Active Learning: Introducing Students to Communities of Practice

Columbia Center for New Media Teaching & Learning

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Introduction

Workshop Goal:

Faculty who understand and can design effective *Active Learning* exercises.

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Crying Out Loud

What are your problems?

What are your experiences?

What are your expectations?

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Questions to answer

Effective *Active Learning* exercises?

What kind of learning / knowing is the goal?

An epistemology

How can one know what a student knows?

Case for assessment and feedback

How can technology make a difference?

Adding capabilities for effective *active learning*

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Overview

Cases for study - It looks like this ...

- What they are after?

Essential ingredients

+ information technology

Designing your own

- connecting to CCMTL

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Case 1

Concept building and reasoning

[Clip of Nick Turro's class's discussions of a concept question]

How many distinct molecules can you conceive of using this combination of atoms [$C_5 H_{12}$]?

[Clip of Eric Mazur's conduct of a concept question discussion]

Which statement can you conclude is true about the (possible) electrical charges on three objects based upon the following observations of their interactions with one another?

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Case 2

Learning to formulate and recognize representations

Abstract symbols gain meaning if linked to picture-like and diagrammatic descriptions.

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陆地上有轮子的交通工具

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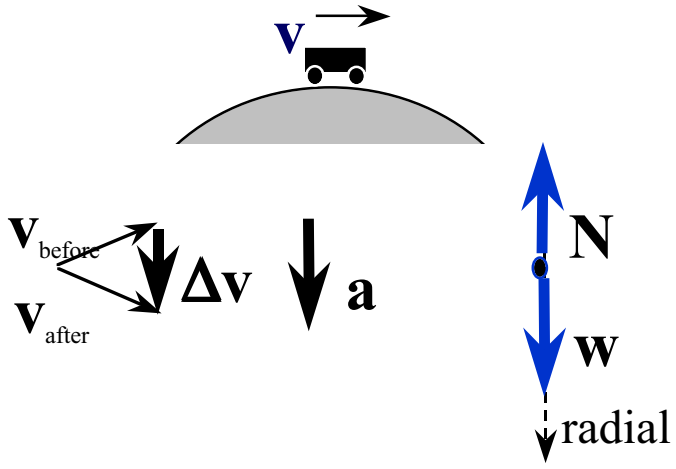
Case 2 (cont.)

Learning to formulate and recognize representations

Moving among multiple representations.

Determine the normal force that a 10-m radius hump in the road exerts on the 40-kg cart traveling at 8 m/s.



$$(40\ \text{kg})(9.8\ \text{m/s}^2) - N = (40\ \text{kg})\,[(8\ \text{m/s})^2/(10\ \text{m})]$$

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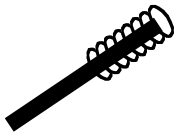
Case 3

Developing higher-order learning - solving complex problems

What do we need to do to launch the spring *from the end of this rod into the box* across the room.



Indicate any assumptions you make and justify them.

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Case 3 (cont.)

Developing higher-order learning - solving complex problems

What genre of fiction does the following plot line and sample passage suggest?

Indicate any assumptions you make and justify them.

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Taxonomy of our *Active Learning* Process

1. Building concepts and reasoning

2. Learning to represent and recognize with understanding using multiple representations; changing representations in any direction

3. Developing high-order thinking skills

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Aspects of our *Active Learning Process*

- Students must participate *actively* to make sense of symbols, concepts, relations ...
- Students can **test** their understanding and get (immediate) **feedback**
- (In-class) exercises should be short … 5-10 mins.
- Activities should address -- teamwork, communication skills, learn to learn, *etc.*
- Exercises can be extended out-of-class via ***IT***!

