Reflection and Dialogue

• Individually reflect on Effective, Interactive Strategies for Facilitating Learning. Write for about 1 minute
  – Context? Subject, Year, School/Department
  – Structure/Procedure?
  – Outcome? Evidence of Success
• Discuss with your neighbor for about 2 minutes
  – Select Story, Comment, Question, etc. that you would like to discuss further
Session Objectives

• Participants will be able to:
  – Describe key features of effective, interactive strategies for facilitating learning
  – Summarize research on *How People Learn (HPL)*
  – Describe key features of the *Understanding by Design (UbD)* process – Content (outcomes) – Assessment – Pedagogy
  – Explain key features of and rationale for Cooperative Learning
  – Identify connections between cooperative learning and desired outcomes of courses and programs

• Participants will begin applying key elements to the design on a course, class session or learning module

It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become *designers* of learning experiences, processes, and environments.

James Duderstadt, 1999 [Nuclear Engineering Professor; Dean, Provost and President of the University of Michigan]
Design Foundations

Science of Instruction (UbD)

<table>
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<tr>
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<tbody>
<tr>
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Science of Learning (HPL)


Designing Learning Environments Based on HPL (How People Learn)
Understanding by Design

Stage 1. Identify Desired Results
• Enduring understanding
• Important to know and do
• Worth being familiar with

Stage 2. Determine Acceptable Evidence

Stage 3. Plan Learning Experiences and Instruction

Overall: Are the desired results, assessments, and learning activities ALIGNED?


Content-Assessment-Pedagogy (CAP) Design Process Flowchart

Backward Design

Start
Context

Content

Assessment

Pedagogy

Yes

C & A & P Alignment?

No

End

UdB – 3 Stages of Backward Design

Identify the Desired Results

Determine Acceptable Evidence

Plan Learning Experiences

Are the desired results, assessments, and learning activities ALIGNED?

UbD Filters for Curricular Priorities
• Are the topics enduring and transferable big ideas having value beyond the classroom?
• Are the topics big ideas and core processes at the heart of the discipline?
• Are the topics abstract, counterintuitive, often misunderstood, or easily misunderstood ideas requiring coverage?
• Are the topics big ideas embedded in facts, skills and activities?

Streveler, Smith & Pilotte (2011)
1. Students prior knowledge can help or hinder learning
2. How student 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 approach to learning
Pedago-pathologies

Amnesia

Fantasia

Inertia

Lee Shulman – MSU Med School – PBL Approach (late 60s – early 70s), President Emeritus of the Carnegie Foundation for the Advancement of College Teaching

What do we do about these pathologies?

- **Activity** – Engage learners in meaningful and purposeful activities
- **Reflection** – Provide opportunities
- **Collaboration** – Design interaction
- **Passion** – Connect with things learners care about

Pedagogies of Engagement

Student Engagement Research Evidence

• Perhaps the strongest conclusion that can be made is the least surprising. Simply put, the greater the student’s involvement or engagement in academic work or in the academic experience of college, the greater his or her level of knowledge acquisition and general cognitive development …(Pascarella and Terenzini, 2005).

• Active and collaborative instruction coupled with various means to encourage student engagement invariably lead to better student learning outcomes irrespective of academic discipline (Kuh et al., 2005, 2007).

Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both positive interdependence (all members must cooperate to complete the task) and individual and group accountability (each member is accountable for the complete final outcome).

Key Concepts
- Positive Interdependence
- Individual and Group Accountability
- Face-to-Face Promotive Interaction
- Teamwork Skills
- Group Processing


Cooperative Learning
- Research – Randomized Design Field Experiments
- Practice – Formal Teams/Professor’s Role
Cooperative Learning
• Positive Interdependence
• Individual and Group Accountability
• Face-to-Face Promotive Interaction
• Teamwork Skills
• Group Processing

Cooperative Learning Research Support

• Over 300 Experimental Studies
• First study conducted in 1924
• High Generalizability
• Multiple Outcomes

Outcomes
1. Achievement and retention
2. Critical thinking and higher-level reasoning
3. Differentiated views of others
4. Accurate understanding of others’ perspectives
5. Liking for classmates and teacher
6. Liking for subject areas
7. Teamwork skills
Active and Cooperative Learning

Farewell, Lecture?

Calls for evidence-based instruction practices

Book Ends on a Class Session

Book Ends on a Class Session

1. Advance Organizer
2. Formulate-Share-Listen-Create (Turn-to-your-neighbor) -- repeated every 10-12 minutes
3. Session Summary (Minute Paper)
   1. What was the most useful or meaningful thing you learned during this session?
   2. What question(s) remain uppermost in your mind as we end this session?
   3. What was the “muddiest” point in this session?

