

Giving your children a Head Start on Engineering

William Straits

Professor, Science Education

Director, *A Head Start on Science*

California State University Long Beach

Challenge #1

- Using only the materials in the bag, build the tallest structure you can.
- Structure must stand on top of your table – on it's own.
 - No holding, no leaning against the wall, no cheating, etc.
- You have 10 minutes
- Any questions?



Challenge #1

GO!



Challenge #2

- Problem: I'm thirsty and I want to drink my water – but also want to keep my hands free.
- Can you design a platform that would hold my water right at mouth level, so I can take a sip without having to pick up the bottle?



Challenge #2

- ❑ Problem: I'm thirsty and I want to drink my water – but also want to keep my hands free.
- ❑ Solution: Design a platform that will hold a water bottle upright, 20 inches above the table.
- ❑ Materials: 1 roll of tape
 100 plastic stirrers



Challenge #2

- Working independently, on a piece of paper draw a possible design or two.
- Share your design with people at your table.
 - Explain the what of your design and the why.
 - “My design has __[feature]__ because __[explanation]__”
- As a group, decide on a single design – draw that design.
- Now – BUILD IT!



Challenge #2

- Compare your structure to your plan
 - Discuss:
 - How does the structure compare to the plan?
 - What deviations to the plan did you make and why did you make them?

- Critique your structure
 - Discuss:
 - What's good about your structure?
 - What about your structure could be improved?
 - What would you need to improve your structure?

- Check out another group's structure
 - Discuss:
 - How much more awesome is yours?
 - Any ideas you want to steal from the other group?



Contrasting our Two Challenges

Both challenges engaged students in building a structure, but...

- Challenge #2 encouraged more student thinking.
- Challenge #2 encouraged a greater diversity of designs.
- Challenge #2 encouraged more student discussion.
- Challenge #2 consisted of building with a plan and purpose.
- Challenge #2 was Engineering.
- Challenge #1 was just building stuff with straws.



Block Center

- Is your block center Engineering or just building stuff with blocks?
- Ideally our block centers are both! (We should allow for free play and focused/directed play in our block centers.) Both are valuable. But they're different and help our children to grow in different ways.



Block Center

Typical block centers:

- Are great!
- Encourage lots of cooperative and imaginative play, while providing rich opportunities for socialization
 - Students engage in plenty of negotiation, cooperation, discussion, compromise, and interaction.
- Allow students to building freely; building is organic
 - Structures grow and evolve. The purpose/identity of the structure emerges creatively during construction.
- Can also serve as the basis for engineering



Next Generation Science Standards

- The Next Generation Science Standards (NGSS)
 - requires to elementary students to engage in Engineering Practices
 - encourages the use of the Engineering Design Process



Next Generation Science Standards

- NGSS Engineering Design standards for K-2nd grade
 - Students ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
 - Students develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
 - Students analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

