

# Design of an Online Global Learning Community: International Collaboration of Grades 7-9 Science Students

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## Abstract:

This poster reviews the design decisions made in the construction of an online global learning community for grades 7-9 science students. The collaborative learning tools of class profiles, student-scientist forums / wrap-up research cruise, and peer review featured in the From Local to Extreme Environments curriculum are discussed. Initial evaluation of these tools and student reactions to global collaborations in this ongoing study has been accomplished through embedded online student surveys and argumentative discourse analysis of student writing.

## Design Considerations:

- Student exposure to multiple scientific data sources
- Interaction with scientists
- Peer interactions
- Large participant number - scalability
- Multiple countries - different cultures, educational systems, first languages, etc.
- Different school calendars
- Protections for students

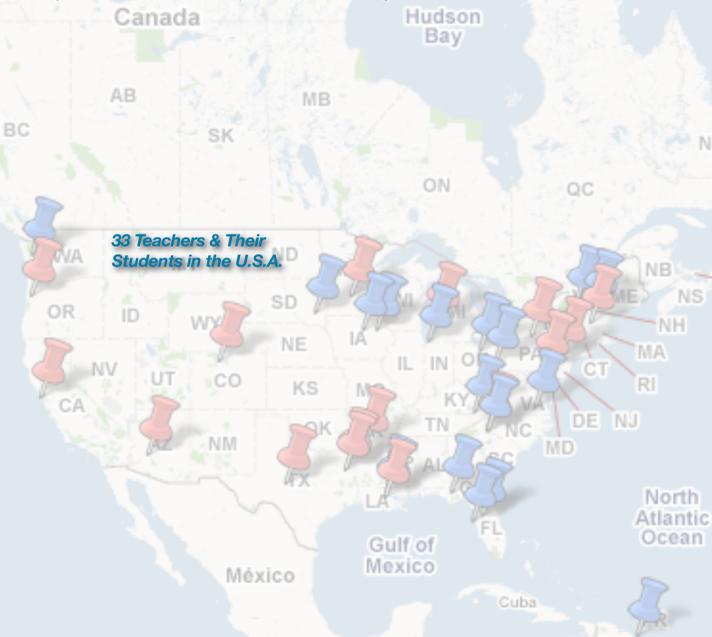
## Context:

From Local to Extreme Environments (FLEXE) Energy Unit Curriculum - Spring 2009

Earth Systems Science Project developed in partnership with the Global Learning and Observations to Benefit the Environment program (GLOBE), a worldwide web-based science and environmental education program.

## Global Learning Community Design Features:

- Clear collaborative educational goals:
  - Develop common understanding of energy in the Earth system
  - Develop understanding of the nature of science through experience
  - Become familiar with diverse environments
  - Compare environmental data from diverse environments
  - Interact with peers and scientists
  - Conduct online peer review
- Asynchronous communication
- 23 days of instruction over 4 months - flexibility
- Principle contrast: Domestic U.S. vs. U.S. to international class partnerships
- All communication in English
- Formats: text, images, videos
- Student anonymity