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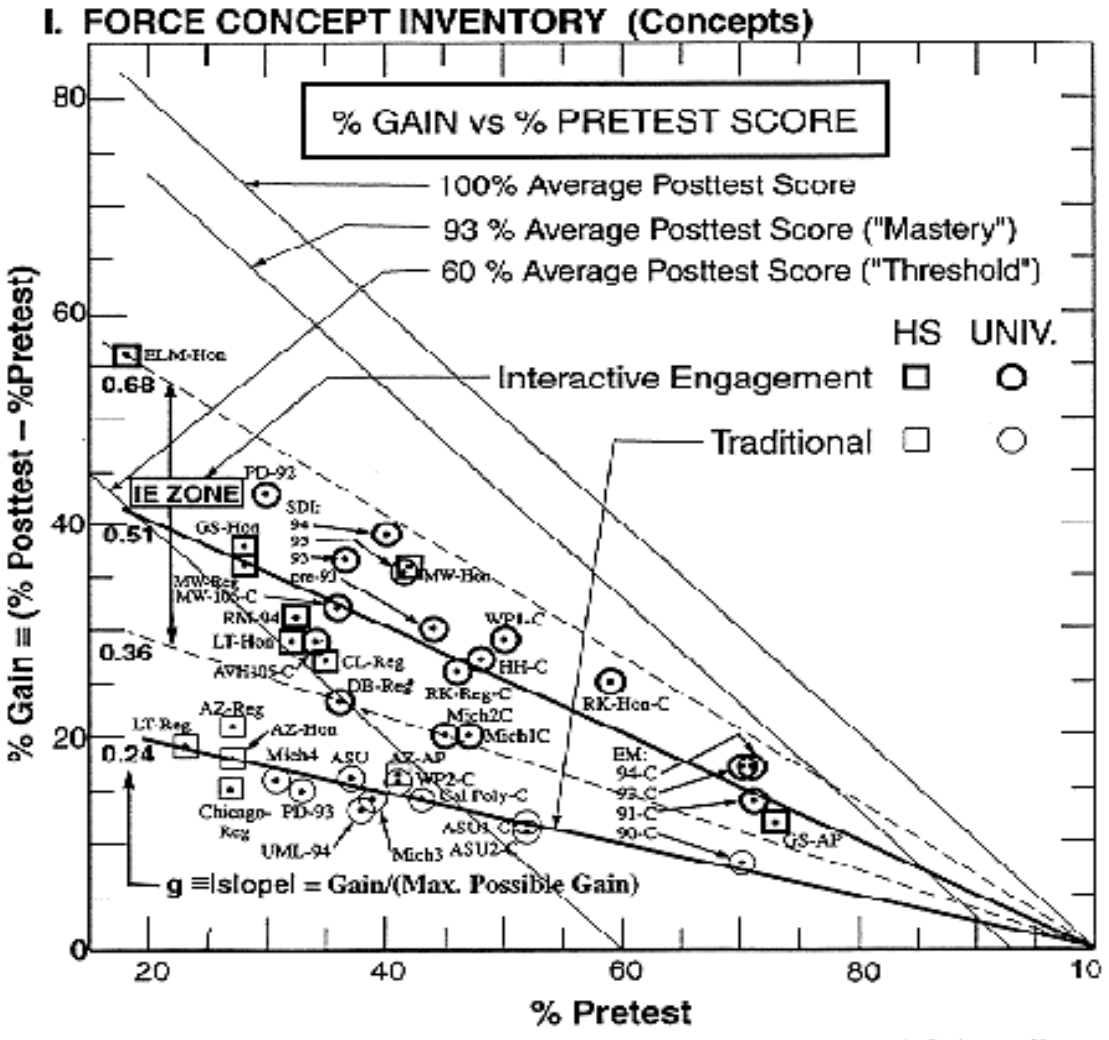
Active Learning Helps



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Back to those Questions …

1. What kind of learning/knowing is the goal?
   An epistemology
2. How can one discover what a student knows?
   Case for assessment and feedback
3. How can technology make a difference?
   Adding capabilities for effective *active learning*

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Question 1: What kind of learning is the goal?

An Epistemology:

Every instructional design assumes one.

Data: values connected to direct experience

Information: **data** with interpretive structure

Knowledge: **information** with abstractive generalization

Each stage is constructed from the previous one and built into a complex, inter-related structure.

