

Inside Engineering Lab Visit

Visitor Information

Group: Hyogo Prefectural Itami High School
 Number of students: 12
 Grade(s): 9-12
 Date: October 25, 2016
 Time: 10:25 am – 10:55 am
 Length: 25-30 min
 Lab: Volpe/Mauel Plasma Lab
 Department: Applied Physics

Lesson Objectives

LO 1: Students will be able to describe engineering in general terms
 LO 2: Students will understand and be able to identify some applications of plasma
 LO 3: Students will see a demonstration or visual of plasma being made
 LO 5: Students will discuss the impact of the lab's research/this topic.
 LO 6: Students will understand the accessibility of science US Ph.D. programs – students receive a stipend, etc.

Materials Needed

- Regular equipment
- Piece of “donut” that shows internal sections of machine
- Liquid metal
- Optical equipment

Lesson Outline

1. Introduction (5 min)

- Make introductions:
 - PI Name, title, department
 - Graduate students and researchers
- Contextualize:
 - Ask students questions to gauge their STEM knowledge.
 - Ask or describe: What is Engineering?
 - Ask or describe: How does applied physics relate?
 - Ask or describe: What are some examples of applied physics work?
- Research — Briefly cover any/all of the following * in lay terms, easily understood with only basic knowledge:
 - What is your research area?
 - What is the problem your research addresses?
 - What's been done so far?
 - What uses or solutions will (or could) your research bring about?

2. Lab Demos (10-15 min)

- Highlight fundamental concepts and key equipment
- Show the optical demo showing the reverse rainbow (if time allows) – demonstrating sights usually unseen in nature.
- Show the CNT stellarator plasma machine that uses magnetic fields. Highlight some key features on the equipment. Invite students to look inside the window and see plasma being made. Ask them what it looks like. Describe some uses and applications of this plasma.
- If possible, invite students to look at the liquid metal, which is similar to mercury. Briefly describe some uses (for conduction, “wall of liquid,” etc.) in lay terms.
- Allow students to examine the section of the machine that shows the inside of the “donut.”

3. Conclusion (5 min)

- Brainstorm some benefits and challenges of research. Try to tie in your work with the real world, why it's important, and why they should care about the topic.
- Discuss the intersectionality of engineering types and how teamwork and collaboration is key. E.g. talk about different types of engineering that went into making a piece of equipment.
- Optional, emphasize *accessibility* of science Ph.D. programs — students will get paid a stipend and can consider it as an option.

4. General Tips

- Ask the audience a question early on to gauge their STEM knowledge
- Ask questions throughout to encourage engagement
- Ask for questions at the end
- Avoid jargon as much as possible; students will be more likely to participate and ask questions
- Emphasize big-picture ideas
- When praising, praise the thought process, not intelligence (promote a growth mindset). More info on growth mindset: <https://www.youtube.com/watch?v=NWv1VdDeoRY>