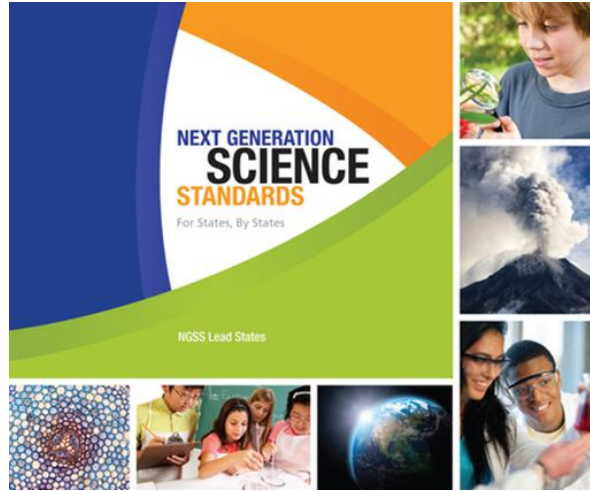


# Engineering Design in the Next Generation Science Standards



**Anne Catena, Princeton University**  
**Kim Feltre, Hillsborough**  
**Martha Friend, Princeton**

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**

Be a Super  
Problem Solver



**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



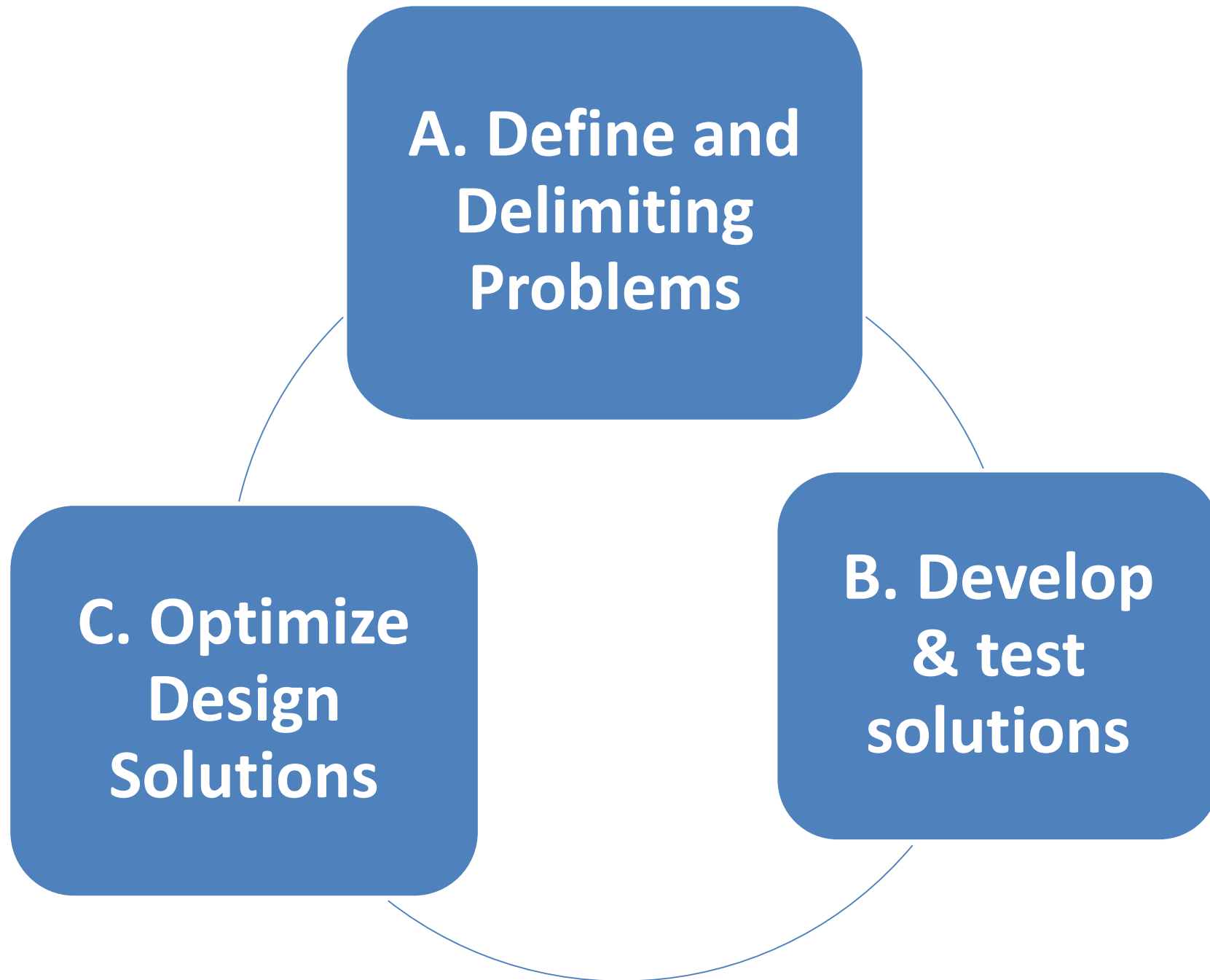
Engineering lessons begin with scenario -oceanfront homes destroyed by waves



