The Fulcrum Flash

Something to Think About

We know that heat is a spontaneous flow of energy from an object at a higher temperature to an object at a lower temperature.

Often when we allow two objects at different temperatures to exchange heat, after some amount of time the two objects will come to the same temperature.

For the earth-sun system this heat flow happens via radiation, and this heat transfer has obviously been happening for a long time.

Why aren't the earth and sun at the same temperature?

Have You Thought About Becoming a Fulcrum Fellow?

Last year, the Fulcrum Institute carefully selected a small group of outstanding teachers to participate as Fulcrum Fellows for the 2009-2010 academic year. The Fellows were chosen based on their clear plans and the promise of solid support from their administrators. This support has been critical to the current Fellows' success as they mentor teacher colleagues in professional growth and development.

We have begun accepting applications for the 2010-2011 academic year. Interested teachers are invited to apply in teams of three to five colleagues. Based on the success of the first cohort, and thanks to increased funding from the Noyce Foundation, we are able to accept a greater number of Fellows for the second cohort.

To be eligible to apply, a *team* of applicants must currently be teaching in a high need district. They each must have completed the entire Fulcrum Institute course sequence, and they each must have a graduate degree or have been admitted into Tufts Master of Arts in Science Education program.

The second cohort of Fellows will begin with a Launch in early August. We anticipate another successful year!

By the completion of the three series of courses, a Fulcrum participant becomes adept at recognizing and utilizing the Inquiry Model. In the final course, *Earth's Energy Balance*, they begin to tie their knowledge and experiences together in something called The Capstone.

A Capstone is the last stone on a pillar or the keystone in an arch. It's put into place once all the other stones are gathered to bind everything together and strengthen the structure as a whole.

This project takes place over nine weeks. Each teacher will select a science investigation that students will carry out while the course is in progress. The teacher will clarify the overarching goals for the investigation, describe how the goals align with national, state, and local standards, and then share the goals with students.

The teachers will then select, design and plan two formative assessments where they will collect and analyze two different types of data. Their students will be partners in the assessment, and a colleague will also participate in the project.

The objective is to implement two formative assessments in the classroom successfully, reflect on how the assessments advance students' learning, and provide evidence of student involvement in assessing the development of their understanding.

To broaden formative assessment skills, it is expected that the teachers will apply an understanding of how to increase students' ownership of their learning through partnership in formative assessment.

Summer Energy Workshop

In the last edition of the Fulcrum Flash, we promised that the details of the Summer Energy Workshop would soon follow. We invite you to refer to the enclosed flyer for information about the workshop, which is filling up fast!

The National Science Teachers Association Conference

The **N**ational **S**cience **T**eachers **A**ssociation recently held its annual conference in Philadelphia. Three Fulcrum Fellows, Pat Adams, Nancy Wile, and Cindy Nugent, along with Fulcrum Institute Program Manager Carole Bersani, attended the Conference to become more familiar with the latest science content, teaching strategies, and research. Each attended workshops and presentations with specific areas of focus with the objective of helping teacher colleagues upon their return.

Because Pat has been working with colleagues on science notebooks, she chose to attend a workshop titled *Using Student Science Notebooks to Assess Student Learning*. Pat shares, *"Science notebooks are a way for students to make sense of their learning. Writing about their learning allows them to examine the data, make claims and provide evidence. The science notebook is a resource that students use all year, not only to collect data, but to reflect, generate new questions, and plan next steps."*

Nancy used materials funds that she received as a Fellow, to purchase a weather station and was able to gain a large amount of pertinent information on the topic. She shares, "*NASA's Space Weather Action Center workshop was a real eye opener. It was also a great learning experience. The program was truly about "space weather," specifically what happens in space when there is sun spot activity. I learned how this affects us here on Earth. I received a copy of the software that would allow students to create video news broadcasts on any topic. I hope to be able to have the students use this program to create news broadcasts related to the vernal pool. First though will be my learning curve on more technology. This was only one small segment to all of the learning and exposure we had at the NSTA conference. I will be ruminating on it for quite a while."*

Carole attended a session titled, *Ideas, Evidence and Argument in Science Education (The IDEAS Project)*. The session was lead by Professors Jonathan Osborne of Stanford University and Shirley Simon of London's Institute of Education. Their research demonstrated how argument and student discussion of competing ideas can support student learning.

There are productive methods for teaching the art of argument to young scientists, and the use of Concept Cartoons™ makes for an effective tool when used in a structured small group discussion format.

