The upper lip is 2nd most painful.
- ▶ **Evidence** - Mr. Smith stung himself with honey bees. On a scale of 1-10, he noticed stings at the nostril and upper lip had an average pain rating of 9 and 8.7 respectively.



Example: Ignobel (Ig Nobel) Prize from Harvard (makes people laugh)

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- ▶ **Reasoning** - Possible reasons: (1) Pain is more intense at locations with thinner skin. (2) Reaction to pain is greater at “important” body locations like “openings” (lips, nostrils) for protection. (3) Measured neural activity show increased sensitivity at thumb, tongue, lips and digits.



GLOBE Conclusions for “Thought”

- ▶ Tracking Air Quality by Using Lichens
- ▶ By looking at our experiment and the measurements we did we can conclude that the air quality has not changed. It may have changed but the change is so insignificant that we aren't able to notice the change.



Changing the Breeding Ability of Mosquitoes Due to Climate Changes

- ▶ Usually female mosquitoes are laying about 100 to 200 eggs for one time but it depends on the proteins which are most important for the nutrition for the eggs and it is reduced when the nutrition is less
- ▶ Mosquitoes are cool-blooded arthropods
- ▶ Mainly they lays eggs in low temperature and sometimes it departs due to urbanization.
- ▶ Their ability to breed also increased when the temperature is going low
- ▶ With this fact, dengue patients are also increasing in low temperature
- ▶ According to the research we considered that when the climate changes mosquitoes' life cycle adapt to it.



Comparing the Soil in Different Ecosystems

The results clearly show the forest soil has a lower pH compared to the heather soil as we expected. This shows the amount of decomposition has a big influence on the pH of the soil. This becomes even more clear when comparing the top layer of the forest with the other two layers of the forest. The pH on the top layer is a lot lower than on the layers below. These two points prove more decomposition of organic material results in a lower pH of the soil. The different soil layers of the heather seem to have quite a similar pH, especially compared to the forest soil. This is because there are less plants causing less decomposition. The small difference between the layers is probably influenced by feces of animals causing the soil to become more acidic at the top layer.



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Open for Q&A

Please use the “raise hand” or chat window to ask your questions.