

# Inside Engineering Lab Visit

## Visitor Information

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Group: Lower East Side Prep

Number of students: 10 \*ESL (English as Second Language) – Chinese is first language, translator may be useful

Grade(s): 11-12

Date: 03/22/17

Time: 12:30-1pm

Length: 30 min

Lab: Chandran

Department: Earth & Environmental

## Lesson Objectives

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LO 1: Students will be able to describe engineering and earth & environmental engineering, in general terms.

LO 2: Students will be able to identify examples of applications of waste water treatment tech

LO 3: Students will discuss the impact of the lab's research/this topic.

LO 6: Students will be able to describe the accessibility of science PhD programs – students do not pay for a PhD, tuition is covered, students receive a stipend, etc.

## Materials Needed

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- Regular equipment present in lab
- Something students can touch and/or pass around (e.g. a filter, a small part in one machine, etc.)

## Lesson Outline

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### 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: Specifically, what is Earth & Environmental Engineering?
  - Ask or describe: What does a E&E Engineer do?
- 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 (each room will show a demo) (10-15 min)

- Highlight fundamental concepts and key equipment
- If possible/as much as possible, show the equipment being used. Visual input on topics being discussed will help visitors grasp the concepts.
- Show the mini water treatment “plant,” including the dirty water feed through to the clean end result.
- Briefly discuss how it works. Ask students why a small treatment “plant” is useful/where they think it could be used. Ask students what they think some challenges of this research are. Describe some challenges of this research. Ask students what they think some of the applications are, then describe applications.
- If there is something students can pass around or touch with their hands, make sure they have the opportunity to interact with it.
- Make the demo as hands-on as possible.

### 3. Conclusion (5 min)

- Discuss any statistics that you think might be interesting. For example, any statistics that motivate this research, any data that will make the students think, etc. will be great to share.
- Brainstorm/emphasize some benefits and challenges of using this technology for water treatment.
- 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 for your equipment, e.g. chemical engineering for water chemical testing, mechanical engineering to make the machines used, etc.
- Emphasize *accessibility* of science Ph.D. programs — students do not pay for their programs; their tuition is covered and they will even receive a stipend to support their studies. Steps moving forward are for them to continue to study, learn, and be involved.

### 4. General Tips

- The visitors will be ESL students, meaning English is not their first language. Speak slowly and clearly. Avoid jargon and repeat key concepts. If there is someone who knows a translation into another language, have them supply it.
- Ask the audience a question early on to gauge their STEM knowledge
- Ask questions throughout to encourage engagement — the more answers they supply, the better.
- 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>