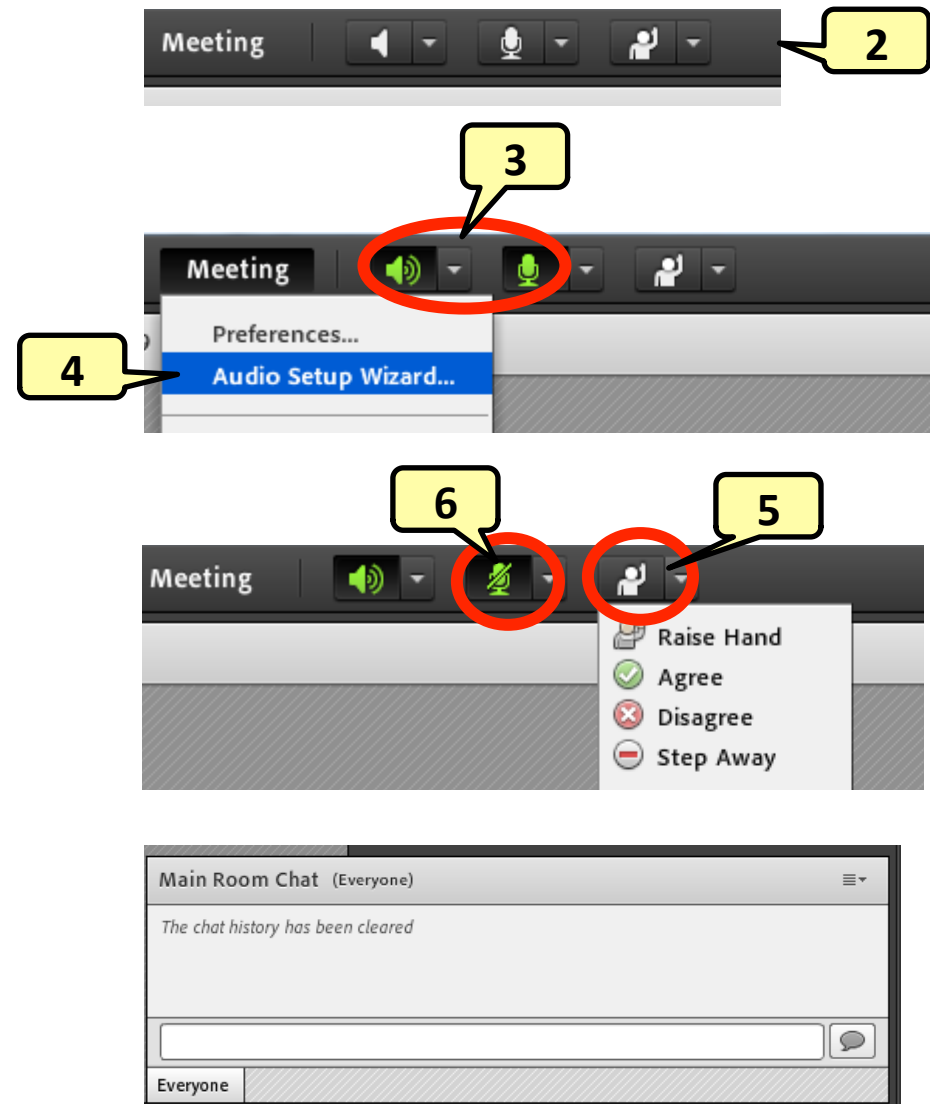


## Welcome! As you enter the room, please...

1. Plug in your headset (if available).
2. Familiarize yourself with the **top bar** on the screen
3. Make sure your **speakers and mic are enabled** (the icons on the top bar should be **highlighted in green**).
4. Run the **audio setup wizard** (this option is available from the “Meeting” menu on the left right of the screen).
5. Once you have run the wizard, “**raise your hand**” by clicking on the icon available on the top bar. This will indicate hosts you are ready to test your mic.
6. After testing your mic, **mute yourself** by clicking on the mic icon on the top bar (this will help to avoid background noise).



