

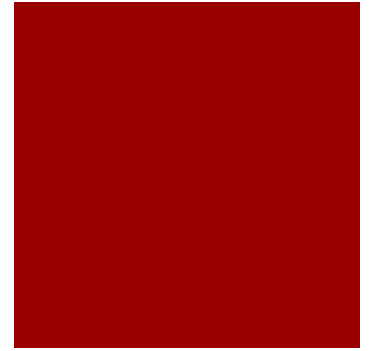
Preparing for Hands-on  
and Minds-on  
Explorations in Math &  
Science: The Tau Beta Pi  
MindSET Teacher  
Development Program

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ASEE K-12 Workshop  
San Antonio, TX  
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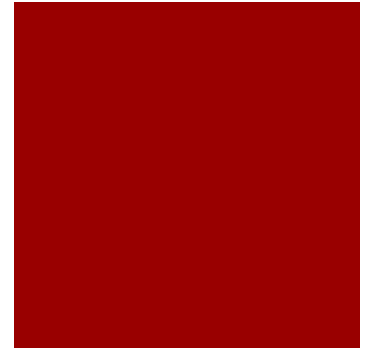
# Agenda

- Introduction
- Tau Beta Pi – MindSET Teacher Development Program
- Center 1 or 2 (Rotate)
- Whole Group Debrief
- Closure



# Tau Beta Pi - MindSET

- TBA



# Common Core Standards for Mathematics: Mathematical Practices



- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

# Scientific and engineering practices

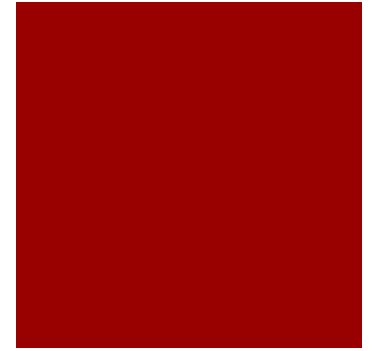


- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics, information and computer technology, and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

# Engineering

- “...a short definition of engineering is the process of designing the human-made world”
- “...engineers modify the world to satisfy people’s needs and wants”
- Engineers also design processes...”

(National Academy of Engineering and National Research Council, 2009, p. 27)



# Engineering Design Process



- “Central Activity of Engineers”:
  - Identify the problem.
  - Generate ideas for solving the problems.
  - Consider potential solutions (or models)
  - Evaluate trade-offs between the solution and solving the problem.
  - Share the solution

(National Academy of Engineering and National Research Council, 2009)

# Manufacturing Engineering



“Manufacturing engineers make things. Everything that manufacturing engineers do is ultimately tied to the production of goods. Almost everything that we use, whether at home, at work, or at play, is manufactured. By its official professional definition, manufacturing occurs when the shape, form or properties of a material are altered in a way that adds value. Manufactured goods are everywhere: aircraft structures, machinery, electronics, medical devices, automobile parts, household products, toys, textiles and clothing, cans and bottles-virtually everything we use”

([http://www.ndsu.edu/ndsu/academic/factsheets/eng\\_arch/manuf.shtml](http://www.ndsu.edu/ndsu/academic/factsheets/eng_arch/manuf.shtml))



# Manufacturing Engineering



“Everything needed in modern society is manufactured. And manufacturing engineers design, direct and coordinate the processes and production systems for making virtually every kind of product - from beginning to end. As businesses try to make products better and at less cost, they turn to manufacturing engineers to find out how”  
([http://www.ndsu.edu/ndsu/academic/factsheets/eng\\_arch/manuf.shtml](http://www.ndsu.edu/ndsu/academic/factsheets/eng_arch/manuf.shtml))

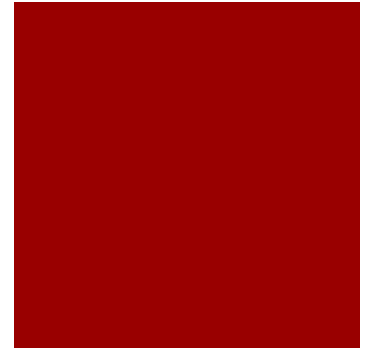
# Presentation Centers

- It's a Hold Up!
- Today's Toothpaste



# Debrief

- What's the best characteristic of your product?
- What changes did you have to make along the way?
- What scientific, mathematical and engineering practices did you use for the experience?



# References

- National Academy of Engineering and National Research Council. Washington, DC: Washington Academies Press.
- Common Core State Standards Initiative. (2010). Common Core State Standards for Mathematics.
- National Research Council. (2011). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.



# Closure

- Thank you!
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