

Inside Engineering (IE) Lab Visit: School Details

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 Chemical Engineering?
 - Ask or describe: What does a Chemical 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 (10-15 min)

- Highlight fundamental concepts and key equipment
- Conduct the high-speed camera demo. Show videos or make live recordings. Begin to guide the students toward thinking about their senses and what they can/cannot perceive.
- Conduct the Schlieren demo. Use live examples, e.g. a student's hand, rather than stock photos or videos. The more hands-on, the better. Briefly explain how Schlieren imaging works (light path with deflections).
- Encourage students to think beyond their senses to try to experience things that are too fast for us to see. Ask them what are some things they see/notice/observe.
- Discuss applications of this technology (current and future) and why it is important. Ask students to volunteer ideas before providing your own. This step should lock in their engagement to the demo as they think about the potential of this kind of technology.

3. Conclusion (5 min)

- Brainstorm some benefits and challenges of your 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 something like Schlieren technology.
- Emphasize *accessibility* of science Ph.D. programs — students will get paid a stipend and it should be something they consider 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>

Recent IE Visitors and Future Partners

The following chart shows schools that we have served in recent years. This list is not all-inclusive, but rather highlights schools that we have partnered with most frequently.

Note: Schools we are likely to work with in the future are starred (). While we cannot be completely sure that we will partner with these schools, we can predict based on the current status of our partnerships.*

School	Neighborhood	Demographics	ELL	% Students qualifying for free or reduced lunch	Grades
East Harlem School*	East Harlem, Manhattan	Asian 4% Black 28% Hispanic 63% White 3%	11%	90%	4-8
English Language Learners and International Support (ELLIS) Preparatory Academy*	Marble Hill, Bronx	Asian 2% Black 15% Hispanic 79% White 3%	89%	84%	9-12
Columbia Secondary School (CSS)*	Morningside Heights, Manhattan	Asian 12% Black 21% Hispanic 44% White 20%	0%	54%	6-12
High School for Math, Science, and Engineering (HSMSE)	Harlem, Manhattan	Asian 35% Black 10% Hispanic 23% White 27%	0%	43%	9-12
MS 54 Booker T. Washington	Upper West Side, Manhattan	Asian 9% Black 8% Hispanic 12% White 64%	2%	18%	6-8
Bronx Center for Science and Mathematics (BxCMSM)*	Claremont Village, Bronx	Asian 8% Black 26% Hispanic 64% White 2%	4%	89%	9-12
The Young Women's Leadership School of the Bronx (TYWLSBx)	Mount Hope, Bronx	Asian 2% Black 39% Hispanic 58% White 1%	5%	87%	6-12
Morris Academy for Collaborative Studies (previously Morris HS)	Longwood, Bronx	Asian 1% Black 26% Hispanic 71% White 1%	19%	89%	9-12
Frederick Douglass Academy II Secondary School (FDA II)*	Harlem, Manhattan	Asian 2% Black 68% Hispanic 27% White 1%	8%	67%	6-12

Next Generation Science Standards (NGSS) Topics Covered

- Science
- Chemistry
- Technology
- Physics
- Engineering

For more information on NGSS, please visit the website: <http://www.nextgenscience.org/>

Common Core Curriculum Topics Covered

- Measurement and Data
- Counting

For more information on the Common Core Curriculum, please visit the website: <http://www.corestandards.org/>

Note: We have identified the topics covered based on the demo you initially discussed conducting. If the demo changes, or if more is supplemented by additional demos, more/different topics would be covered. A full list of the topics can be found in the table below.

NGSS and Common Core Outlined Topics

NGSS Topics	Common Core Topics
Chemistry	Geometry
Earth's Systems	Statistics & Probability
Adaptation	Ratios & Proportional Relationships
Technology	Financial Literacy
Conservation	The Number System
Weather and Climate	Patterns
Physics	Measurement & Data
Agriculture	Money
Botany	Counting
Ecosystems	Operations & Algebraic Thinking
Engineering	
Space	
Animals	
The Scientific Method	
Biology	
The Water Cycle	
Geology	
Life Sciences	
Climate	
Water Testing	