**Note:** Feel free to use the chat at any time!



# Record the Session



# Mechanics VCP Session 5

## May 2, 2013

### PROJECT-BASED AND TEAM-BASED LEARNING ACTIVITIES

#### Agenda:

- (i) Objectives for today's session**
- (ii) Review of your blog posts**
- (iii) Project-based and team-based learning strategies**
- (iv) Assignments for Session 6 (9 May 2013)**

# Session 5 Learning Objectives

Brian

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- **At the end of this session, participants will be able to:**
  - *Describe* the variety of team-based and cooperative learning strategies useful in engineering education
  - *Develop* team-based activities of appropriate complexity and duration, and with good assessment and feedback
  - *Define* team membership and member roles for maximum effectiveness

# Introductions

*Brian*

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**Anyone not have a chance to  
introduce themselves yet?**

# Review of your blog posts

*Brian*

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- <http://www.socrative.com/> - not anonymous
- **PollEverywhere – free for up to 40**
- **Use CRS right at beginning**
  - Build from previous lesson (reading quiz)
- **Benefits of using CRS**
  - Some use for attendance, grading
  - Forces students to commit, confront misconception
  - Show of hands, colored cards, go to side of room
- **How to get students to come to class prepared....**

# How Learning Works\*

Brian

7

- 1. Students' prior knowledge can help or hinder learning**
- 2. How students organize knowledge influences how they learn and apply what they know**
- 3. Students' motivation determines, directs, and sustains what they do to learn**
- 4. To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned**
- 5. Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
- 6. Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning**
- 7. To become self-directed learners, students must learn to monitor and adjust their approaches to learning**

\*Ambrose, Bridges, DiPietro, Lovett, and Norman, *How Learning Works* (2010)

# A HLW Organizing Principle

Brian

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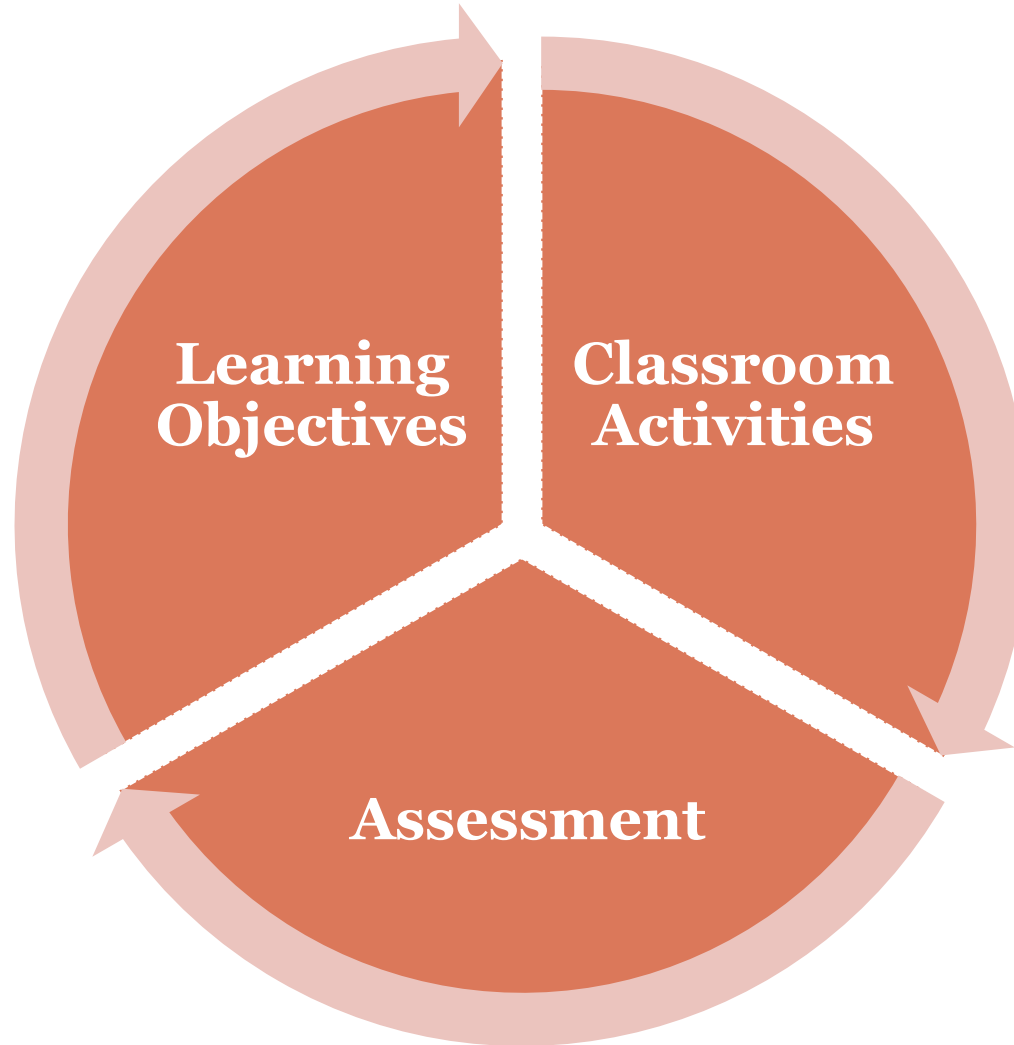
3. **Students' motivation determines, directs, and sustains what they do to learn**
  4. **To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned**
  5. **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
  6. **Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning**
- ***Team-based learning activities (also called “cooperative learning”) can target each of these important principles***