## Class Profiles

School Data	
Name of School	Beckman High School
Latitude	42.4740
Longitude	-91.1144
Elevation (meters)	292
3 Warmest Months	June, July, August
3 Coldest Months	December, January, February
Highest Temperature Last Year (°C)	28
Lowest Temperature Last Year (°C)	-32
Average Daily Temperature Variation During Warmest Month (°C)	10
Average Daily Temperature Variation During Coldest Month (°C)	10
Class Data	
Class Introduction	Our eighth grade Earth Science class has 67 students who primarily speak English. A few students are enrolled in an Exploratory Spanish class. Our school is a private Catholic school located in the eastern Iowa rural farming community of Dyersville, Iowa, home of the Field of Dreams movie site. We are looking forward to working with your class.
Extreme Temperature Location in our Environment	On February 6, 2009 in the morning, the coldest temperature: 4 degrees Celsius which was north of the school on a hill where there was shade from a tree and very windy. The warmest temperature: 30 degrees Celsius which was under a vent which was above a door on the northeast side of the school.
Temperature Variation in our Local Environment Summary	On February 6, 2009 in the morning, the temperature variation in our local environment was from an low average of 7.7 degrees Celsius to an average of 22.5 degrees Celsius for a high.
Student Data	
What were your hottest and coldest days like last year? What do you remember doing on each of those days? Did you have to stay indoors? (1 answer)	
Describe typical outdoor activities you participate in during the summer and winter. If you don't have winter and summer, describe typical outdoor activities for your other seasons, like rainy and dry seasons. (1 answer)	
students-389 — "Well, hunting. I hunt deer with my 12ga. 870 Remington. I go with some of my friends in my timber. Then I sit and let the deer come to me. Then I also snowmobiling in our timber too. I go with friends on that too."	
How do your pets act in the warmest and coldest months of the year? How do you take care of them in these months? Do you need to do anything different for them during the different seasons? (1 answer)	
students-391 — "I don't think pets really act any different. Some stuff you have to do for them in the winter that is different then others is you have to put stuffing in their doghouse more to keep them warm. In the summer you need to give them more water so they stay hydrated."	
Describe the seasons in your environment (Winter, Spring, Summer, Fall, Rain vs. Dry Season). When does each season occur, how long does it last and what are one or two words to describe each season (e.g., summer is "hot" and "muggy", winter is "sunny" and "very cold")? (1 answer)	
Describe where you are located in relation to large bodies of water, mountain ranges, and location on your continent. If there are no large bodies of water or mountains nearby, simply state this and describe other physical features in your environment. (1 answer)	
students-395 — "We have one big river that is the Mississippi River. We also have other small rivers like Lake Delhi."	

- ### Class Profile Design Features:
- Prompts to focus on environmental data & life in local environment
  - Personal and local environment data
  - Manageable scale of partnerships
  - Class data
  - Student paragraphs
  - Updates throughout unit
  - Teacher to teacher email

## Student-Scientist Forums & Wrap-up Research Cruise

### FLEXEFORUM

**Dataset B: Hydrothermal Vent Plume Temperature**

**Featured Scientist:**  
Dr. Peter Rona  
Marine Biologist  
I am a marine geologist and a deep ocean explorer.  
[Read more...](#)

Greetings FLEXE students! My name is Dr. Peter Rona from Rutgers University in New Jersey. Are you ready for another dataset from the deep-sea? This time, we are going to look at what happens to the extremely hot fluids, setting out of the hydrothermal vent chimneys and up into the water column. What do you think happens to them? Where do the fluids go and what happens to the heat? Remember, deep ocean water surrounding the chimneys is near freezing.

Understanding what happens to the heat from hydrothermal vents is something I am interested in understanding (see bio ). The FLEXE team and I thought you might like the particular dataset listed below not only because it tells an interesting story about hydrothermal vent temperature, but also because of the really fun way we collected the data - through "elevator rides" (explained below).

**Plume studies**

To answer the question of what happens to the temperature of the hydrothermal vent plumes, my colleagues and I made measurements of the temperature of a large plume rising from a group of chimneys along the Mid-Atlantic Ridge. To obtain temperature readings from the plume, the Alvin pilots and I devised an array of temperature sensors that could be mounted on a frame on the Alvin. We then drove the submersible into the center of the plume (see drawing on the right) and recorded the plume temperature and the height above the seafloor. To measure the entire plume, we continued to take readings as the Alvin buoyantly rose within the plume, up to an altitude of over 100 meters above the chimney openings. Altitude, by the way, means height over the Earth's surface or the seafloor (or chimney, in this case).

The sensation of being lifted in the sub by the hot plume felt like riding an elevator, so we nicknamed the trips "elevator rides." Here are data from three "elevator rides."

**Plume Cooling Above the Elevator**

Graphic courtesy of Dr. Peter Rona

**Try this In the Classroom!**

Build a Plume Tank in your classroom. [Click here for instructions on how to set up a plume tank in your classroom.](#)

**Related Links:**

- For more information on finding hydrothermal vents in the deep ocean, visit the [Dive and Discover Hot Topics website](#).
- For more information on how scientists study vent plumes, visit the [NOAA Vents Website](#).

