The Fulcrum Flash

Meet The Fulcrum Fellows

It was a challenging task to select the first cohort of Fulcrum Fellows from the highly qualified candidates and their administrators who submitted applications. The competition was tight. However, after careful deliberation, the committee has selected four Fellows for the upcoming 2009-2010 academic year. These four teachers will share their science content knowledge in their schools, effectively enhancing classroom practices with their colleagues. As mentors, they will build a cadre of science leaders throughout their schools and districts.

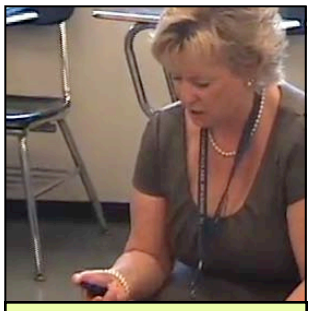
Fellow Joel Blackmer

Joel Blackmer was a member of the first cohort of Fulcrum Teachers. He teaches science to students in grades 6-12 at the Next Wave Junior High School and the Full Circle High School in Somerville. He is already very well-established within the Somerville School District as a valued mentor. Joel has the full support of Principal David Willey. They both look forward to, "..broadening the impact of the Institute in both our school and in our school district."

Equally important to the success of Joel's Fellowship is the support of Assistant Superintendent Vincent P. McKay. Dr. McKay envisions making time in Joel's schedule so that Joel, "...would be available to provide demonstration lessons, provide one-on-one consultation and... make classroom visits in support of our district science initiative."

Cyndy Nugent completed the courses of Fulcrum Institute with the second cohort. She is an eighth grade science teacher at the Donald P. Timony Grammar School in Methuen, and has been sharing her Fulcrum experience, focusing on the Inquiry Method. Cyndy is also participating in the new Fulcrum Masters in Education at Tufts.

She and Principal Judith H. Scannell have developed a variety of plans for professional development opportunities for the teachers of the Methuen School District. Cyndy looks forward to presenting workshops on the Inquiry Method, emphasizing particular grade levels and covering a variety of science curriculum. Cyndy is eager to assist her colleagues in planning lessons that will instill a level of confidence and comfort on the part of the teacher and student. She will be working with teachers at four different schools in Methuen.



Fellow Cyndy Nugent

Something to Think About

"All science requires mathematics."
~Roger Bacon

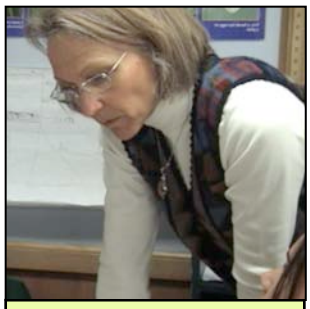
A bug by the name of Mindy Minute is stuck at the end of the 6 foot long minute hand of a giant clock. A second bug, Homer Hour, is stuck at the end of the 4 foot long hour hand of the same clock.

As the clock moves they are sometimes as close as 2 feet to one another and sometimes as far away as 10 feet from one another.

Homer claims that from noon to midnight they are 2 feet away from one another 12 times. Mindy disagrees and claims that from noon to midnight they are 2 feet away from one another 11 times.

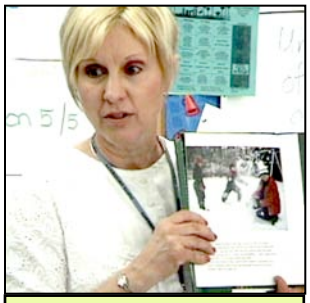
Do you think either of them is right, or are they both wrong? Why do you think so? Can you sketch a graph of how the distance between Mindy and Homer varies over that 12 hour period?

Nancy Wile and **Pat Adams**, also members of the second cohort, will be sharing the Fellowship. They teach at the Dr. Elmer S. Bagnall Elementary School in Groveland. In partnership with Principal Elaine M. Champion, they are eager to continue strengthening science instruction across the school district.



Fellow Nancy Wile

The team plans to continue mentoring new teachers and "...establish classroom partnerships between the intermediate and primary grades..." This will involve sixth grade students helping to develop lessons for third grade students. They plan to incorporate Lesson Study, awarding in-service credits or professional development points to participating teachers. Pat and Nancy plan to form a solid cohort of teacher colleagues who will spend time observing each other, debriefing afterwards, and using their conversations to strengthen their instruction.