# Course Alignment

*Brian*

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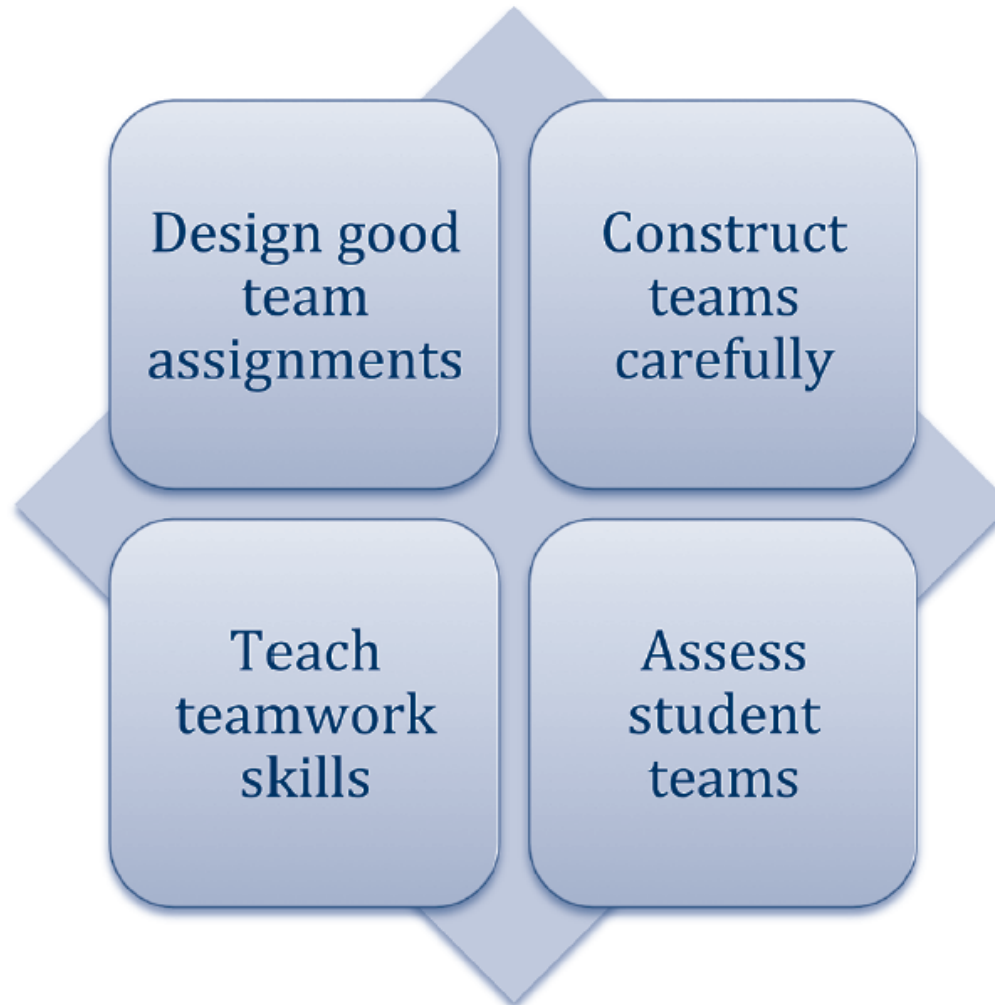


