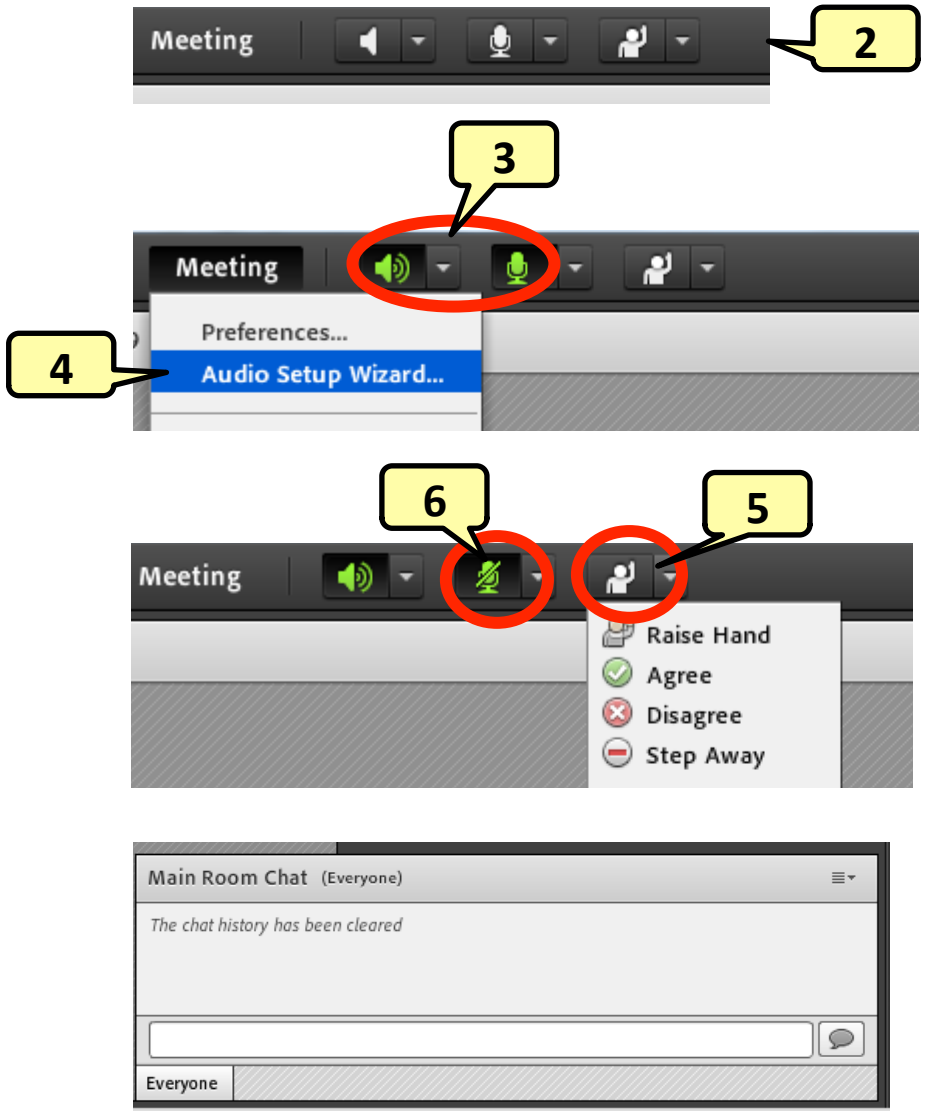
Welcome! As you enter the room, please…

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 3
April 18, 2013

ALIGNING LEARNING OBJECTIVES, ACTIVITIES, AND ASSESSMENT

Agenda:

(i) Objectives for today's session
(ii) Review of D/F/W survey
(iii) Review of blog comments
(iv) Structuring classroom activities and assessment to match learning objectives
(v)Assignments for Session 4 (25 April 2013)

