SCALE-UP

Student-Centered Activities for Large Enrollment Undergraduate Programs

Robert J. Beichner

NLII – Rethinking the Classroom: Designs for Interaction Summer Focus Session Project Parlor June 15, 2005
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SCALE-UP

What did we want to accomplish?

How did we do it?

- Redesigned learning environment
- Revamped instruction

Did it work?
1. Students should develop a good functional understanding of physics.

2. Students should begin developing expert-like problem solving skills.

3. Students should develop laboratory skills.

4. Students should develop technology skills.

5. Students should improve their communication, interpersonal, and questioning skills.

6. Students should develop attitudes that are favorable for learning physics.
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What did we want to accomplish?

How did we do it?

- Redesigned learning environment
- Revamped instruction

Did it work?
Learning Environment
Studios are not new...

West Point Engineering class, c. 1922 (USMA Archives)
Adopted/Adapted
The “Big Picture”

- Round Tables & Whiteboards
- Less Lecturing
- More Doing
SCALE-UP

What did we want to accomplish?

How did we do it?
  - Redesigned learning environment
  - Revamped instruction

Did it work?
Instruction

- Tangibles
- Ponderables
- Computation
- Labs
- Problem Solving
Tangibles

How thick is one page of your text?

How many extra electrons are on a piece of tape?

What are the dimensions of an aluminum block?
(in units of “atoms”)

What impulse is experienced by a bouncing ball?

Roll the ball between the lines
Tangibles

Roll the ball through the arcs (at constant speed), without touching them.

\[ \left| \vec{F}_{\text{net}} \right| = \left| \frac{d\vec{p}}{dt} \right| = \frac{|\vec{v}|}{r} |\vec{p}| \]

\[ = \frac{m|\vec{v}|^2}{r} \]

\[ = \frac{(0.041 \text{ kg})(1 \text{ m/s})^2}{0.13 \text{ m}} \]

\[ \left| \vec{F}_{\text{net}} \right| = 0.3 \text{ N} \]
Instruction

- Tangibles
- Ponderables
- Computation
- Labs
- Problem Solving
Ponderables

Minds-on questions

- How far does a bowling ball skid?
- What fraction of a candy bar is burned while walking past the snack isle?
- How many electrons can you fit on a foil-covered racquetball?
- How many two-step paces does it take to walk from NYC to LA?
5 feet/pace ≈ 1000 paces/mile

\[(3 \times 10^3 \text{ miles})(10^3 \text{ paces/mile}) = 3 \times 10^6 \text{ paces}\]
SCALE-UP

What did we want to accomplish?

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- Revamped instruction

Did it work?
Did it work?

- Conceptual Learning
- Problem Solving
- Pass/Fail Rates
- Performance in Later Classes
- Attitudes

Described in Case Study...
For more information:
http://scaleup.ncsu.edu
Questions?
beichner@ncsu.edu