# Four Components of Team Activity Design

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*Brian*



# Instructor's Role in Cooperative Learning

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*Ed*

- **Specify your learning objectives**
- **Explain task and cooperative structure (positive interdependence and individual accountability)**
- **Monitor and intervene to teach teamwork skills**
- **Evaluate students' achievement and group performance, and provide detailed feedback**

# Things you must decide....

*Ed*

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12

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- **Complexity of problem**
- **Duration of activity**
- **Task group size**
- **Group selection/formation method**
- **Group member roles**
- **How long to leave groups together**
- **How to arrange the room**
- **How often/when to intervene**
- **How to assess performance (rubric? Peer evaluations?) and provide feedback**

# Complexity and Time Options

*Ed*

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13

- **In-class collaborative learning**
  - Problem sessions
  - Quizzes
  - Pedagogy: peer-instruction (Mazur)
- **Out-of-class collaborative learning**
  - Team-based homework
  - Short duration projects
  - Long duration projects

# Some Team Activities

*Ed*

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14

- **Jigsaw—learning new conceptual/procedural materials**
- **Peer composition or editing**
- **Reading comprehension/interpretation**
- **Problem solving, project, or presentation**
- **Review/correct homework**
- **Constructive academic controversy**
- **Group quizzes or tests**

# An Example: MEA's

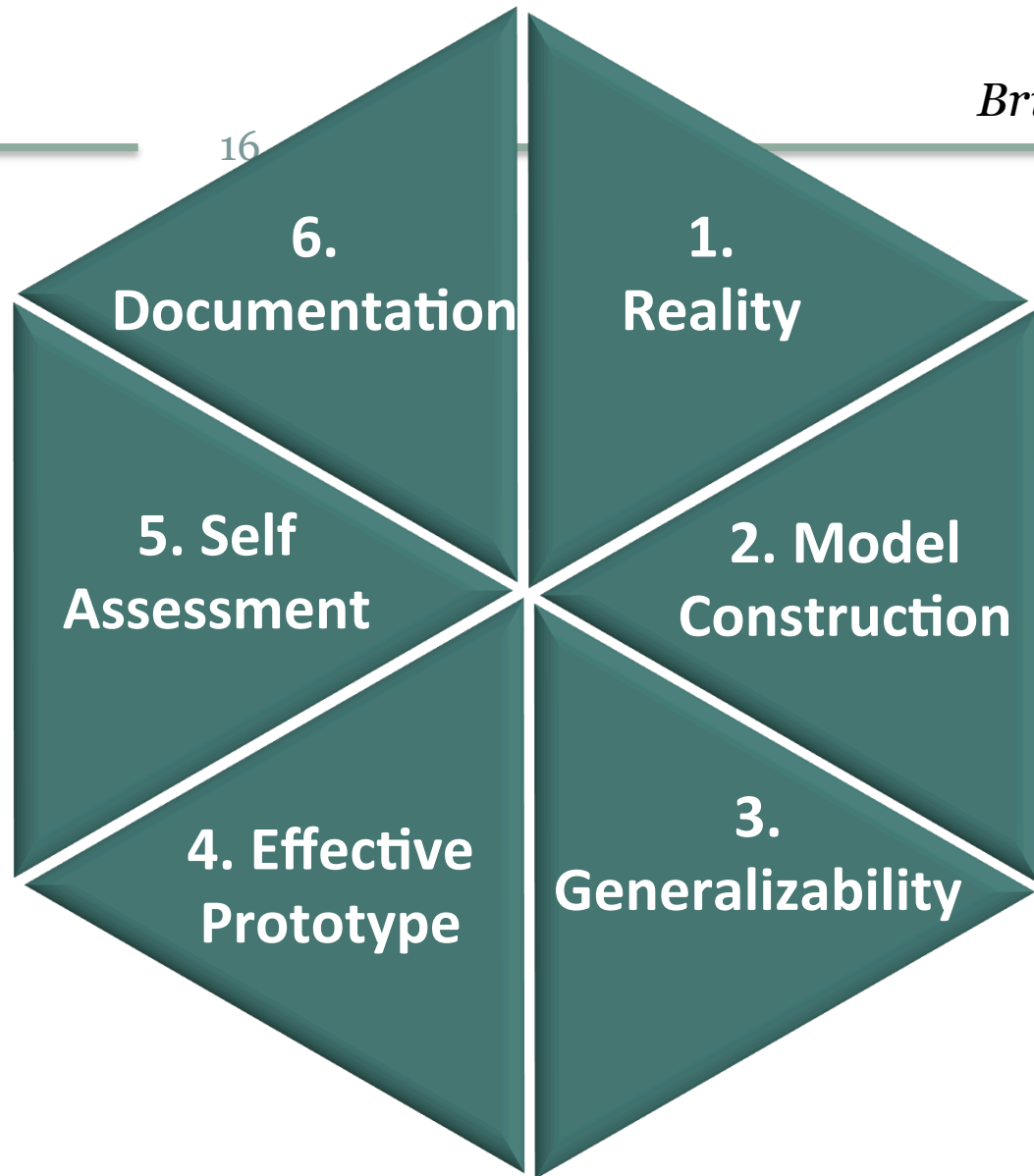
*Brian*

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- **Model eliciting activities (MEA's) are activities that require teams of students to develop, test, and revise models of processes or systems, inspired by real clients and using sample data**
- **<http://modelsandmodeling.net/Home.html>**
- **Example: create an Excel program to help police in Sri Lanka perform vehicle accident investigation**

# MEA Principles





# Breakout Exercise!

*Brian*

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17

- **What types of shorter-term collaborative learning do you do in you classes?**
  - We'll talk about projects a little later
- **Do you have grading rubrics for individual and team performance, and do you use peer evaluation?**
- **Do you assign teams and roles?**
- **Instructions:**
  - Set the timer for 15 minutes
  - 1<sup>st</sup> person on the room list takes notes
  - 3<sup>rd</sup> person on the room list reports out

