Concrete for Kids

K-12 Engineering Education Workshop

ASEE Conference and Exposition

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Presentation Outline

- Program Introduction
- Basic Activities and Mixing Concrete
- Adaptable Learning Modules
- Concrete Properties and Breaking Beams

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Is It…

A) Cement

B) Concrete

C) Asphalt

Is It…

A) Cement

B) Concrete

C) Asphalt

Is It…

A) Steel

B) Cement

C) Concrete

Is It…

A) Steel

B) Cement

C) Concrete

Is It…

A) Tile

B) Concrete

C) Stone

Photo from www.stainedbydesign.com

Is It…

A) Tile

B) Concrete

C) Stone

Is It…

A) Concrete

B) Brick

C) Stone

Is It…

A) Concrete

B) Brick

C) Stone

Is It…

A) Granite

B) Marble

C) Concrete

Photo from http://pccpbeach.com

Is It…

A) Granite

B) Marble

C) Concrete

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Program Introduction

- Introduction to Engineering and Concrete
- Thanks to:
  - Dr. Carin Roberts-Wollmann
  - Dr. Richard Weyers
  - Virginia Tech ASCE
  - Titan America

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Program Introduction

- Exciting, Hands-On Learning

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Program Introduction

- Applicable to Multiple Age Groups

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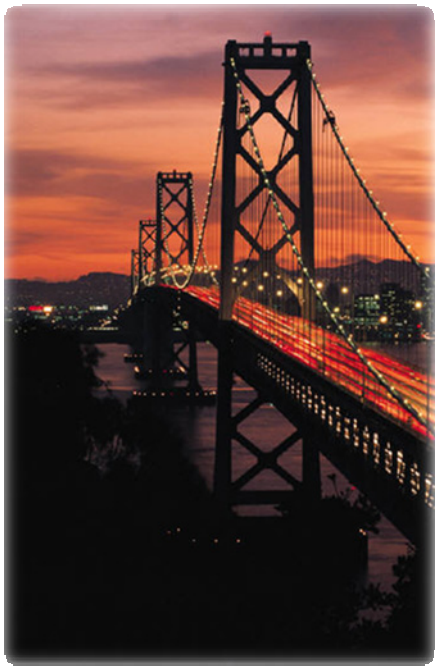
Basic Activities

Engineering and Design Discussion

- Design Process
- Scientific Method



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Basic Activities

Civil Engineers

"We Build the Quality of Life"

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Basic Activities

Discussion of Concrete

- Applications
- Pros/Cons
- Methods

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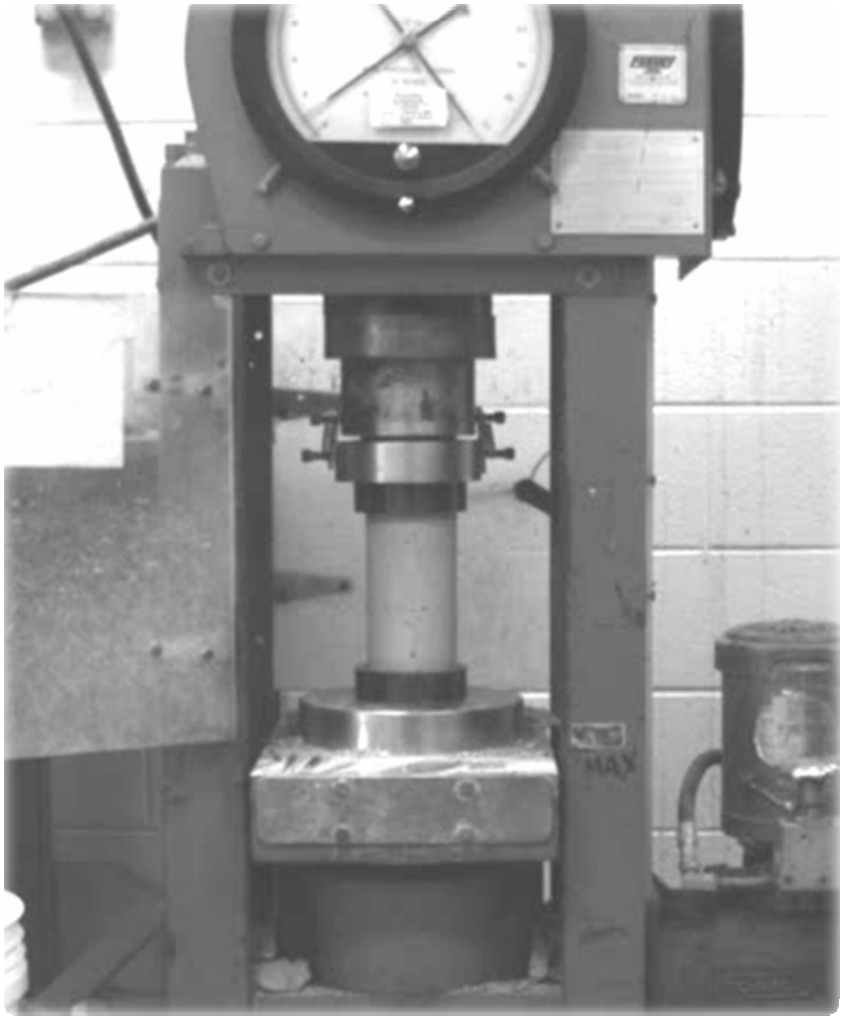
Basic Activities