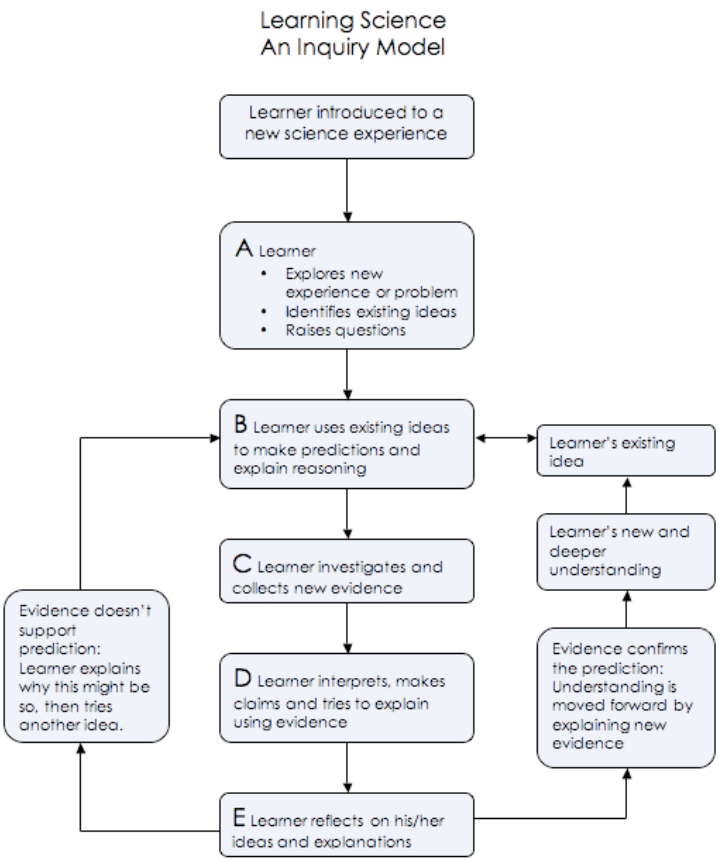
Concept Cartoons™ were created by Brenda Keogh and Stuart Naylor in 1991 to provoke discussion and scientific thinking. The cartoons encourage science teaching, learning, and assessment by presenting a drawing of characters arguing about an everyday situation. There may not be a single 'right' answer, but this is a reflection of scientific discussions in general, as justified by Dr. Osborne, "*Uncertainty is an inherent feature of science-in-the-making, [and] the resolution of uncertainty requires argument*."

A typical Concept Cartoon™ has the following features:

- visual representation of scientific ideas
- minimal text, in dialogue form
- alternative viewpoints on the situation
- scientific ideas are applied in everyday situations
- the scientific acceptable viewpoint is included as alternative
- the alternatives are given equal status

For further information on Concept Cartoons™, or if you want to send any ideas for cartoons, please contact Millgate House Education Ltd. at: info@millgatehouse.co.uk

The Inquiry Model Revisited



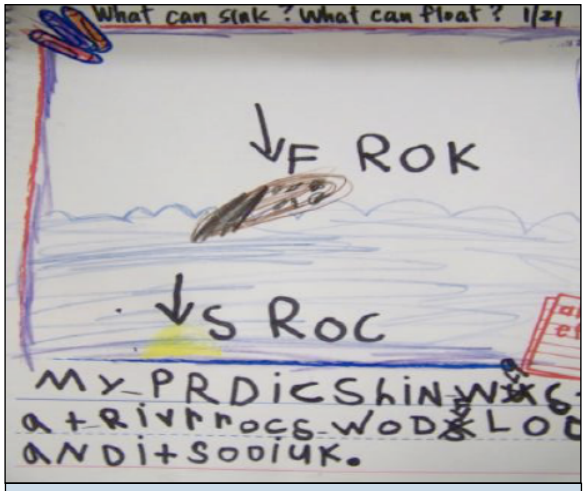
The Inquiry Model table is useful as the present cohort of Fulcrum teachers is in the midst of designing and carrying out Capstone Projects.

The photographs and quotations on this page demonstrate Christina Ryan's journey through formative assessment as her young students explore the many properties of water.

***A** Learner explores new experience or problem... raises questions.*

***B** Learner uses existing ideas to make predictions*

"Even small things can sink, and even big things can float... like my rubber duck is big and IT can float."



***C** Learner investigates and collects new evidence: "My prediction was that river rocks would float and it sunk."*

***D** Learner interprets, makes claims, and tries to explain....*

***E** Learner reflects on his or her ideas and explanations.*

"When you shake water, it makes lots of bubbles."

"Water doesn't have enough power to go uphill by itself."

"When water went down the slide piece, the water came off like kitty whiskers."

In the last issue we gave you something to think about...

The "White Roof Movement" promotes making the roofs of buildings white instead of dark as a way of reducing energy consumption and greenhouse gas emissions.

How would that work? Are there situations in which dark roofs might save more energy? How so?

Here's the resolution, and a little more to think about...

A white roof reflects more sunlight, and therefore absorbs less energy, than a dark roof. As a result there is less solar heating of the building. In a hot, sunny climate where air-conditioning is a bigger user of energy than heating, replacing a dark roof with a white one can significantly reduce the amount of energy the building uses by reducing the need for air conditioning. Since much electricity is generated by burning fossil fuels (especially coal), which results in carbon dioxide emission from the power plant, white roofs can also reduce global warming. The reflection of sunlight from the roof also directly reduces Earth's energy absorption from the Sun, sending some of the radiation back into space.

In a colder climate like ours where more energy goes into heating than into air-conditioning, white roofs wouldn't reduce energy consumption much, and might even increase it – in the winter we can use as much solar heating as we can get. But in Arizona or Texas or southern California, white roofs could make a real difference.

For more information, Visit www.nytimes.com and type "White Roofs" in the search box.

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National Science Foundation
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