Fellow Pat Adams

Assistant Superintendent William I. Hart supports their vision and contends, "A partnership between the Fulcrum Institute and Pentucket Regional School District is a winning combination." Hart goes on to say, "These two teachers are overflowing with enthusiasm and passion for the methods espoused by the Fulcrum program."

First Course Completed

The 55 participants of Cohort 3 are demonstrating their interest in the inquiry model of science in Course 1. They are a persevering group that has remained diligently engaged right up until the end of the semester. It was an intense fourteen weeks of online learning, managing their own classrooms, and maintaining social lives and family commitments.

A portion of their final assignment required them to reflect on the impact of the course on their science pedagogy. Here is a sampling of what they shared:

Dear Colleagues,

- I no longer think of Science as a singular subject, it's a lifestyle. Are you observant about the things around you? Are you appreciative of nature's delicate balance? Do you know how to problem solve with your peers and be a forward thinker? Do you want to make the world a better place?
- The Fulcrum program is helping me tremendously with my confidence to do the job well. I think this first class has helped shape my overall thinking about what teaching Science is all about, and I am looking forward to the summer course to help further my scientific knowledge.
- I sort of had the attitude that this class would be too complicated for me to transfer the information to my class, but I was wrong. This course helped me to look at science in a way that children should look at science. We need to give our students the chance to question and explore the world around them. Using the inquiry approach allows students to not only question the world around them but also to explore the reasons behind things.
- This course has challenged me to be a better guide for my students on their journey to discover the answers to all their questions. On their quest for knowledge, I can now confidently ask them questions, challenge them, and share with them experiences that will help us all grow as scientists.

Erin Goulding and her students discuss the surface tension of water.

- This course has taught me that the more ways a person is involved in the learning, the better and more lasting the understanding will be. My task is to encourage my students to explore, understand, and appreciate the world around them.
- One of the things that is neat about the course is the way we experienced the science learning. I think it really helped me realize how much time is needed to dig deep enough to get a solid understanding of a science concept. Time to think, time to talk, time to ask questions, time to listen and time to experiment and test out ideas. By encouraging us to spend that time doing science investigation, the course opened my eyes to the importance of allowing students the same privilege. Reading Harlen's work brought that into focus and gave me a structure to help incorporate it into work with students. Already I am more aware of the way I ask questions and the need to incorporate time and a structure into a lesson so that the students can experience similar quality inquiry and have the opportunity to build strong and lasting understanding of science.
- My Fulcrum experience has been overwhelming, enlightening, frustrating, exciting, tiring, and definitely worthwhile! Through our investigations and forum discussions, I have become a better science learner and a better science teacher. I can see the benefit of focusing on one or two goals instead of trying to fit too much into one lesson, of sharing those goals with the students, and of asking the right questions at the right times.

Science is blooming in Patricia Kraus' classroom as students determine characteristics of 4 types of soil.

Lia Peacock's students explore sound energy vibrations.

- What helped me the most was the feedback I got from my discussion group. I began to think, "Gee, maybe I'm onto something. Maybe I do know what I'm talking about after all!" My confidence in my science teaching has improved greatly because of this course. I find myself utilizing the techniques I learned - for example- questioning and wait time. I take more care in developing investigations and lesson plans. I don't feel I have to play it safe and go "by the book".
- Prior to coming into this class I viewed myself as a teacher of science. Coming out of this class I realize now that I am doing more than just teaching. I am guiding my students along the path of self discovery. I'm not merely teaching them science, I am laying the foundation for students to teach themselves and learn from themselves.