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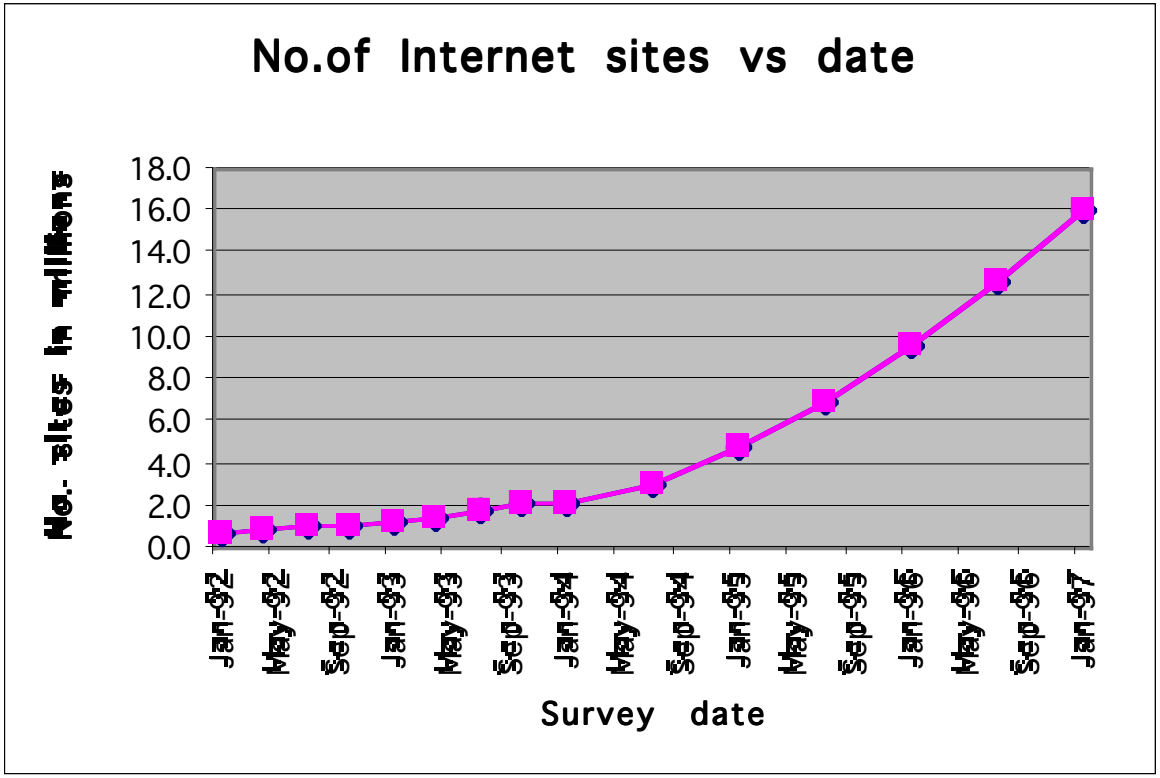
Distinctions: *Data*, *Information*, *Knowledge*

Data counting Internet host sites.

Report date	No. of sites
Apr - 92	890.000
Apr - 93	1,485,000
Jan - 92	727,000
Jan - 93	1,313,000
Jan - 94	2,217,000
Jan - 95	4,900,000
Jan - 96	9,700,000
Jan - 97	16,000,000
Jul - 92	992,000
Jul - 93	1,775,000
Jul - 94	3,100,000
Jul - 95	7,000,000
Jul - 96	12,600,000
Oct - 92	1,135,000
Oct - 93	2,056,000

Information showing a pattern.