# Team Formation and Roles

*Ed*

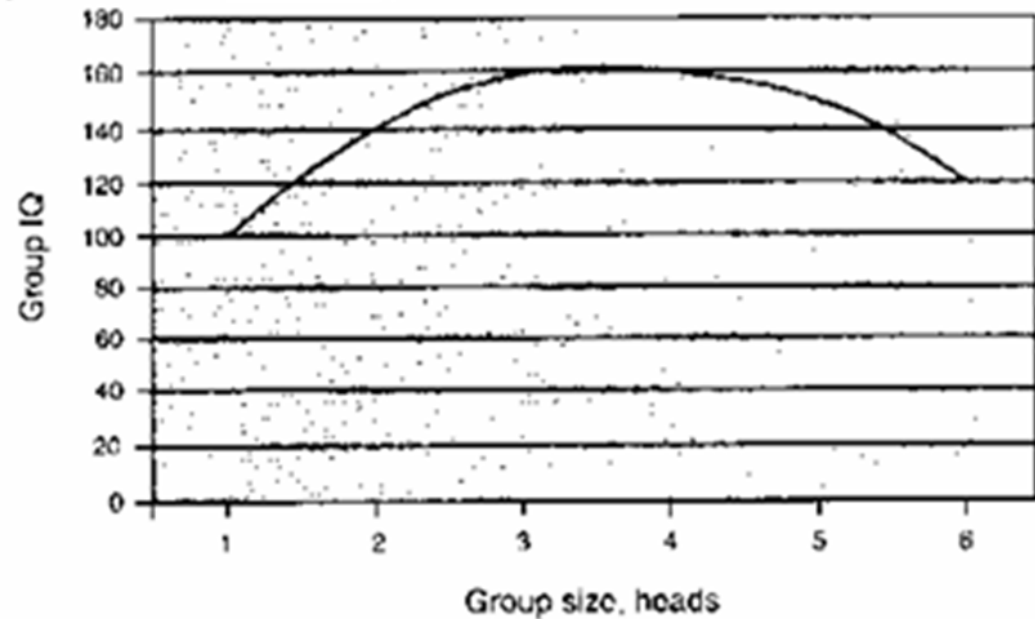
18

- **Professor forms groups, and assigns specific roles that rotate among group members**
  - Roles: manager, recorder/scribe, proofreading, skeptic, others?
  - Rotate roles for each assignment
- **Form groups with heterogeneous ability level**
  - Mix weaker and stronger students together
- **Form groups with an eye to diversity**
  - Gender and race
  - Promote a positive course and group climate

# Group Size Influences Effectiveness

Ed

19



- Perkins, D. 2003. *King Arthur's Round Table: How collaborative conversations create smart organizations*. New York: Wiley.
- Hackman, J.R. 2002. *Leading Teams: Setting the stage for great performances*. Boston: Harvard Business School Press.
- Smith, K.A. 2014. *Teamwork and project management, 4th Ed.* New York: McGraw-Hill.

# Team Management and Intervention

*Ed*

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20

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- **Do not reform teams too often**
  - Felder suggests “at least a month” to allow for the usual stages of team development
- **Mentor teams that are struggling**
  - Provide targeted feedback about team dynamics based upon team member reports and direct observation
  - Counsel teams on how to communicate and perform
  - Develop ways to “fire” uncooperative students or allow students to quit uncooperative teams

# Team Evaluation and Feedback

*Ed*

21

- **Make sure that you encourage individual accountability**
  - Mix team and individual assignments (exams?)
- **Formalize peer evaluation of team member contributions and performance**
  - Formative—how are they functioning right NOW?
  - Summative—how did they complete the assignment?
- **Grading on a curve undermines cooperative activities by de-incentivizing cooperation**
  - A student's grade could be negatively impacted by helping a peer

# CATME--Tools to Form and Monitor Teams

*Brian*

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- **CATME suite of tools (“Comprehensive Analysis of Team Member Effectiveness”),**  
<http://50.116.81.218/~catme/>
  - Team-maker
  - Allow team to develop (or you specify) a team charter or “contract” for cooperation
  - Peer evaluation
  - Rater calibration
  - Many other team tools and research basis for each