Session 3 Learning Objectives

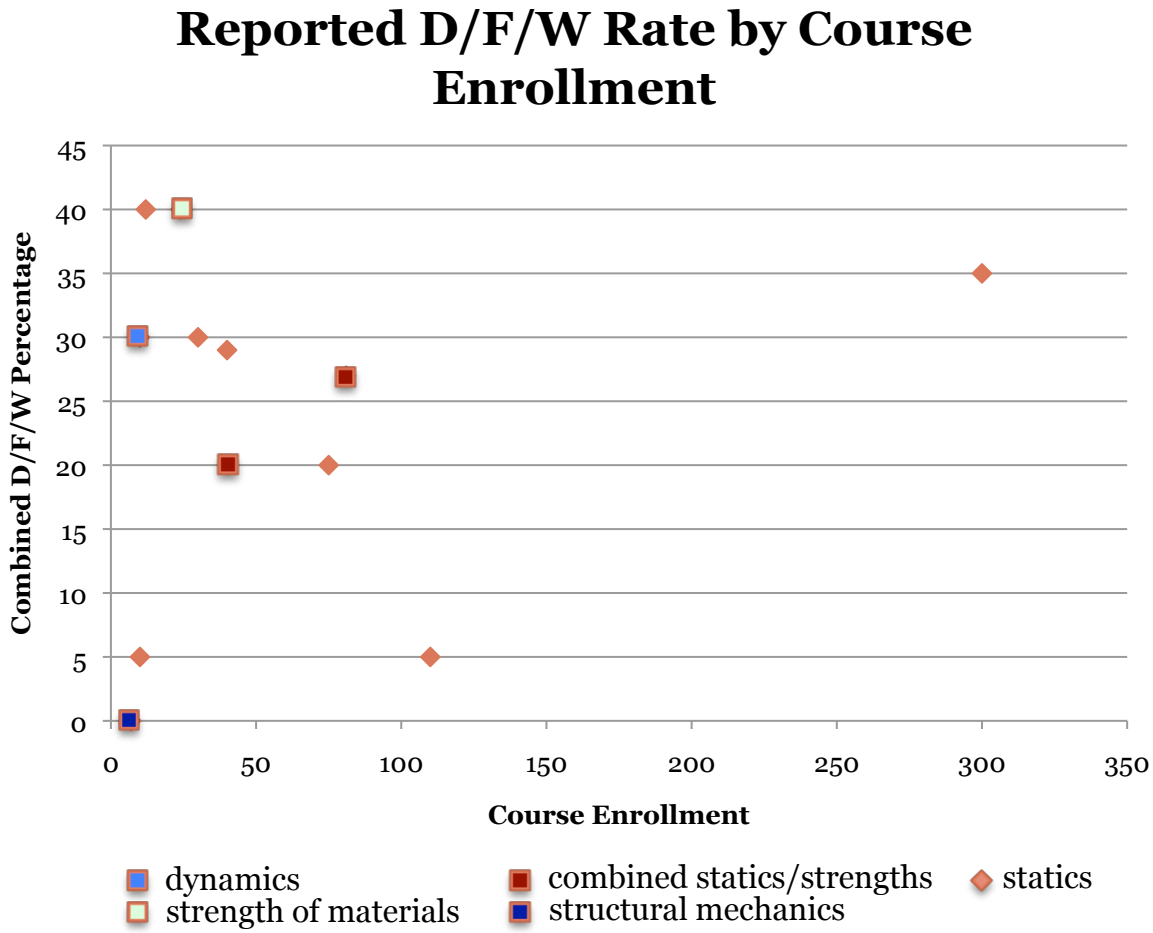
Ed

- **At the end of this session, participants will be able to:**
  - ***describe*** **alignment of objectives, activities, and assessments**
  - ***develop/use*** **tools to assess prior knowledge of your students**
  - ***construct*** **classroom activities that encourage goal-directed behavior**
  - ***select*** **assessment strategies consistent with both activities and objectives**

D/F/W Survey Results

Ed

- **D/F/W rates do not seem to vary systematically with enrollment**
- **hypotheses:**
  - **students get stuck early and never catch up**
  - **poor preparation in calculus (or other)**
  - **students don't sustain a high effort throughout the entire semester (give up after 1st exam)**
  - **unprepared for work load, unwilling to work hard enough**
  - **decide they don't like engineering?**