## FLEXE Scientist Forum & Wrap-up Research Cruise Design Features:

- Scalability
- Inverted Ask-a-Scientist design
- 3 components spread over ~3 weeks for each Forum
- Scientists provide deep-sea data and ask questions
- Students submit responses to scientists' questions
- Scientists write feedback mentioning sample student responses
- Additional resources & activities in sidebar
- Scientist and ship crew blogs
- Podcasts, images & research cruise / study site details
- Live phone call to the ship

## Preliminary Research & Evaluation Findings: Contrast of U.S. Students in Domestic U.S. and International Partnerships

- ### Embedded Online Student Surveys:
- Students excited to learn about partner environment and life in that environment, higher level of excitement in international partnerships
  - Students felt data provided by their partner class was useful
  - Students felt that their partner collaborations were similar to scientists' collaborations
  - Students would like to continue working with their partner class

- ### Analysis of Student Writing:
- Students in international partnerships wrote a higher percentage of correct scientific claims
  - Students in international partnerships used more evidence to support their scientific claims
  - Students in international partnerships wrote a lower number of incorrect or not valid bits of evidence
  - Students in international partnerships used argument components of contrast, causality, & experience more often to support their scientific claims

## Online Student Peer Review

**Results**

Our results for graph one were as follows: For "my Extreme" site the lettuce seed never grew. We think that since there was no sunlight and it was shaded we when we went back there, that caused the seeds not to grow. For "this Extreme" site we don't think there was any growth. We say "we don't think" because our base got lost. For "random" site we all averaged 7 seeds that germinated per day. We did notice that it took 14 days to see the first seed.

Our results for graph two were as follows: For "my Extreme" site none of the seeds had grown so there were no indices to measure. For "random" site we don't assume that seed had grown so there were no indices. But that's just a guess because as we said before the logs were lost. For "random" site our average index length was 18.5 mm.

**Please consider the following peer review excerpts when revising your "Results"**

"Is there a written description of the results in the form of one or more paragraphs?"

students-1227 said "yes"  
students-949 said "yes"

"Is the written description, do the authors refer explicitly to the numbered tables and/or graphs?"

students-1227 said "yes"  
students-949 said "yes"

**Discussion** (help)

In conclusion lettuce seeds cannot grow in the type of weather we have right now. Our hypothesis was fairly correct. We predicted what was going to happen to the "random" and "random." We said the "random" was going to grow and that the "random" was not going to grow and our predictions were right. For the "my extreme" we said it was going to grow but unfortunately it got lost. So we couldn't see what happened. But based on the other data from other classmates nobody's outdoor had grown. If the project were to be repeated something that could change is when they actually do this experiment, like the season.

**Please consider the following peer review excerpts when revising your "Discussion"**

"Do the authors state whether their findings support their original prediction (hypothesis)?"

students-1227 said "yes"  
students-949 said "yes"

"What were the strengths of the paper?"

students-1227 said "the information was the great strength in the paper, my partner had a horrible paper, but yours was great."  
students-949 said "they well constructed, had plenty of information, and had a lot of details."

"Do you agree with the conclusions? Why or why not?"

students-1227 said "yes it was very well done."  
students-949 said "yes because they explained everything clearly."

"What suggestions can you make to help the authors improve the final draft of their report?"

students-1227 said "well, the only thing I can say is that it might be better if it was shorter."  
students-949 said "include the protocol."

"Did the authors follow the guidelines for writing their report and provide good support for their conclusions?"

students-1227 said "excellent, exceptionally well done."  
students-949 said "good. Very well done."

"Please rate the overall quality of the writing in this report for clarity, readability, and technical accuracy (spelling errors, run-on sentences, etc.)."

students-1227 said "excellent, exceptionally well done."  
students-949 said "Good. Very well done."

## Peer Review Design Features:

- Student anonymity
- Domestic U.S. and U.S. - international pools for peer review process
- Common knowledge base - FLEXE unit and Lettuce Seed Bioassay Experiment
- 5 components to peer review process spread over ~ 8 weeks
- Conduct lettuce seed bioassay experiment
- Write & submit initial scientific report
- Review 2 student reports from pool
- Yes/No and open ended feedback
- Receive peer reviews
- Revise and submit final report
- Help tools for each section of report

## 6 Teachers & Their Students in Thailand



## East Lau Spreading Center (Between Tonga and Fiji)



## 7 Teachers & Their Students in Victoria, Australia

