

Final report - DR138: Expanding Your Horizons Conference

Dr. Tom Thomas and I have written up the demonstrations for 2 workshops we presented at the recent Expanding Your Horizons Workshop here at the University of South Alabama. The files have been sent separately and are in word documents. We understand that these workshop notes, two on electrical engineering and one on fluids engineering, will eventually be placed on the SWE web site for others to use in their workshops. I have also sent a draft of the announcement for the next Expanding Your Horizons workshop scheduled for October 19, 2002. It includes a picture of the pickle experiment and an acknowledgement of the support by SWE. We will amend it to also recognize the contribution from the Ford Fund. The girls seemed to enjoy all three of the demos outlined in these files. We hope they are a useful addition to the service SWE is providing.

Final Budget: We had requested a percentage of the overall costs for the original Expanding Your Horizons conference. Since the funds were released to us after the conference, they were added to the existing account and are being used to prepare for the next Expanding Your Horizons conference scheduled in October. We have just made our first (of 3) mailings to over 120 middle school principals, teacher contacts, the Deep South Girl Scout Council, and the SECME counselors (South East Counsel for Minority Engineering). We plan to mail out additional announcements in early August during the teacher planning periods, followed by another announcement and the registration materials at the end of August. The deadline for applying to the conference will be in late September. We anticipate 200 – 250 girls participating this fall. We have commitments so far for 25 of the 30 targeted workshops with 2 more weeks to go before the deadline. We are also planning to offer several seminars for parents and/or teachers in conjunction with the workshops for the girls.

We appreciate the support of the Ford Fund and the Society of Women Engineers as we endeavor to actively recruit young girls into math, science, and engineering careers!

Submitted by:

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Expanding Your Horizons In Science and Mathematics 2002

Conference on Careers in Science, Math and Engineering for Middle School Girls

Date: Saturday, October 19, 2002
8am – 3pm
University of South Alabama
Main Campus
Speaker: Kathie Olsen
NASA
Deadline: Tuesday, October 1, 2002
Fee: \$10 (includes lunch)
Students attend 3 workshops

Registration limited to 200 girls
Student scholarships will be available

Sponsors: USA Women in Science
Alabama Cooperative
Extension System



Partners: The Math/Science Network
USA Colleges and Departments
Society of Women Engineers
NASA
Syngenta
VWR

Details and other conference information will be available on the EYH



40 girls from local middle schools attended the 2001 EYH Conference at USA.



Cheryl Thompson - Vice President, Alabama Power - was the Keynote Speaker.



Stethoscopes allow students to listen to the heart in "Can you hear the beat?"



Students investigating the chemistry of perfumes in the workshop "It's all in the air."



The Electric Pickle

Purpose: To introduce students to unusual electrical phenomena

Grade Level: 4th – 8th grade

Materials Needed:

- Two common nails, 16-d
- Sandpaper
- Extension cord, two conductor
- Plastic electrical tape
- Kosher dill pickle, 4-inch length or larger
- Glass baking dish

Length of Time for Activity:

15-30 minutes

Volunteers needed:

2-3 to help with preparation, but the actual experiment should be performed by an adult.

Activity Description:

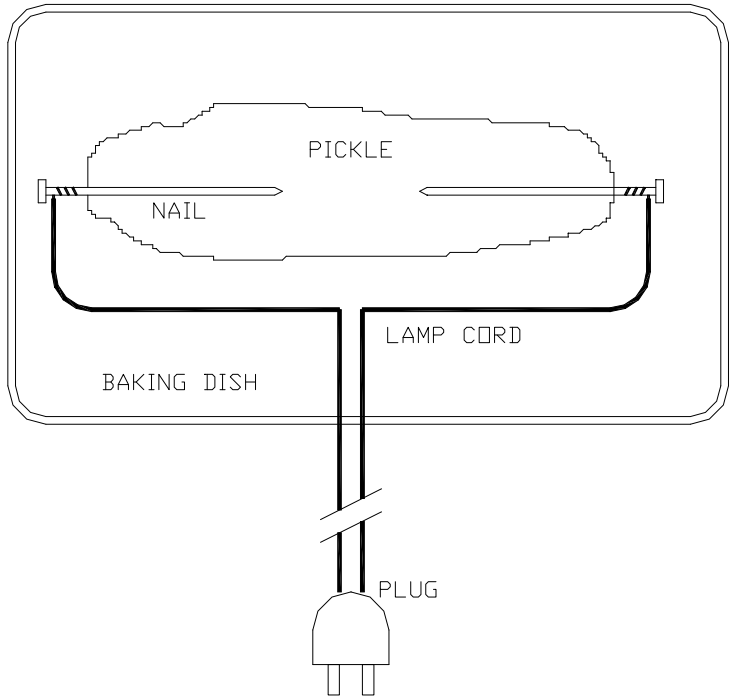
- Cut the socket end of the extension cord off and discard it. Separate the two wires on the plug end to a length of about 8 inches.
- Strip 2 inches of insulation off of each wire and wrap the bare wire ends around two nails.
- Tape the bare wires to the nails, and sandpaper the shafts of both nails until bright.
- Insert the nails into the ends of the pickle. The pointed ends of the nails should be at least 2 inches apart. The nails must NOT touch together!
- Place the pickle in the glass baking dish.
- Stand back from the baking dish and plug the extension cord into the wall.