Introductions

Brian

Edward Davis

Auburn University

Carisa Ramming

Oklahoma State University

Barbara Fleck

Maine Maritime Academy

Himangshu S. Das

Blog Posts

Brian

- **Jon – worked over iPad!**
- **Amelito - I am still having difficulty finding a direct relationship between activities and learning levels in Bloom's taxonomy**
  - **does lecture necessarily lend itself to the "lower" levels of learning**
  - **Does problem solving, or group work, or demonstration, or simulations necessarily lead to a higher level of learning than lecture?**

Blog Posts

Brian

- **Anna – hybrid course for Statics**
  - **LiveScribe for example problems**
  - **YouTube for subject introductions**
  - **5-question Moodle quizzes each class**
  - **How to motivate…..**
  - **“Trick” question – or “challenge their current conceptual framework”**

Lesson Redesigns

Ed

- **Examples**
  - **Jon Miller: design an activity that allows students to discover shear/bending moment diagram rules for themselves**
  - **Amelito Enriquez: design an instructor-mediated, peer-review environment in which students share FBD's, review them, and develop solution approaches**
  - **Rick Hill: use a motivating "challenge" problem to provide real-world context to specific concepts; teach concepts skills with consistent reference back to the challenge problem**

How Learning Works*

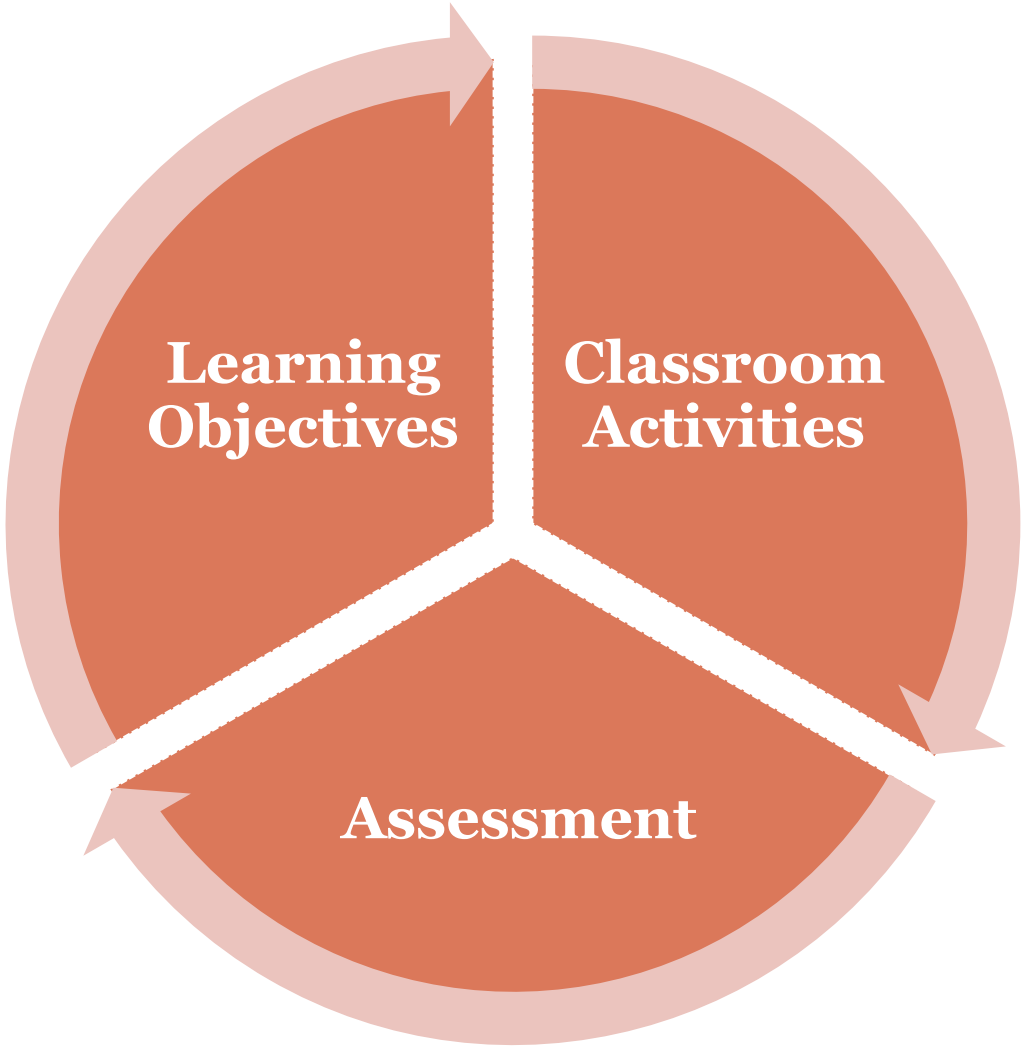
Ed

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)