Engineering lessons focus on a **scenario**  
that allows students to define the problem.

Science Phenomena >> **ocean waves  
move sand and water**

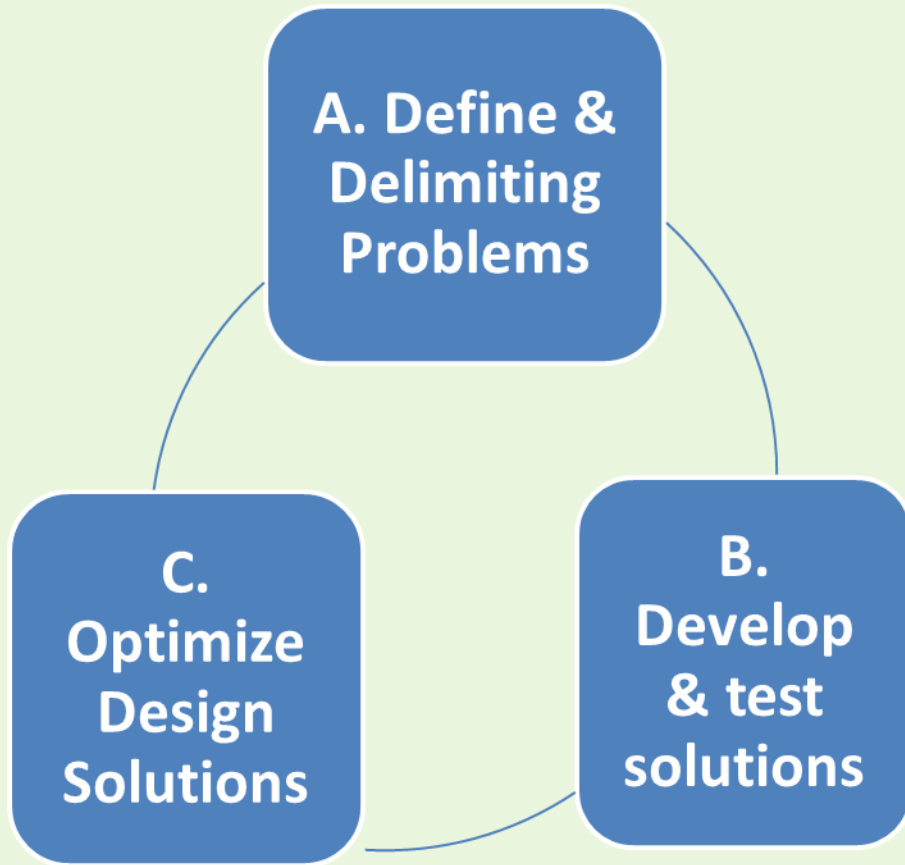
Eng'g Scenario >> **oceanfront homes  
are destroyed by waves**



