


Cooking Up Science Education Reform

Or How Iron Chef became the inspiration for the Exploratorium Teacher Institute



It isn't often that a television show becomes the catalyst for a successful professional development program for teachers. For the Exploratorium Teacher Institute – a nationally respected program that has provided science and math teachers with support and training for almost twenty years – inspiration came from *Iron Chef*, a wildly popular Japanese game show that has reached cult status in the U.S. We have been web casting our own satirical

version of *Iron Chef* called *Iron Science Teacher*, and it is rapidly achieving cult status among science teachers, science students, and anyone aspiring to be a “mad scientist.”

Iron Chef, the game show that inspired our work, pits two master chefs against each other in a head-to-head culinary duel. A secret ingredient is revealed to the chefs (say, squid or radishes) and each chef is given one hour to create a six-course meal in the television studio that is transformed into a state-of-the-art kitchen arena. Each course must contain the secret ingredient, even dessert. During the hour of frenzied chopping, slicing, and sautéing, two anchormen provide running commentary. After an hour of cooking, the two armies of assistants retire to their respective corners. Each of the dishes are tasted and the chef whose creations have satisfied the palates of a distinguished panel of judges (that includes Japanese celebrities and food experts) is crowned, “Iron Chef.”

Our *Iron Science Teacher* web cast pits talented science teachers against each other in the Exploratorium's *Phyllis Wattis Web Cast Studio*. The contest attracts



by Linda S. Shore

IRON

SCIENCE TEACHER



Each combatant comes up with a math or science activity that could be done at home or in a classroom.

The only rules are that the activity (1) must teach a math or science concept, (2) be safe to do at home or in a classroom, and (3) make some use of the secret ingredient.

between five and ten contestants. Each contestant is a secondary science or math teacher participating in the Exploratorium Teacher Institute summer programs and all enthusiastically volunteer to be part of the competition. About a week in advance, teachers are told what the show's "secret ingredient" will be (the "secret ingredient" is only secret to the audience, not to the contestants). The ingredient is an object that is commonly available to teachers and very inexpensive; for example, 2-liter bottles or balloons. Each combatant comes up with a math or science activity that could be done at home or in a classroom. The only rules are that the activity (1) must teach a math or science concept, (2) be safe to do at home or in a classroom, and (3) make some use of the secret ingredient.

Like *Iron Chef*, teachers construct their activities from scratch in the web cast studio that is transformed into a machine shop. Contestants have access to drill presses, hammers, jigsaws, vices, soldering irons, and other tools. After a 15-minute construction period that features informative yet somewhat irreverent running commentary for the viewers, each teacher must demonstrate their activity and teach a science or math concept to our esteemed judges – our live studio audience of museum visitors. Because the Exploratorium is a science museum that prides itself on being at the cutting edge of high technology, determining the winner of *Iron Science Teacher* is done scientifically and with state-of-the-art tools. Whoever gets the loudest applause

wins. What measures this? I do. I'm the show's host.

I have been the mistress of ceremonies for *Iron Science Teacher* since the first show in 1999. My qualifications for becoming a game show host? None, really. I'm a science educator, a physicist, and the director of the Exploratorium Teacher Institute. But after hosting over 25 broadcasts, game show hosting has become my fallback career in case my dreams of reforming science education in the U.S. don't pan out.

The show is broadcast live every Friday during the summer and several times during the academic year. Each show is archived and available on-line for viewing anytime (www.exploratorium.edu/ironscience). We have even produced some special shows, like a "bake-off" between two highly respected physicists who created science activities using pantyhose. It was an "East Meets West" competition that pit Exploratorium teachers against graduate students at Columbia University Teacher's College, and a show celebrating Women's Health Month in which the secret ingredient was a feminine hygiene product.