Discussion of Concrete

- Strength
- Test Cylinders



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Hands-on Activity!

So What is Concrete?

Coarse Aggregate

(Rock)

Fine Aggregate

(Sand)

Cement

Water

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Mixing Concrete!

- Pre-mixed Bags
- Student Choice
- Reinforcing

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Mixing Concrete!

Cast Beams

- 1” x 1” x 22”
- Cylinders

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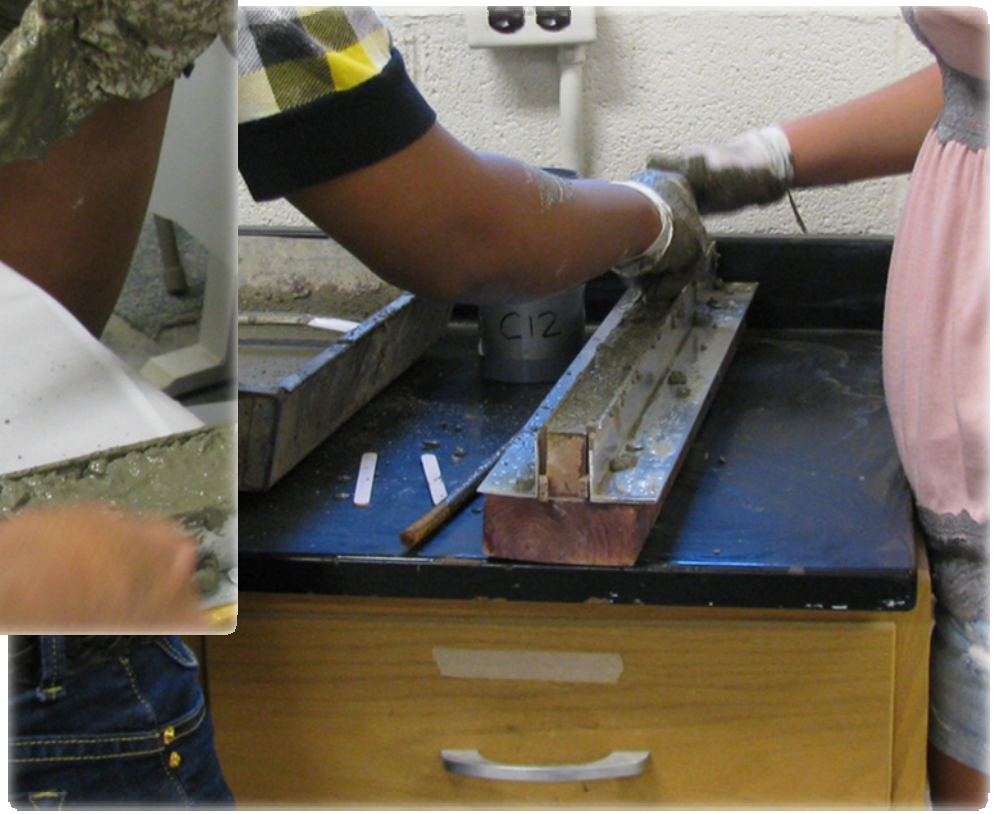
Mixing Concrete!