# 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 ....

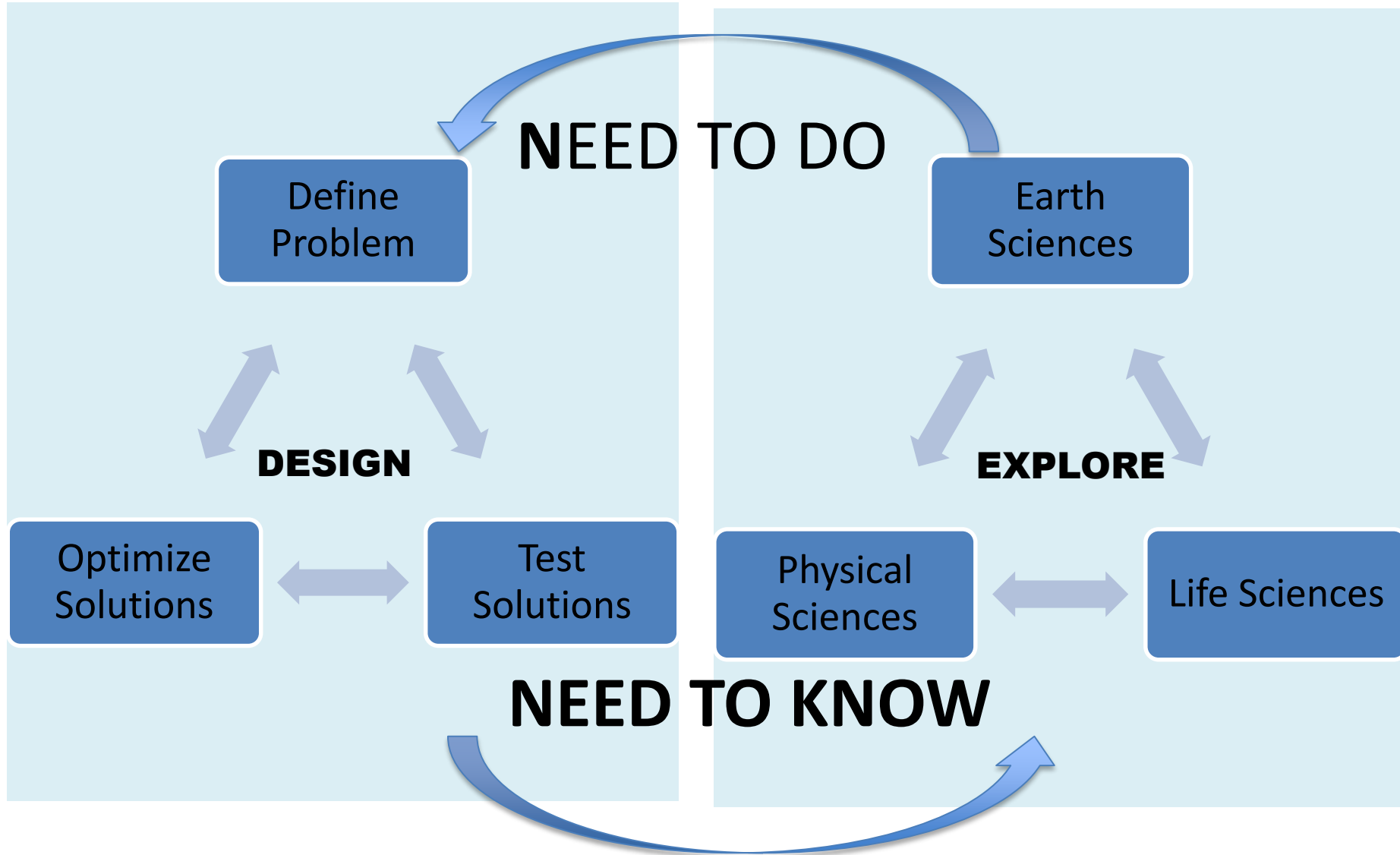


- shells are too thin (Life Science)
- packing is faulty (Physical Science)
- potholes (Earth Science)

# Engineering Scenario -> Causes -> Engineering Problem(s)

- **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.