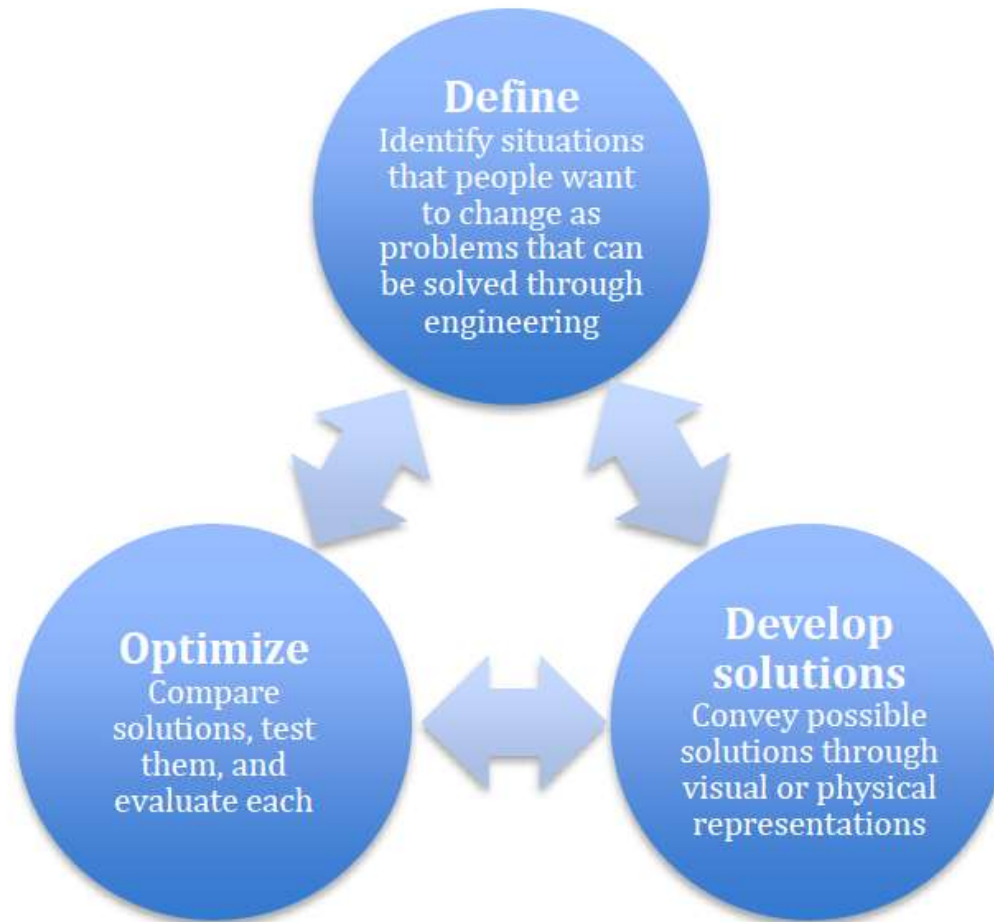


Next Generation Science Standards

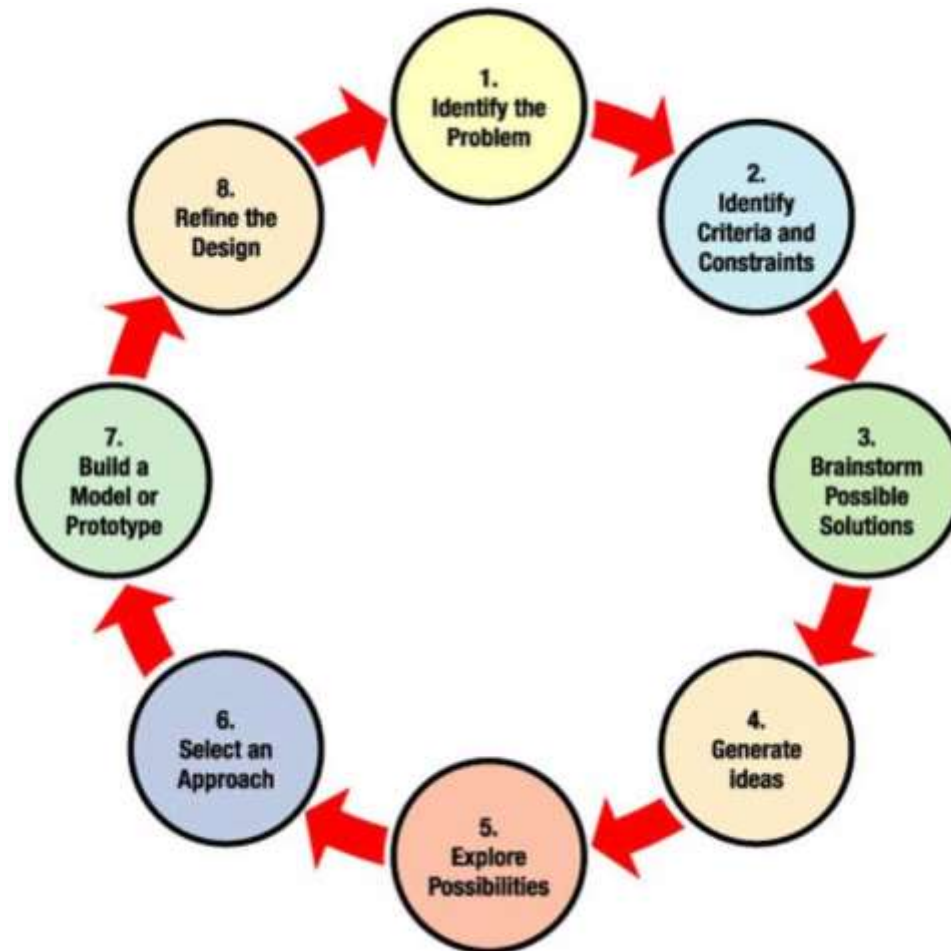
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