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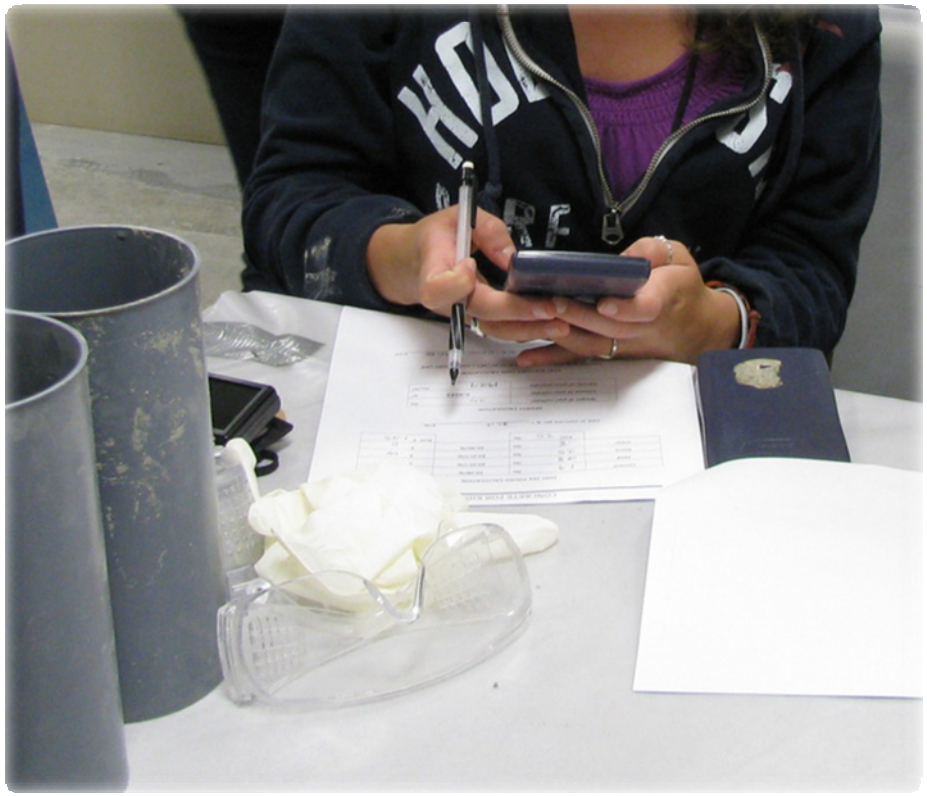
Adaptable Learning Modules

- Basic Concrete for Kids
- Chemistry and Environmental Science
- Physics
- Industrial Technology