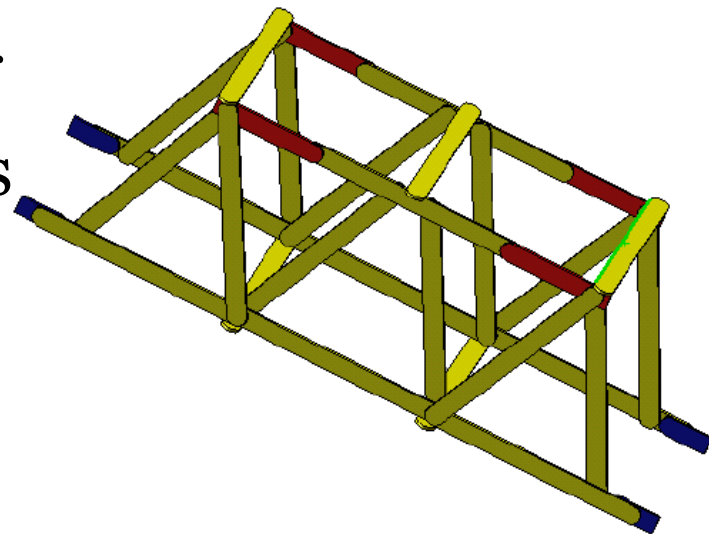
# Your Project Ideas

Brian

23

## Trusses

- Computer applications and simulations to design truss bridges. <http://mathonweb.com/truss.htm>
- Design and build truss using PASCO Scientific kit <http://www.pasco.com/>
- Design and build a truss of 12 inches long and 3 inches high using popsicle sticks; efficiency = strength / weight.

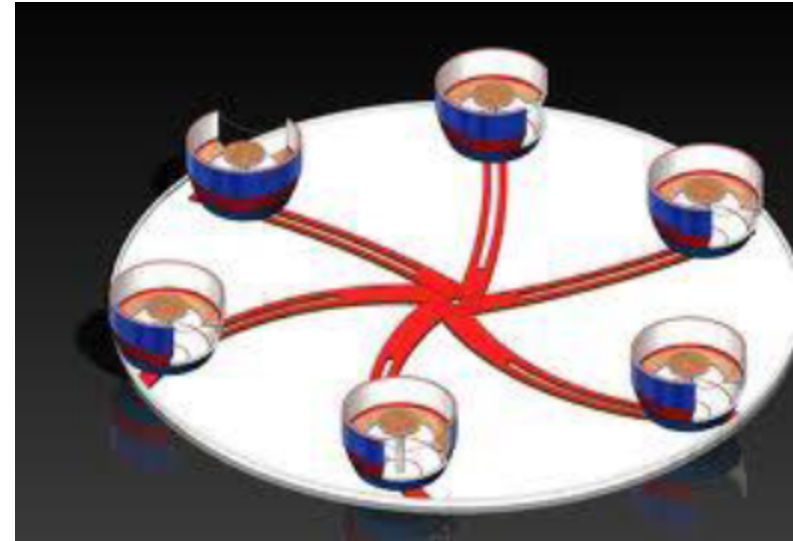


# Your Project Ideas

Brian

24

- **Teacup amusement park ride – recommend  $\omega$ ,  $\alpha$**
- **Simulate forces experienced by rider**
- **Rocket project**
- payload component, total impulse has to be less than 20 N-s
- Budget for design, fabrication and operation is \$250
- Complexity increases throughout semester





# Your Project Ideas

*Brian*

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- **Design and build two beams using the materials provided**
- **Beam 1: 18 wooden coffee stirrers, simply supported at two points 6 inches apart, and loaded in the middle**
- **Beam 2: 6 wooden paint stirrers, simply supported at two points 12 inches apart, loaded at a point 7 inches from one support and 5 inches from the other.**
  
- **Bolted Joint Design Project**
- **Design and build a bolted joint to be loaded in tension to connect 2 pieces of 1/8 inch thick, 1018 cold drawn steel plates that are 2" x 1/8" and approximately 6 inches long. The plates may overlap by no more than 3 inches.**

# Breakout Exercise!

*Brian*

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26

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- **What types of projects have you done in class?**
- **What are some obstacles to using projects?**
- **What can you do to overcome these?**
- **Instructions:**
  - Set the timer for 10 minutes
  - 4<sup>st</sup> person on the room list takes notes
  - 2<sup>nd</sup> person on the room list reports out

# For Session 6 (May 9, 2013)

*Brian*

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27

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- **Update your user profile (with a picture!)**
- **Connect with our community on the blog**
- **Review materials placed in Session 6 Resources folder**
- **Upload descriptions of hands-on demos or activities that you have used in your mechanics classes – pictures would be great!**