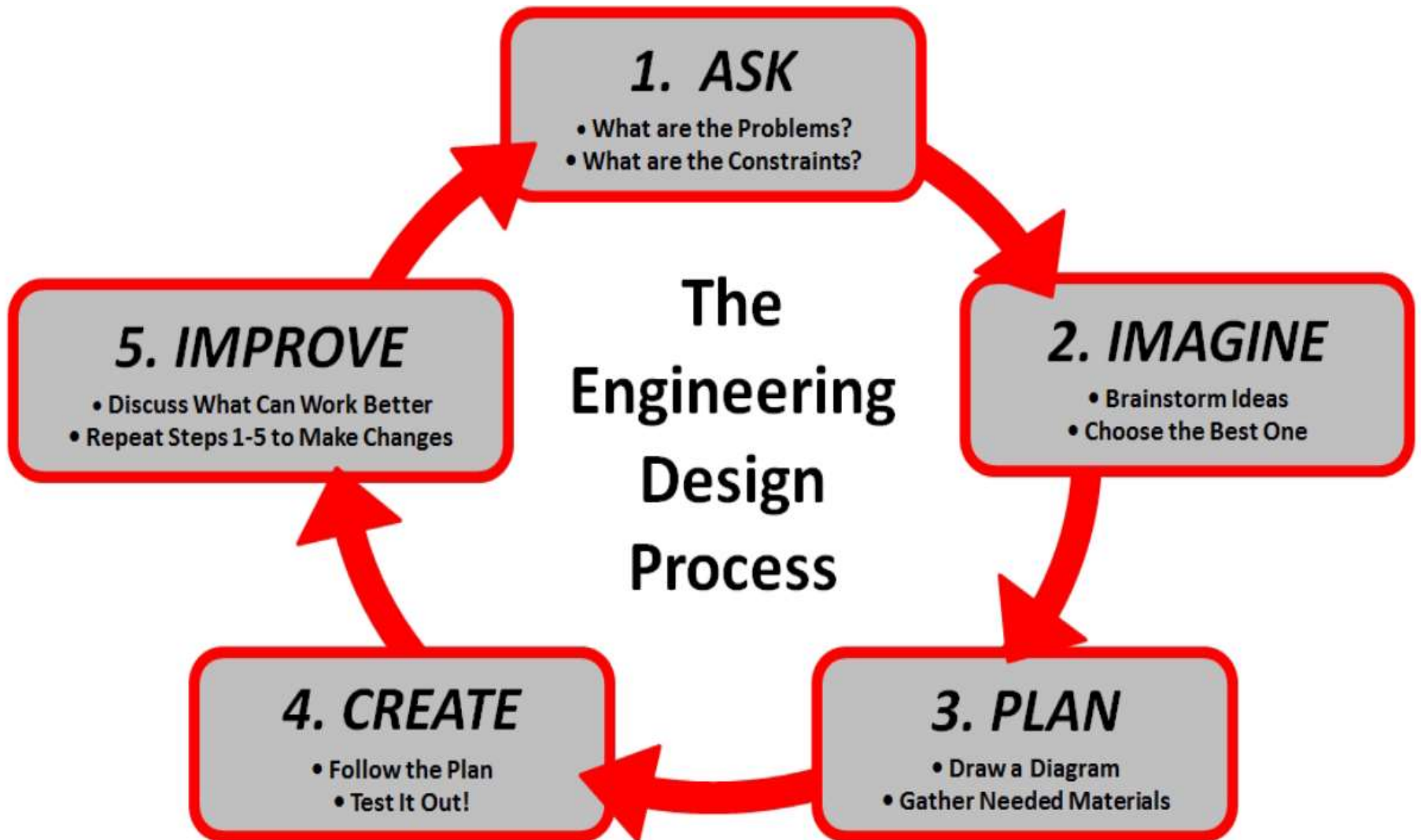
The Engineering Design Process



The Engineering Design Process



The Engineering Design Process



NGSS in preschool

□ No.