Plans Are Underway for the Fulcrum Summer Institute

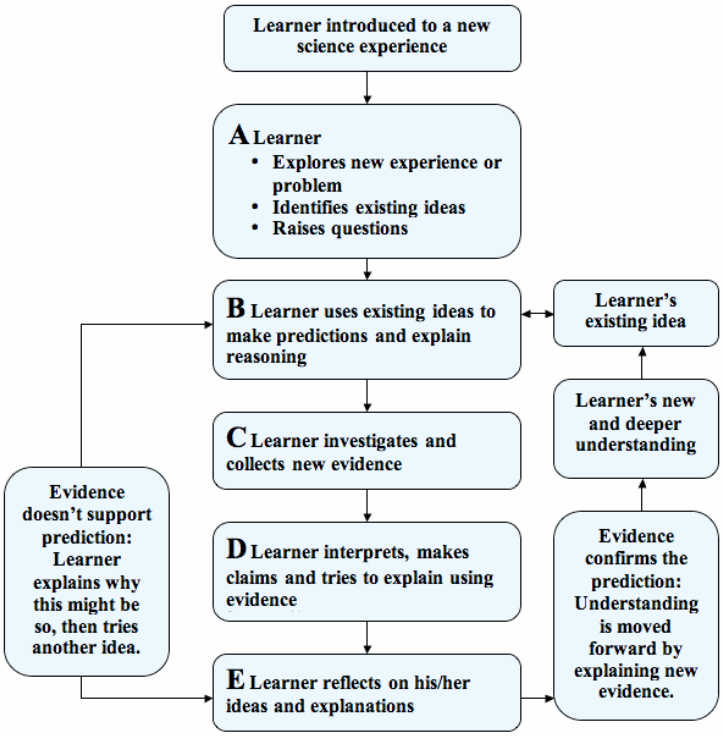
Summertime for Fulcrum Participants will include a week of face-to-face sessions at Tufts University's Medford campus. The Summer Session has three strands: Science, Science Leadership, and Teaching.

In **Science** we investigate matter. During the week, an understanding of mass, volume, and density becomes increasingly nuanced. Participants develop a partial evidentiary base for the particulate theory of matter, build a mental model of particle collisions, and develop a sense of likely and unlikely spatial and velocity distributions of particles in matter, as well as the nature of equilibrium.

In **Science Leadership** an awareness of essential perspectives, skills, and knowledge held by science leaders. You then identify your own next step toward leadership beginning in your classroom.

In **Teaching** the participants will take a close look at a physical science curriculum unit in order to determine its most important ideas and how best to ensure grade- appropriate understanding of these ideas. There will also be an exploration of what children commonly believe about the central ideas in the unit and about the particulate theory of matter. The participants will be selecting a unit based on the Massachusetts Curriculum Framework.

The Inquiry Model



Fulcrum scientists, staff, and teacher participants all use inquiry in their everyday conversations and writings about science teaching. Fulcrum Institute Leader, Linda Beardsley, identifies Fulcrum teachers as colleagues that, "... understand why inquiry must be at the heart of all science teaching, learning, and assessment." Fulcrum Leader Sue Doubler explains that "Scientific inquiry includes formulating questions, predicting, measuring, modeling, and talking." Mike Hansen, a Fulcrum Institute Graduate, validates using the model, "One can read the research about the effect it (inquiry-based instruction) has on student learning, but experiencing the transformative impact ourselves is better."

Using an Inquiry Model is key for learning science at all levels, from preschool to graduate school, and beyond. There are many variations of the Inquiry Model, and this is also useful in the area of mathematics. Fulcrum's model (left) can also be found on the Blackboard Academic Suite which hosts the Fulcrum Institute's online course.

Massachusetts Science and Technology/Engineering Curriculum Framework

The physical sciences examine the physical world around us. Students learn about the composition, structure, properties, and reactions of matter, and the relationships between matter and energy.

Students are best able to build understanding of the physical sciences through hands-on exploration of the physical world. This Framework encourages repeated and increasingly sophisticated experiences that help students understand properties of matter, chemical reactions, forces, motion, and energy. Links between concrete experiences and more abstract knowledge and representations are forged gradually.

Tools play a key role in the study of the physical world, helping students to detect physical phenomena that are beyond the range of their senses. By using well-designed instruments and computer-based technologies, students can better explore physical phenomena in ways that support greater conceptual understanding.

Learning standards for **PreK–2** fall under three subtopics: Observable Properties of Objects; States of Matter; and Position and Motion of Objects.

- In grades PreK–2, students' curiosity is engaged when they observe physical processes and sort objects by different criteria. As they push, pull, and transform objects, the students see the

results of their actions and begin to understand how part of their world works.

Learning standards for **grades 3–5** fall under the following three subtopics: Properties of Objects and Materials; States of Matter; and Forms of Energy (including electrical, magnetic, sound, and light).