Formulate-Share-Listen-Create

Informal Cooperative Learning Group
Introductory Pair Discussion of a

FOCUS QUESTION

1. Formulate your response to the question individually
2. Share your answer with a partner
3. Listen carefully to your partner's answer
4. Work together to Create a new answer through discussion
Informal Cooperative Learning (Book Ends on a Class Session)

Physics
Peer Instruction
Peer Instruction – www.prenhall.com
Richard Hake – http://www.physics.indiana.edu/~hake/

Chemistry
Chemistry ConcepTests - UW Madison - www.chem.wisc.edu/~concept
Video: Making Lectures Interactive with ConcepTests
ModularChem Consortium – http://mc2.cchem.berkeley.edu/

STEMTEC

Harvard – Derek Bok Center

The “Hake” Plot of FCI

Gain (Percent)

Pretest (Percent)

ALS  SDI  UMn-CL+PS  WP  UMn Cooperative Groups
ASU(nc)  WP*  UMn Traditional  ASU(c)  HU  PI(HU)
Physics (Mechanics) Concepts: The Force Concept Inventory (FCI)

- A 30 item multiple choice test to probe student's understanding of basic concepts in mechanics.
- The choice of topics is based on careful thought about what the fundamental issues and concepts are in Newtonian dynamics.
- Uses common speech rather than cueing specific physics principles.
- The distractors (wrong answers) are based on students' common inferences.
Cooperative Learning

At M.I.T., Large Lectures Are Going the Way of the Blackboard

CAMBRIDGE, Mass. — For as long as anyone can remember, introductory physics at the Massachusetts Institute of Technology was taught in a vast, windowless classroom known by its acronym, NWSL.

http://web.mit.edu/edtech/casestudies/teal.html#video

http://www.ncsu.edu/PER/scaleup.html

http://www.youtube.com/watch?v=lFT_hoiuY8w
http://youtu.be/lFT_hoiuY8w

http://www.udel.edu/inst/
Leading with TeamLEAD: An Innovative Curriculum at Duke-NUS

• Called TeamLEAD (learn, engage, apply, develop), the method is a radical departure from traditional lecture-based teaching formats. Instead, students are responsible for learning the bulk of the material before class, using recorded lectures from Duke University School of Medicine along with reading assignments from textbooks and medical journals.

• Once in class, they are tested both individually and in small groups, so instructors can focus the rest of the session on areas of weakness. The teams then work together, with “open-book” access to medical references, to solve clinically oriented questions related to the material.

• “The best doctor is no longer the doctor with the best memory,” says Robert Kamei, MD, vice dean for education at Duke-NUS. “In an age when information is available anywhere, instantaneously, we want to provide students with the skills they’ll need in the future -- the ability to find the latest information and apply it to clinical practice.

• To succeed at the highest level, they need to be able to both work in teams and provide leadership, so our curricular approach focuses on developing those abilities, not just rote memorization.”

• Although the concept of team-based learning was introduced in business schools in the 1980s, TeamLEAD is the first time it has been adapted for medical education.

http://www.youtube.com/watch?v=BlVPLYGdBLg
The American College Teacher:
National Norms for 2007-2008

<table>
<thead>
<tr>
<th>Methods Used in “All” or “Most”</th>
<th>All – 2005</th>
<th>All – 2008</th>
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<tr>
<td>Cooperative Learning</td>
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<td>59</td>
<td>66</td>
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<tr>
<td>Group Projects</td>
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<td>36</td>
<td>61</td>
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<tr>
<td>Grading on a curve</td>
<td>19</td>
<td>17</td>
<td>14</td>
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<tr>
<td>Term/research papers</td>
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<td>44</td>
<td>47</td>
</tr>
</tbody>
</table>

http://www.heri.ucla.edu/index.php

Session Summary
(Minute Paper)

Reflect on the session:

1. Most interesting, valuable, useful thing you learned.
2. Things that helped you learn.
3. Question, comments, suggestions.
4. Pace: Too slow 1 . . . . 5 Too fast
5. Relevance: Little 1 . . . . 5 Lots
6. Instructional Format: Ugh 1 . . . . 5 Ah
Q4 – Pace: Too slow 1 . . . . 5 Too fast (2.9)
Q5 – Relevance: Little 1 . . . 5 Lots (3.9)
Q6 – Format: Ugh 1 . . . 5 Ah (3.7)

Resources

• Design Framework – How People Learn (HPL) & Understanding by Design (UdB) Process

• Content Resources

• Cooperative Learning
  – Cooperative Learning (Johnson, Johnson & Smith) - Smith web site – www.re.umn.edu/~smith

• Other Resources
  – University of Delaware PBL web site – www.udel.edu/pbl