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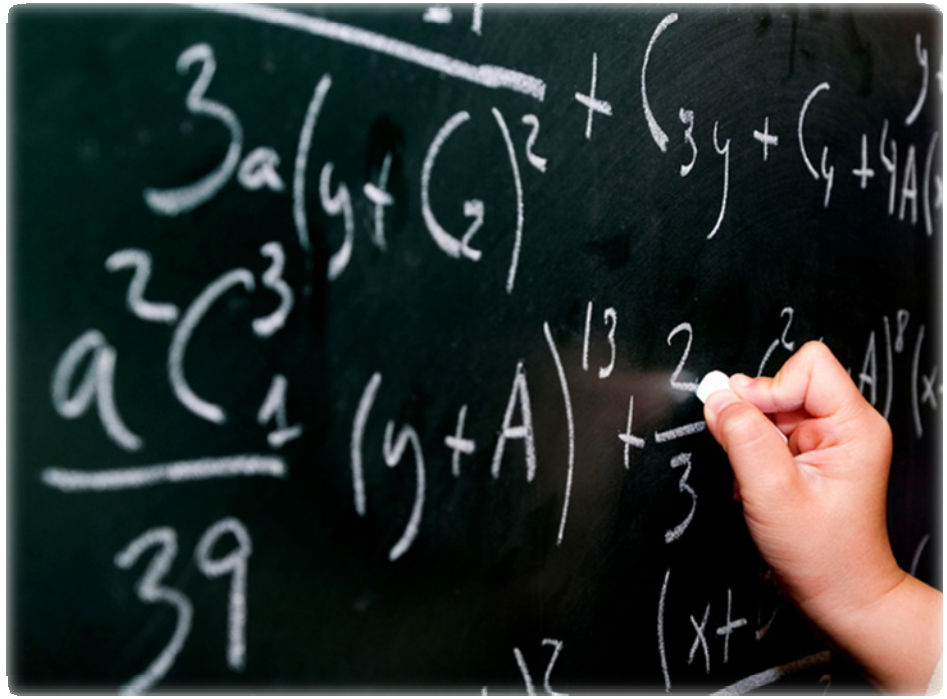
Adaptable Learning Modules

Basic Math, Science, and Economics

- Scientific/Design Process
- Arithmetic, Ratios, etc.
- Weight/Mass
- Use of Scales
- Statistics/Variability
- Material Cost Analysis



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Adaptable Learning Modules

Chemistry and Environmental Science

- Cement Production Process
- Hydration Reaction
- Stoichiometry
- Recycled Materials in Concrete
- Environmental Impacts of Concrete

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Adaptable Learning Modules

Industrial Technology

- Innovative Concretes
- Building Formwork
- Concrete Finishing
- Construction Tools and Techniques

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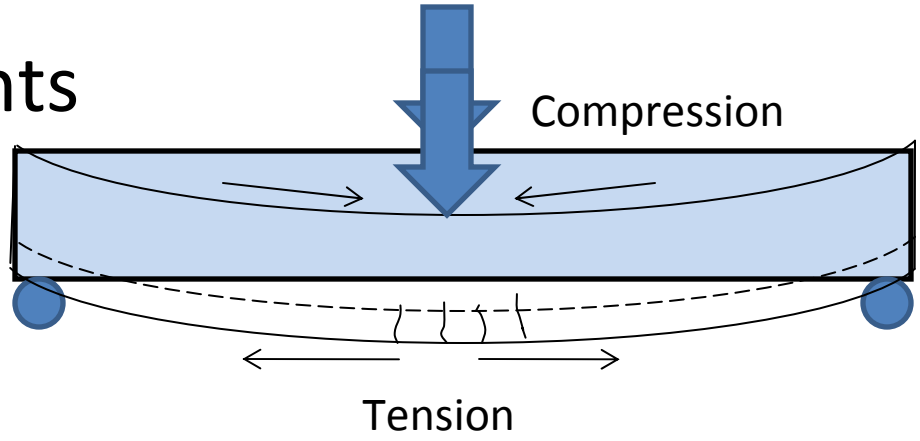
Adaptable Learning Modules

Physics

- Force and Stress, Tension and Compression
- Moments/Force Couples
- Deflection Measurements
- Moment of Inertia