There have been some memorable science dishes served up during our *Iron Science Teacher* web casts. There was the teacher who used a film can to create an actual working model of the human eye. For our first Christmas web cast, the winner demonstrated that fruitcake – both celebrated and shunned for its density – actually floats in water. That was until he sat on it and smashed it flat. Then the fruitcake's density

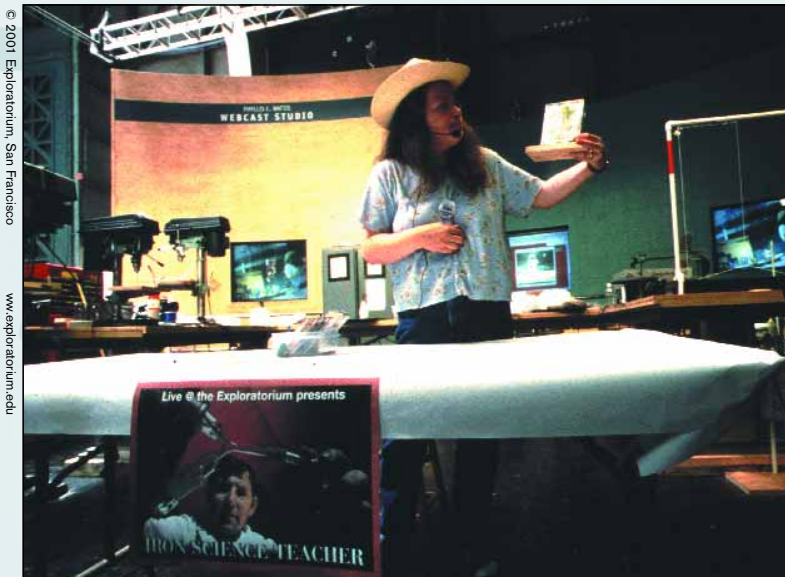


Photo by Lily Rodriguez

Iron Science Teacher winner, **Karen Mendelow Nelson**, demonstrates that a CD jewel case can be used as a seed germinator.

increased enough to send the holiday treat to the bottom of the tank. Equally memorable was the five foot long blow-gun made of PVC pipe that exerted a force over enough distance to send the secret ingredient (a marshmallow) over 75 feet, finally striking a visitor in the back of the head. My personal favorite was from the infamous Women's Health Show, where a rocket launcher made of three tampon applicators launched a cotton tampon into the metal rafters of the museum where it remains to this day.

By combining strong science content with scientific inquiry and adding more than a pinch of outrageousness, we have cooked up a very popular show. *Iron Science Teacher* has attracted it's own cult following, including a dedicated group of science teachers in Japan who regularly watch the archived web casts and vote for their own winner. But despite the somewhat wacky nature of our show, there is a very serious side to *Iron Science Teacher*. We are discovering that our show promotes science education reform in ways that

no one could have anticipated when we first concocted the idea.

Anyone wanting to learn more about science and the nature of scientific inquiry benefits from *Iron Science Teacher*. Our shows reinforce the Exploratorium philosophy that even the simplest things can excite our curiosity and become the center of an investigation. It's the familiarity of the objects under examination that makes the show surprisingly popular with children. Although our show explores fairly complex concepts, our shows attract large numbers of elementary school students who watch the entire one-hour broadcast without fidgeting. At the end of each broadcast, kids wanting to know more about the activities literally mob the contestants. Many of these children go straight to their homes and recreate the experiments they just saw. Hopefully, some will be inspired to become scientists or take up the challenge of being a science teacher.

Iron Science Teacher is also increasing the public's awareness of the talent that exists in their schools.

One can't possibly watch an enthusiastic science teacher whip up an amazing physics lesson using nothing but paperclips and still believe the absurd cliché that "those who can't



Staff biologist, Dr. Karen Kalumuck, competes in the "baking soda" episode of *Iron Science Teacher*. Here Dr. Kalumuck is demonstrating how to use the secret ingredient to mummify a fish.



Contestant, Sue Pritchard (right), finds a young audience member to help with an experiment.