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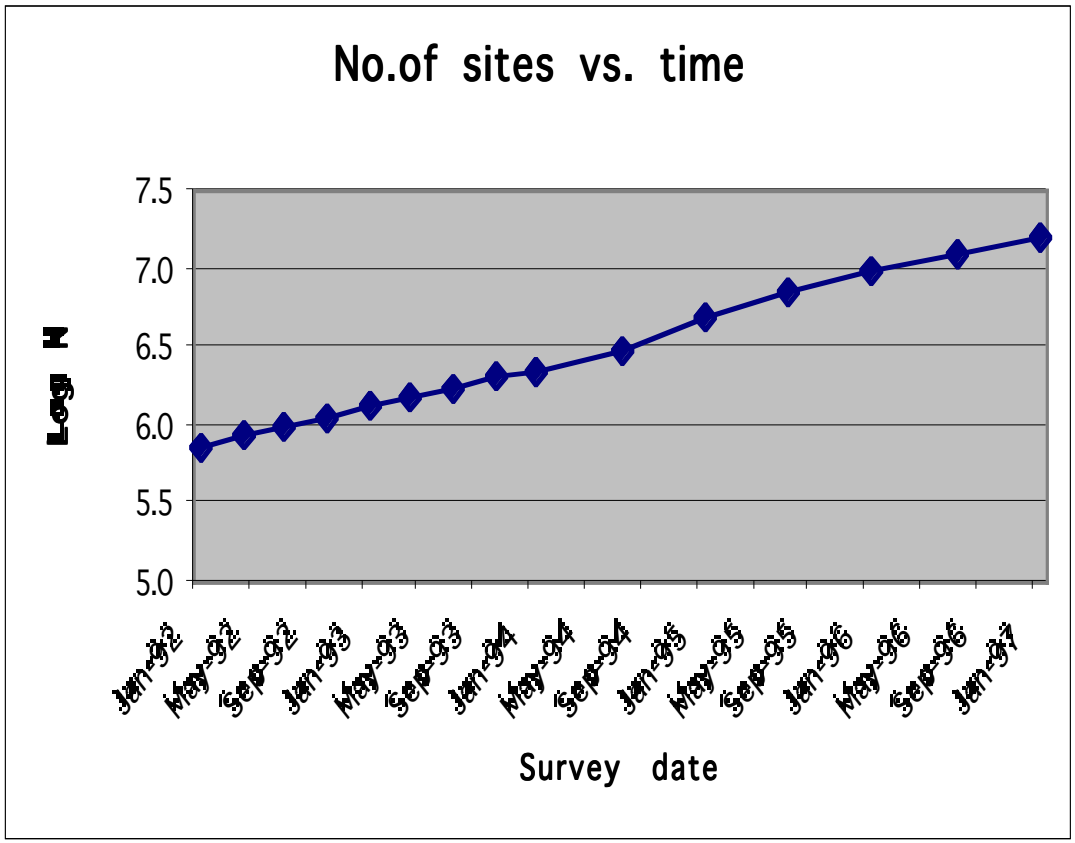
Distinctions: *Data*, *Information*, *Knowledge*



Knowledge construct:

Roles for this graph?

- deeper insights about mathematical relation
- recognition that this is one of characteristic type
- provision of predictive criteria for testing

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Distinctions: *Data, Information, Knowledge*

From the previous example:

Data	Information	Knowledge
No. of Internet hosts at various survey dates	Multiple representations: • Table • Graph • Equation	Growth rate is independent of time Exponential function whose exponent is this graph's slope First order differential equation

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Question 2: What is currently learned?

Assessment and Evaluation:

Modes of knowing

Has the student come to know as **data**?

Ask for a literal answer.

Has the student come to know as **information**?

Ask for a relationship.

Has the student come to know as **knowledge**?

Ask for an application of principle beyond the context of its invention.

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Question 3: How can IT facilitate learning?

Assessment, collaboration, reflection:

Modes of interacting

In the Learning Cycle:

- The *living* syllabus - objectives, assignments, feedback
- Many *uses* of assessment - pre-, in-, post-lecture questions
- Student *collaborations* - reflective, moderated electronic discussions

In the Instructional Design Cycle:

- *Classroom research* - setting goals and hypotheses
- *Iterative* IT development - dialogue with media designers

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Designing Assessments

1. Set context - scope, target, and cycle time
2. Set objectives *and* criteria
3. Use multiple instruments
4. Evaluate the results
5. Use of results - feedback to students

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Instruments of *Active Learning* Assessment

1. Concept Tests
2. Sixty second essay
3. What's the principle?
4. Student-generated test questions
5. Muddiest point via e-mail feedback

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Activity design and *Classroom research*

Principles of instructional design:

- Make a prototype exercise
- Use multiple design and testing cycles
- Assess exercise effectiveness
- Evaluate and refine the exercise
- Include students in the process

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CCNMTL can help ...

Individual attention from professionals for your priorities in specific courses

- Web-sites as resources for active learning
- Electronic *bulletion boards* for out-of-class discussions and feedback
- Assessment design, rubrics, evaluation