

The InterActive Classroom





A Higher Education?

- “... they were not all learning what I wanted them to learn ...”
- “... inexplicable blunders from apparently bright students ...”
- “... one problem ... lies in the presentation of the material ... it comes straight out of textbooks and/or lecture notes, giving students little incentive to attend class ...”
- “... students asked to distribute lecture notes in advance so they didn't need to spend time copying down notes ... so they could pay more attention to my lecture ... then students complained that I was lecturing straight out of my lecture notes ...!”

Giving a 'Talk': Passive Learning

Traditional instruction presumes two types of 'knowledge':

- *Facts* and ideas which are things that can be packaged into words
- *Know-how* which can be packaged into words as rules or procedures

These 'packages of knowledge' are then 'told' to the students, **but**:

- Students usually *miss the point* of what we tell them, if they listen at all
- Key words or concepts do not elicit the same *connections* for students as they do for the teacher



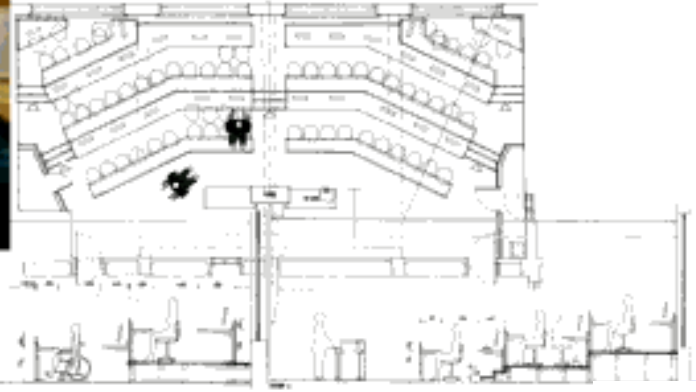
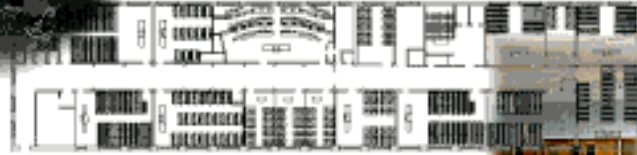
Talking: Active Learning

"... *interactive engagement* of students is heads-on (always) and involves hands-on (usually) activities which yield immediate feedback through *discussion* with peers and/or tutors ..."

RR Hake: "Interactive-engagement vs traditional methods: a six-thousand student survey of mechanics test data for introductory physics courses" Amer. J. Physics, 1998

"...learning is the process whereby knowledge is created through the transformation of *experience*..."

D Kolb in "Experiential Learning"



Weir Teaching Cluster




RPI Studios - 1



Teaching by Questioning

- The benefits of teaching by questioning are now widely recognized and the technique is becoming widely used
- The disciplines include physics, chemistry, mathematics, biology, sociology, economics, political science, business negotiation, history and school reading comprehension
- A recent *Harvard* survey indicated over 700 instructors use the technique, with about 400 using a variation called *Peer Instruction*

Teaching by Questioning

- **Why ask questions in class?**
 - **How do you write questions?**
 - **How do you ask the question?**
 - **Does it work?**
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Why ask questions in class?

- To assess background knowledge
- To test if what has been taught has been understood
- To provoke a class discussion
- To emphasize or reinforce a point
- To introduce a new topic
- To see if students can combine past material to reach an understanding of present material

How do you write questions?

- Decide on fundamental point of the lecture
- Cut out explanations printed in the lecture notes, or textbook. Keep definitions, but don't explain them
- Outline a list of *key points*, definitions, videos, demonstrations etc.
- Create several questions for each key point etc. in the list. Follow the basic rules:
 - Focus on a single concept, idea or learning outcome
 - Have adequate, believable, multiple choice answers
 - Unambiguously worded (this is difficult!)
 - Neither too easy or difficult
 - Use a hierarchy of educational objectives

Bloom's Taxonomy of Educational Objectives



- **Knowledge** - remembering 'it'
- **Comprehension** - what does 'it' mean
- **Application** - using 'it'
- **Analysis** - how is 'it' structured
- **Synthesis** - how does 'it' relate
- **Evaluation** - does 'it' have a value

The ConcepTest

- Question posed (1 minute)
- Student given time to think (1 minute)
- Students record individual answers and level of confidence (optional)
- Students *convince their neighbors* (2-3 minutes) - this is Peer Instruction
- Students record revised answers and level of confidence
- Feedback to teacher (histogram)
- Explanation of correct answer