Course Alignment

Ed



Learning Objectives

Ed

- **these are the thing you want your students to be able to do upon completion of the course**
- **should be written using Bloom's taxonomy verbs to target appropriate tiers on the hierarchy**
- **Conceptual vs. skills-oriented**
- **Generally have course objectives as well as lesson objectives**

A HLW Organizing Principle

Brian

- **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
- **Two pieces**
  - **Goal-directed practice (the learning activities)**
  - **Targeted feedback (the assessment)**

Goal-Directed Practice

Brian

- **Conduct a *prior knowledge assessment* to target an appropriate challenge level**
- **Be explicit about your goals (on the syllabus!)**
- **Where possible, use a rubric**
- **Build *scaffolding* into assignments (remember what we did last week?)**
- **Set expectations about practice**
- **Show examples of what you do (or don't) want**
- **Be flexible and refine your performance criteria as necessary**

Assessing Prior Knowledge

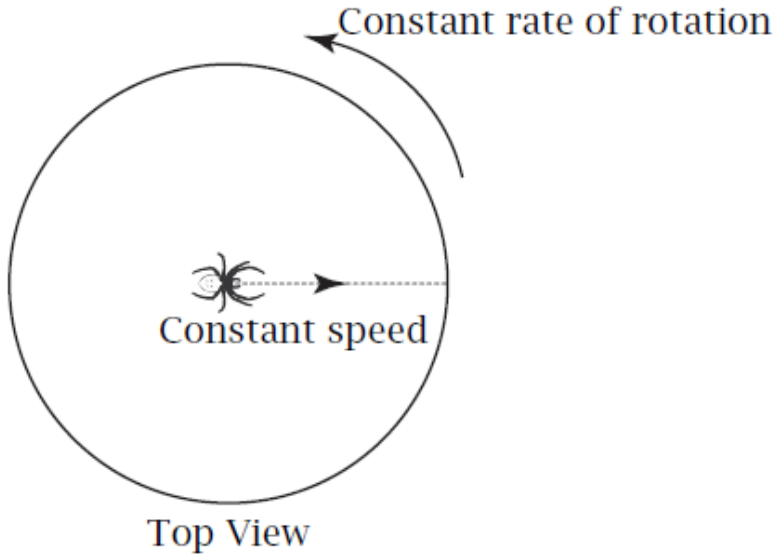
Brian

- **Concept inventories ciHUB.org**
  - **Often used to assess different interventions (pre/post)**
  - **Force concept inventory**

A spider is walking with a constant speed across a platform that is rotating at a constant rate as shown to the right. When the spider is in the center of the platform what is the direction of its acceleration?

(a) → (b) ← (c) ↑ (d) ↓

(e) The acceleration is zero.



Assessing Prior Knowledge

Brian

- **Skills Reviews**
  - Statics skills assessment tool
  - Create your own, concentrate on pre-requisite skills and concepts to gauge student understanding
- **Pre-quizzes or reading quizzes**
  - Just-in-Time Teaching -- www.Jitt.org
  - Students submit answers ~3 hours before class
    - **Change lesson content depending on answers**

Classroom Activities

Ed

- **the actual things that you and your students do either when you are together (in the classroom, or in office hours), or when your students are working independently (homework, projects, etc.)**
- **examples (IC = in class, OOC = out of class):**
  - **lecture (IC)**
  - **collaborative problem solving (IC)**
  - **homework (OOC)**
  - **projects (IC/OOC)**
  - **peer discussions (IC)**
  - **physical demonstrations (IC)**
  - **create/show/watch relevant videos/simulations (IC/OOC)**
  - **build *scaffolded* exercises**