Photo by Lily Rodriguez

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teach.” Also the shows give the public a chance to experience the kind of hands-on, inquiry- based science and math teaching advocated by school reform movements. As one mother said to me after a show, “I wish my science classes had been this fun. I’m glad my daughter has these kinds of teachers in her school.”

Teachers throughout the country benefit from our shows. The archived *Iron Science Teacher* shows are a tremendous pedagogical resource. Literally hundreds of hands-on science and mathematics activities are available through the archive. A novel ingredient – like kitty litter – might be just what an earth science teacher needs to help her students understand how geologists interpret layers in sedimentary rock. And because every activity makes use of an ingredient that is inexpensive and readily available, the shows demonstrate how a teacher’s multi-million dollar state science standards can be taught on their ten dollar supply budget.

Finally, *Iron Science Teacher* provides contestants themselves with an increased sense of empowerment and accomplishment. Participants in the Exploratorium Teacher Institute are selected for our summer program because of their passion and abilities, yet this talent is hidden behind classroom doors. For many, *Iron Science Teacher* is the first chance they have ever had to teach for their peers. The opportunity to share teaching strategies with colleagues is an important step in becoming a leader, and many go from nervous *Iron Science Teacher* contestant to confident workshop leader in their districts. But most importantly, whether a science teacher is crowned *Iron Science Teacher* or not, each receives a huge cheer from a large and appreciative crowd. For our contestants, this long overdue ovation is a rare chance to be recognized for being the exemplary teachers that they are.

Linda Shore, Ed.D.

is the director of the *Exploratorium Teacher Institute*. Shore is also the Principal Investigator of the *Exploratorium Teacher Induction Program* that provides support to beginning science teachers in the Bay Area. Shore has also co-authored several activity books for families (*The Brain Explorer*, *The Science Explorer* series) and is the host of *Iron Science Teacher*.

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iron science student

Teachers often ask me how to get their students involved in an Iron Science Student competition. Doing an Iron Science Student competition is a great idea for an after school science or math club or as a special assignment for students in your science or math classes.

Try this:

1. Have students watch *Iron Chef*, or better yet, *Iron Science Teacher*. This will give your students an idea of what they will do as contestants. (You might want to consider having students work in teams of 3 to 5 students).
2. About 1 to 2 weeks before the “show,” tell your students what the secret ingredient will be. You might even want to do the competition the way *Iron Chef* actually does it – give the students a list of 3 ingredients it *might* be. The actual secret ingredient is revealed during the show itself. Keep the secret ingredient simple. It should be something readily available and cheap (for example, ping pong balls, rubber bands, or plastic bottles).
3. About a week before the show, assemble the names of the contestants (or teams). Have each contestant (or team) tell you what activity they are thinking of doing and what science or math concept they will teach. Make sure that the activity is safe for others to duplicate and that the students have an accurate understanding of the underlying math or science.
4. Find an audience and a place to perform your show. You might want to do the show for younger students. Other audiences might be parents attending a Family Night at your school. Some teachers have even considered doing an *Iron Science Student* competition instead of a science fair.
5. Prior to the show, make sure that you have the following available for your contestants: a table where students will demonstrate their lesson, tables and equipment needed for students to build their activity, and a microphone and speaker system.
6. The show itself has the following four parts: (i) The game is described by the host and students/teams introduce themselves. (ii) The secret ingredient is revealed and contestants have a 10-15 minute building time. (iii) Each student/team teaches a science or math concept using the device/activity they have built. (iv) The audience (or some panel of judges) selects *Iron Science Student* by applause (or some other method of your choosing).

INTERNET CONNECTION

Iron Science Teacher webcasts are archived and can be found at http://www.exploratorium.edu/iron_science/index.html

Information about the Exploratorium Teacher Institute can be found at <http://www.exploratorium.edu/ti/>

All Exploratorium live web casts and archives can be found at <http://www.exploratorium.edu/webcasts/>