One step at a time

- Plan
- Build
- Improve



Plan

- ❑ Before children build, ask them to draw a picture of what they intend to build.
- ❑ Ask your children to describe and explain their plans.
- ❑ Better yet - before they build ask children to:
“Create a prototype of their structure that shows the different features included in their design.”



Engineering Vocabulary

- Structure – something that is built and made of multiple parts or pieces
- Prototype – an initial plan, drawing, or model of a structure you plan to build
- Design – (a plan for) the arrangement of parts to create a structure
- Features – different parts or functions of a whole (structure)
- Engineer – someone who creates designs (for structures)
- Engineering – creating designs (of structures)



Build

Give your children a **purpose** in the block center

Challenge your children to build a structure that:

- I can roll this truck through
- Completely surrounds a stuffed animal
- Has three sides and is as tall as this yard stick



Build

Not just towers – all sorts of structures; build:

- Chairs, Tables, Beds, etc.
- Boats, Cars, Sleds, etc.
- Bridges, Tunnels, Ramps, etc.
- Different types of buildings
 - Fire Station, School, Two-story House, etc.



Build

And not just blocks – consider:

- ❑ Toilet Paper and Paper Towel Rolls
- ❑ Straw... and Sticks... and Bricks
- ❑ Paper, Aluminum foil, Cardboard, etc.
- ❑ Straws, Stirrers, and Swizzle Sticks
- ❑ Paper Cups, Plastic Cups, Plastic Bottles



Build

And not just building materials:

- If children are building a zoo – need animals.
- If children are building a doghouse – need a stuffed animal dog.
- If children are building a cradle – need a baby doll.
- And books and pictures of structures too!



Improve

After children build, encourage them to describe and analyze it

- ▣ What are the best parts of your structure?
- ▣ How could you improve your structure?
- ▣ What would you need to improve your structure?
- ▣ If children had a prototype – ask how does their structure compare with their plan? What changes did they make?



You know best

Share your ideas for the blocks center with others at your table

Flooring (carpet, wood etc)

Different textures

Blue prints

Outside building

literature about construction

pictures of buildings

various different kinds of blocks

testing materials (type of block)

pictures (of students) on blocks

ROOM/SPACE

Lots of blocks

take photos of structures

use yellow tape to save
structure (const. zone)

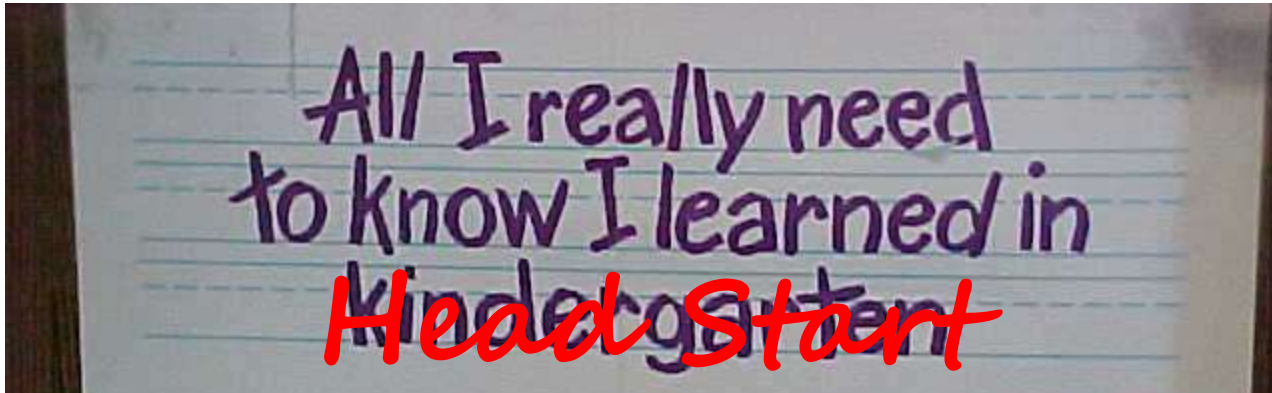
ramps

Family connections (build
house)

paint rollers

wrap blocks in foil

Thank you



A Head Start on Science

www.sci4kids.org

sci4kids@csulb.edu