Scaffolding Experiences, 1

Ed

- **Scaffolded Content**
  - **activity 1: students solve a "simple" problem that targets one specific skill (calculating a moment of inertia) [Bloom: *recall* the formulae and *carry out* the calculation]**
  - **activity 2: students then solve a problem that embeds that specific skill into a more complex problem (calculate bending stress) [Bloom: *integrate* moment of inertia calculations into a larger structural mechanics problem]**
  - **activity 3: students then design the cross section of a beam for a desired performance, subject to specific loads and b.c.'s [Bloom: *design* the moment of inertia for a specific purpose]**

Scaffolding Experiences, 2

Ed

- **Scaffolded Instruction***
  - **activity 1: the instructor guides the class in the solution of a "simple" problem[Bloom: *recognize* the formulae/goals and *summarize* the process]**
  - **activity 2: the instructor guides the class through the beginning of the solution to a more complex problem, then challenges the class to finish the problem [Bloom: *provide* a starting point to students, then ask them to *select* appropriate finishing steps and *differentiate* among all the methods they know]**
  - **activity 3: the instructor presents a problem that students must solve from beginning to end [Bloom: *evaluate* the problem to *determine* appropriate steps/starting point, then *design* a process to execute the full solution]**

* for example: R. Moreno, "Toward a Fundamental Understanding of Worked Example Instruction: Impact of Means-Ends Practice, Backward/Forward Fading, and Adaptivity", *Proceedings of the 36th Annual Frontiers in Education Conference*, 2006.

Breakout Exercise!

Ed

- **What are the kinds of *goal-directed classroom activities* that you employ in your course? Do you do anything "unconventional"? Does lecture qualify as "goal-oriented"?**
- **Instructions:**
  - **Set the timer for 15 minutes**
  - **2nd person on the room list takes notes**
  - **4th person on the room list reports out**

Introductions

Brian

Mathew Kuttolamadom

Texas A&M University

Jon K. Miller

Stevens Institute of Technology

Reza Moradi

University of Guam

Targeted Feedback

Brian

- **Look for patterns of error**
- **Prioritize/focus your feedback**
- **Balance strengths and weaknesses in your feedback**
- **Use peer feedback, real-time if possible**
- **Design frequent opportunities for feedback**
- **Specify how students should use feedback in subsequent work**
- **Provide group-level feedback**

Assessments

Brian

- **Homework (OOC)**
- **Quiz, exam (IC)**
- **Clicker questions (IC)**
- **Projects (OOC)**
- **Observations (IC)**
- **Observations (OOC, office hours)**
- **Peer evaluations (IC or OOC)**
- **Participation/support (as on a blog, OOC)**
- **FORMATIVE vs. SUMMATIVE**

Frequent Feedback

Brian

- **Think-pair-share**
- **Clickers**
- **Other informal, formative feedback (conversation, observation)**
- **some teaching strategies emphasize very frequent, low-stakes (i.e., with no course grade attached to it), formative feedback:**
  - **Carl Wieman: "The design goal was to have the students spend all their time in class engaged in deliberate practice at 'thinking scientifically' in the form of making and testing predictions and arguments about the relevant topics, solving problems, and critiquing their own reasoning and that of others." [Deslauriers, Schelew, and Wieman, "Improved Learning in a Large-Enrollment Physics Class", *Science*, 332(6031):862-864, 2011.]**
  - **Eric Mazur: "The goal of PI is to transform the lecture environment so that it actively engages students and focuses their attention on underlying concepts…lectures consist of a number of short presentations on key points, each followed by a [pre-]ConcepTest", peer discussion, then a post-test. [Crouch, Watkins, Pagen, and Mazur, "Peer Instruction: Engaging Students One-on-One, All at Once", *Research-Based Reform of University Physics*, 2007.**

Breakout Exercise!

Brian

- **What are the kinds of *formative and summative feedback/assessment* you provide to students, either individually or in groups? Do you do anything "unconventional"?**
- **Instructions:**
  - **Set the timer for 15 minutes**
  - **1st person on the room list takes notes**
  - **3rd person on the room list reports out**

For Session 4 (April 25, 2013)

Brian

- **Update your user profile (with a picture!)**
- **Connect with our community on the blog**
- **Upload at least 3 *multiple choice, conceptual-understanding questions* to use in your class**