- In grades 3–5, students' growth in their understanding of ordinary things allows them to make the intellectual connections necessary to understand how the physical world works.

Learning standards for **grades 6–8** fall under the following five subtopics: Properties of Matter; Elements, Compounds, and Mixtures; Motion of Objects; Forms of Energy; and Heat Energy.

- In grades 6–8, students still need concrete, physical-world experiences to help them develop concepts associated with motion, mass, volume, and energy. As they learn to make accurate measurements using a variety of instruments, their experiments become more quantitative and their physical models more precise.

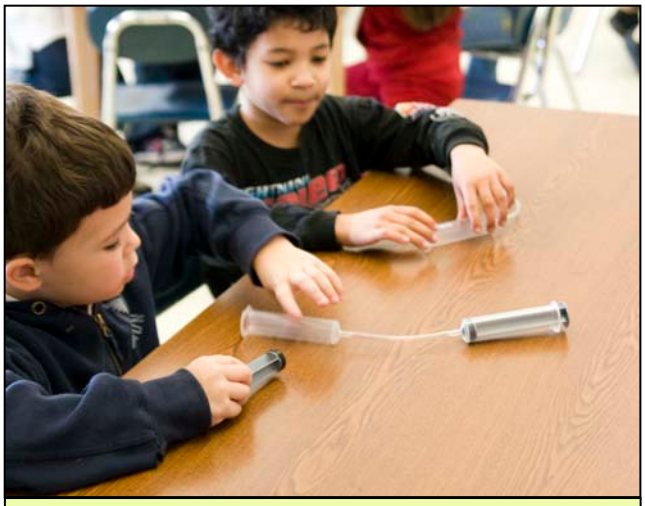
The Annual NSF Report

It has happened every year since Fulcrum Institute's inception back in 2004- the annual report for the National Science Foundation.

We are continually revising the content of Fulcrum courses based on our growing understanding of the teachers' science backgrounds and the demands of their classrooms. Going through the process of revising the content deepens our understanding that ongoing re-inspection of the content of our courses is a process that should never end, no matter how tempting it might be to allow it to do so.

We continue to understand how to better our use of our teacher participants as facilitators of online discussions with their colleagues. Frequently, these efforts seemed to be remarkably successful.

We are proud that the Fulcrum courses are now the core of a new Masters' program in Science Education at Tufts for in-service K-8 teachers.



Ashley Marshall's students are learning that air takes up space, can move things, and can be compressed.

We have begun to consider the issues involved in disseminating our materials and the remarkably productive collaborative modes of working that we have evolved. We have moved forward in several ways, including producing videos that we believe capture the spirit of the Fulcrum Institute, and publishing a bimonthly newsletter that has been circulated widely to past and present Fulcrum students, their school systems, and to others in the greater Boston area. Future plans call for a variety of implementation experiments to better understand how such programs might work in other settings.

National Science Foundation
WHERE DISCOVERIES BEGIN

President Obama Renews his Commitment to Science

President Obama addressed members of the National Academy of Sciences on April 27, 2009, announcing a renewed commitment to science, technology, engineering, and medicine. Topics included America's energy future, revitalizing our health care system, science and math education, and allocating funding and implementing policies to ensure that America reclaims a position of world leadership in scientific innovation.

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

Why do you imagine that the public health people have invented a measure like body-mass index rather than use density as a measure of obesity?

Important Dates:

- July 13-17, 2009
  Cohort 3 Fulcrum Summer Institute at Tufts
- August 11, 2009
  Fulcrum Fellows Launch at Tufts
- September 9, 2009
  Cohort 3 Begins Course 2 Online
- Early September
  Look for the next issue of ***The Fulcrum Flash.***

Have a great summer!

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

Most people's density is very close 1 gm/cc as evidenced by the fact that most people more or less just about float in fresh water. This means that density would not make useful enough distinctions of obesity for public health purposes.

Could you imagine other measures of obesity that depend on mass and size?

What about mass x volume?

Mass x height?

Mass x area of your shadow?

Would they be useful measures?

Tufts University
School of Arts and Sciences

Fulcrum Institute
leveraging leadership in science education
Paige Hall, Medford, MA 02155