

Inside Engineering Lab Visit

Visitor Information

Group: ELLIS Preparatory Academy
 Number of students: 25-30
 Grade(s): 11-12
 Date: November 17, 2016
 Time: 4:10pm–5pm
 Length: Two 25-min sessions
 Lab: Agrawal/ROAR
 Department: Mechanical Engineering

Lesson Objectives

LO 1: Students will be able to describe engineering and mechanical engineering, in general terms.
 LO 2: Students will understand and be able to identify examples of specific physical disabilities that the research aims to address.
 LO 3: Students will see a demonstration or live examples of mechanical exoskeletons and machinery that the lab uses.
 LO 5: Students will discuss the impact of the lab's research/this topic.
 LO 6: Students will understand the accessibility of science PhD programs – students do not pay for a PhD, tuition is covered, students receive a stipend, etc.

Materials Needed

- Regular equipment (e.g. exoskeleton, treadmill, etc.) present in lab
- Something students can touch and/or pass around

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: Specifically, what is Mechanical Engineering
 - Ask or describe: What does a Mechanical 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 exoskeleton that helps with gait or movement rehabilitation. Briefly discuss what it does. Describe some challenges of this research. Ask students what they think some of the applications are. If there is something students can pass around or touch with their hands, make sure they have the opportunity to interact with it.
- Show the rehabilitation station for children and describe how it works. Talk about the implication for the outcomes for the children — how will it help them in the future? What are some challenges of the research? Ask students to share their opinions on why this is important.

- If possible, show or pass around a PD shoe and describe what it does, how it helps, what some challenges are, etc. Again, the more hands-on the demo is, the more students will be engaged.

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 rehab.
- 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.
- 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>