# Engineering Design and Science



# HOW?

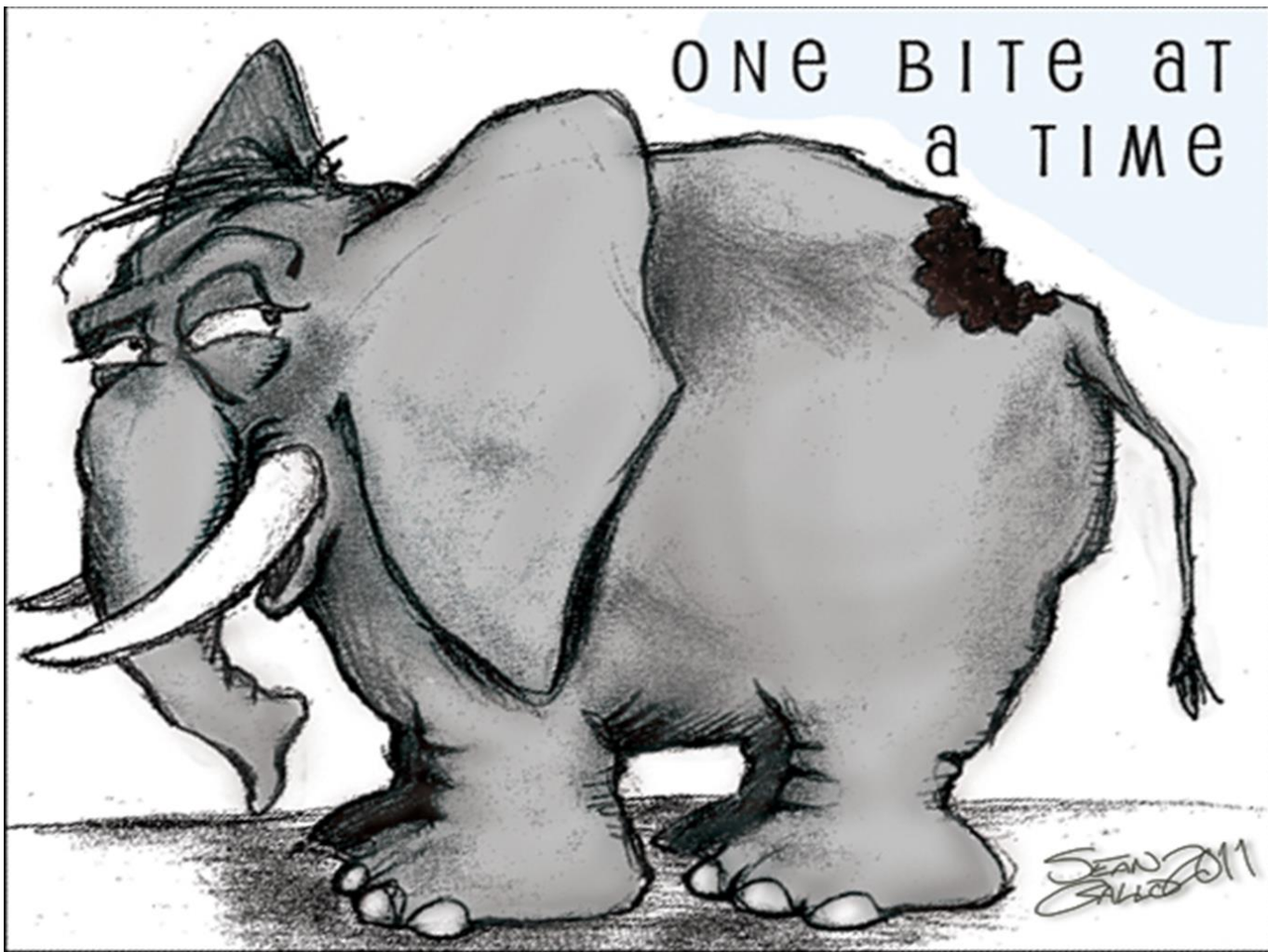


## Engineering Design Goals

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

- Defined STEM - <http://www.definedstem.com>
- Engineering Design Resources - in the Google Drive
- Teach Engineering
- STEM Jobs - lesson plans

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.



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