Engineering Design in the Next Generation Science Standards

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The What -> Engineering at grade level

The How -> lessons, curriculum & professional learning
Disciplinary Core Idea: Engineering

- Physical Sciences
- Life Sciences
- Earth and Space Sciences
- Engineering Design
Disciplinary Core Idea: Engineering

Engineering is embedded in

- all content
- all grade levels

FOR ALL STUDENTS
Are we understanding our world?
If yes, it’s SCIENCE.

Are we solving a problem (a human want or need)?
If yes, it’s ENGINEERING.
Science Lessons begin with phenomena - ocean waves move sand and water

Engineering lessons begin with scenario - oceanfront homes destroyed by waves
Engineering lessons focus on a scenario that allows students to define the problem.

Science Phenomena >> ocean waves move sand and water

Eng’g Scenario >> oceanfront homes are destroyed by waves
A. Define and Delimiting Problems
B. Develop & test solutions
C. Optimize Design Solutions
Putting the pieces together

Read each of the pieces

Put sets of 3 elements of NGSS Eng’g Design in grade band order:

- K-2
- 3-5
- 6-8
- 9-12
Begin with an **engineering scenario**: a situation we want or need to change.

- **Eggs break during shipping.**
- **Fish are dying in the lake.**
- **Cell phone battery needs frequent recharging.**
Students Define Problem

Eggs are breaking because ....

• shells are too thin  (Life Science)
• packing is faulty    (Physical Science)
• potholes            (Earth Science)
Problems are expressed as statements that describe what we want to do about a given cause.

Criteria describe what the solution should do so that we will know when our solution is acceptable.

Constraints describe the limitations under which we must solve the engineering problem.
HOW?
Engineering Design Goals

- Defining and Delimitating an Engineering Problem
- Developing Possible Solutions
- Optimizing the Design Solution

Identify at least one engineering design project per grade level/subject. Physics lends itself to more than one. Keep in mind that the engineering project should drive the learning of the content, NOT be a culminating project (even if the actual building occurs at the end of the unit). Provide time for optimizing the design.