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## Amp It Up! Engineering/Technology and Industry Lesson Extension

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<b>School and District:</b>	<b>Salem High School; Salem, MA - Salem Public Schools</b>
<b>Course:</b>	<b>Environmental Science</b>

**Abstract:** In 200 words or less, please provide a summary of the goal for the lesson extension and its relationship between industry and academic topic.

During my visit to the DEP in Lawrence, MA; I was astounded how much time and effort that the Division and Station Director, Oscar Pancorbo put into the redesign of the building. His vision for both the efficacy of the building, and the grounds were quite astute. His attention to detail even included the grass, which did double duty by not needing to be watered or cut often, but also providing excellent drainage to the beautifully designed drainage ditches that filtered water to a reclamation station within the building. The design was meticulous inside and out. This fastidious attention to detail, earned the highest LEED certification available.

### Engineering/Technology Link:

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.
  - ✓ Defined terms (science, engineering, technology)
  - ✓ Described the engineering design process
  - ✓ Engineering design challenge related to industry
  - ✓ Overview of the company

**Level of Inquiry:** Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

- Structured inquiry:* Instructor provides question and procedure. Students determine the results based on given procedures.
- Guided inquiry:* **Instructor provides question.** Students design procedure and determine the results. **PBL**

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## Amp It Up! Engineering/Technology and Industry Lesson Extension

- ~~Open inquiry: Students investigate their own research question. Students design procedures and implement the procedure on their own. PBL~~

### Lesson Extension Plan:

**Title/Topic:** "Design an environmentally friendly space/building according to LEED certification standards" PBL

**Time (minutes):** A time period of five (or six-depending on class size) 90-minute classes will be needed.

**Company Name and brief Description:**

Senator William X. Wall Experiment Station

Massachusetts Department of Environmental Protection

The Division of Environmental Analysis (DEA) is housed in the Senator William X. Wall Experiment Station in Lawrence. This division includes the state environmental reference laboratory for the Commonwealth of Massachusetts. The Air Assessment Branch which is in charge of air monitoring for the state is also located in the Wall Experiment Station.

**Overview of the Lesson:**

Students will decide upon a project creating either a neighborhood, building or a space that would qualify for a LEED certification.

**Standard(s)/Unit Goal(s) to be addressed in this lesson:**

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

**Essential Question(s) addressed in this lesson:**

"How do we reduce the impact of human activities on natural systems when we build (or re-build) structures?"

**Objectives (academic and/or engineering/technology, career):**

\*Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

\*Create a building/space that utilizes technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.

**Link to Industry (how the lesson connects to the industry visited):**

The planning of the building and the surrounding grounds of the DEP station in Lawrence, was integral in practicing what type of structures would have the least amount of impact in the environment.

## Amp It Up! Engineering/Technology and Industry Lesson Extension

What students should know and be able to do before starting this lesson?

Students will be able to:

- Choose their own collaborative groups and select roles within those groups.
- Research relevant information (and utilize it) in regards to their proposed project.
- Contact relevant “experts” in the field to help them along the way.

Instructional Materials/Resources/Tools:

- Computers with internet access
- Skype
- Graph paper, pencils, colored pencils and rulers
- Google maps
- STEM Makerspace miscellaneous supplies (for models)

### Lesson Delivery

Lesson Opening:

- Students will be introduced to the lesson by researching what “LEED certified” means.
- Students will then “turn and talk” with neighbors.
- Students will be called on (at random using popsicle sticks with names on them) to share out what they learned.
- Students will be given their mission, and determine collaborative groups and roles within those groups.

During the Lesson (activities/labs/challenges):

Day 1:

- Students will take a [virtual tour](#) of the DEP building site in Lawrence via Google maps.
- Students will research their mission and share their research.

Day 2:

- Students decide a plan of action, determine what they need to research more fully, and then decide upon a course of further action.
- Plan out their plan of action with detailed steps-begin to implement their action plan

Day 3:

- Plan in action: based on individual groups

Day 4:

- Create their model/presentation (up to individual groups)

Lesson Closing:

Day 5 (depending on size/number of students in the groups; Day 6 as well)

- Present their findings/models to their peers/community members.
- Peers and community members rate their “projects” based on the LEED’s certification scale.

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## Amp It Up! Engineering/Technology and Industry Lesson Extension

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Assessment
Student Assessment: (Stake holders) Community members and peers will assess the model/creation with the LEED's certification system.
Delivery Assessment: Community members (various stakeholders) invited for student presentations.

**Additional resources and assessments:** Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

**Handouts (Digital):**

Resources for rubrics and planning devices for all PBL work: [LINK](#)

**Suggested Readings:**

Research: [LINK](#)

**Suggested project mediums:**

PowerPoint/Slides, Makerspace Models, Nearpod, WeVideo, Loom etc...Student choice.

**Rubrics:**

Presentation/Model Rubric for LEED Certification level: [LINK](#)