WARNING: DO NOT TOUCH THE PICKLE WHILE THE EXTENSION CORD IS PLUGGED INTO THE WALL!

- After a few seconds, the pickle will begin to emit fluorescent green light. Unfortunately, it also emits a quantity of steam and smoke, so the experiment should be done in a well-ventilated area.

Things to Discuss:

- Science can be fun!
- Nobody really knows why this happens.



Flow Visualization

Purpose: To introduce students to streamlines and how fluids behave around basic shapes.

Grade Level: 4th – 8th grade

Materials Needed:

- Long piece of square duct – an 8-10 foot piece of rain gutter works really well.
- Small children's building blocks – a triangle, a rectangle, and a cylinder all work well. If you have access to a wood saw, a simple airfoil shape and a simple wedge shape are also good. Shapes should be at least 1 inch thick, and the airfoil and wedge should be 2-3 inches long.
- Laundry bluing – You could use food coloring, but laundry bluing shows up very well, and does not stain clothes or hands! It washes right off.
- Medical syringes (no needles!) or small spoons
- Small paper cups
- Lots of paper towels
- Can of cooking spray

Length of Time for Activity:

10-15 minutes for each group of 5-6 students

Volunteers Needed:

It helps to have one adult with each group of 5-6 students, but it can easily be done with fewer adults.

Activity Description:

- Set duct or gutter up so that it can get a constant stream of water at one end and run into a drain or large bucket on the other end. If using a bucket, be sure to constantly check water level. I usually set up in a lab with two or more sinks or on a bench with a drain at one end and water hookups along the bench.
- Practice with the water delivery to get a smooth, continuous stream of water that covers 2-4 feet of the duct with a reasonably fast steady flow of water about 1/4 inch deep. This is the test section. It usually takes a bit to adjust the water flow to get a nice, clean, smooth flow across and down the test section. If you are using a rain gutter, I've found that it is often treated with a special paint that is not quite smooth. If you spray down the length of the duct with cooking spray, it helps make the water in the test section smoother with fewer reflections from the particles on the walls and bottom.
- Pour laundry bluing into several small paper cups. Have syringes or spoons out and handy.
- When the students are ready, invite them to the test section and tell them they will be making streamlines to see how the water flows around basic shapes. I often have a couple of posters of streamlines around a cylinder and an airfoil posted to refer to. Tell them they will get to choose the shapes and test the waters!
- Have a student pick a shape and tell him/her to draw up some of the bluing in a syringe (or put some on a spoon). Have him/her place the shape in the water stream. Ask him/or

her to gently squeeze (drop if from spoon) a small amount of the bluing ahead of the block. They will see streamlines briefly develop around the block. They can also drop bluing downstream of the block to see wake effects.

- Let all the students take turns choosing shapes and checking the resulting flows. If your test section is long, 2 different tests may be done, since the bluing mixes quickly with the water. I find that students are eager to try this, and the adult just needs to stand near and talk about what's going on. Students are not shy about trying this. Paper towels are available for the inevitable spills.

Things to Discuss:

- Streamlining versus blunt shapes (if you have an airfoil or a wedge shape)
- Stagnation regions
- Turbulent wakes
- With older students, you can also talk about choked flows and pressure head, demonstrating with the blocks. You can draw analogies to shock waves for compressible flows by showing a 'bow shock' – actually a pressure head - in front of a blunt shape.

Bending Light

Purpose: To introduce students to basic fiber optical principles

Grade Level: 4th – 8th grade

Materials Needed:

- Laser
- Ring stand
- Clear plastic bottle
- Plastic electrical tape
- Large bowl

Length of Time for Activity:

15-30 minutes

Volunteers needed:

2-3 to help with preparation, but the actual experiment should be performed by an adult.

Activity Description:

- Drill a 1/8-inch diameter hole in the plastic bottle approximately 4 inches above the bottom.
- Cover the hole with a small piece of electrical tape.

WARNING: OBSERVE LASER MANUFACTURER'S EYE SAFETY PROCEDURES!

- Adjust the laser on the ring stand until the beam shines through the bottle and is in the center of the hole.
- Fill the container above the level of the hole with water.
- Remove the tape and allow a stream of water to flow from the bottle into the bowl.
- Observe that the laser beam follows the stream of water and is bent in the shape of the stream.
- As the water level falls below the hole, the laser beam returns to a straight line. Chalk dust from a blackboard eraser introduced in the path of the beam will help the students to see the beam shape.

Things to Discuss:

- The beam is trapped in the water by reflection.
- This is how fiber optic fibers conduct telephone signals.
- Lasers are really cool!