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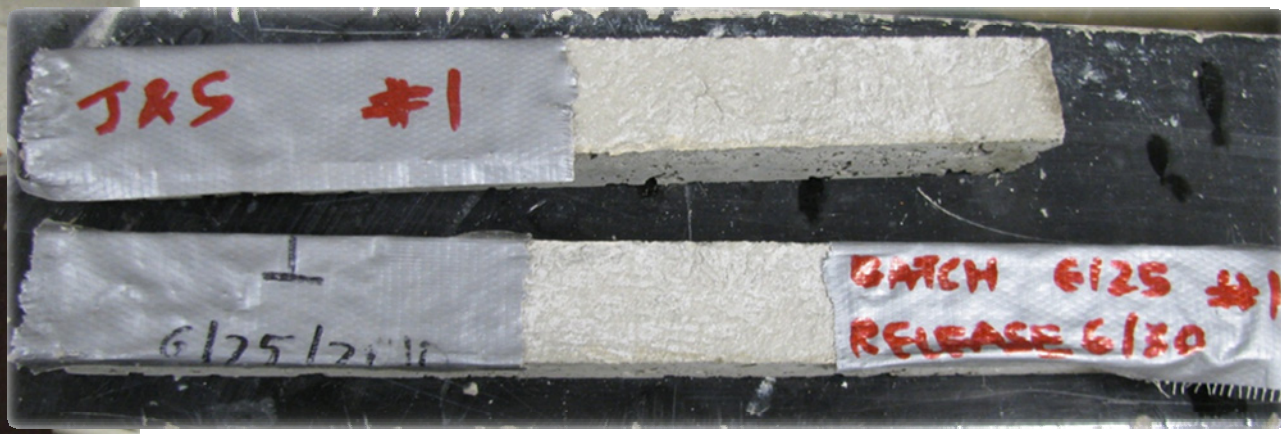
Breaking Beams!



Break Beams!

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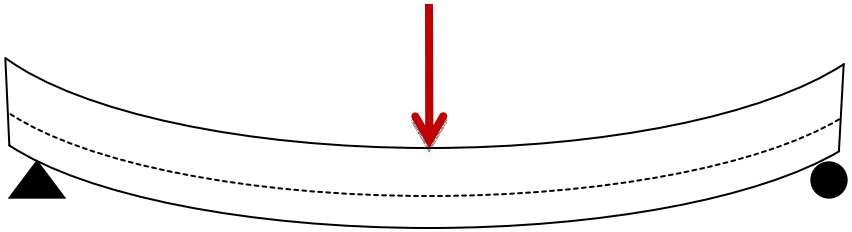
Concrete Properties

- Tension vs. Compression



- Bending Behavior
- Reinforcing Steel

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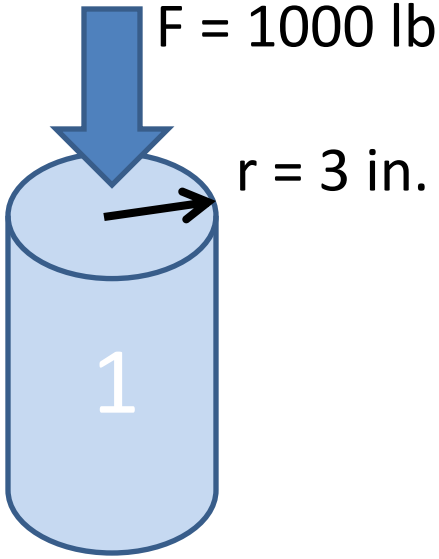
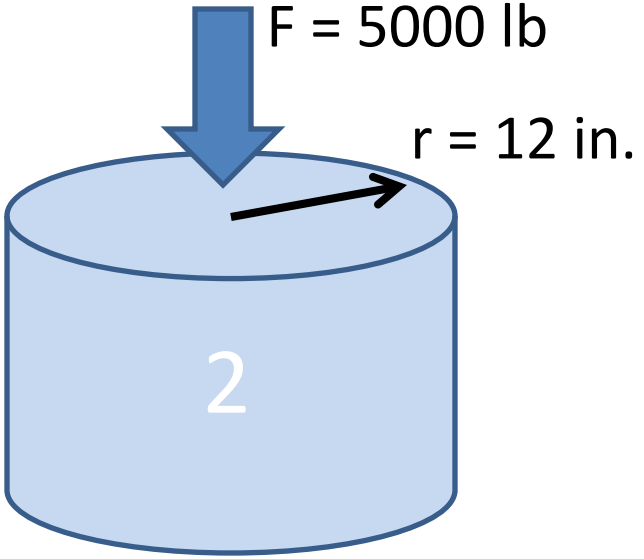
Concrete Properties





Area = 28.3 in^2

Pressure = F/A = 35.3 lbs/in^2

Area = 452.4 in^2

Pressure = F/A = 11.1 lbs/in^2

Which one is the stronger material?

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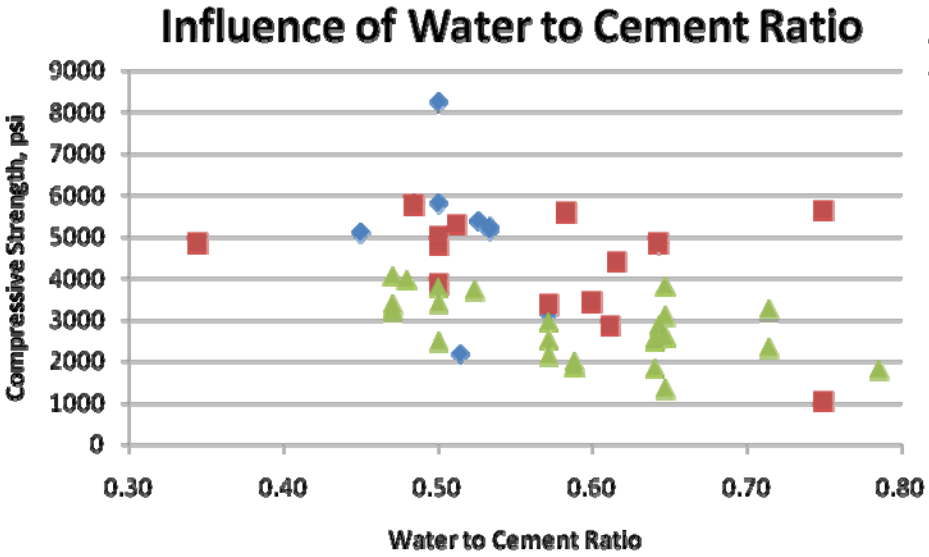
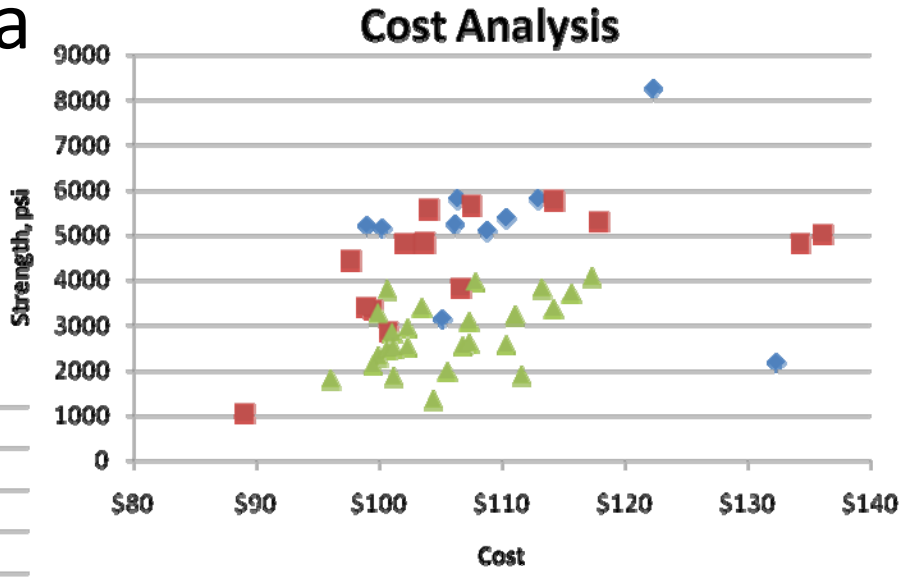
Analysis

Collect and Compare Data





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Wrapping Up...

- Hands-On Learning
- Introduction to Engineering
- Any Grade Level
- Applicable to Multiple Topics
- FUN!

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Questions?

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