Student-Centered, Technology-Rich Classroom

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Department of Chemistry and Physics
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Starting Ideas:

- Traditional Lecture:
  - Instructor-Centered
  - Lecture and labs are “disconnected
  - Missing key elements:
    - Communication skills
    - Problem solving skills
    - Team skills
Student-Centered Learning
(an analogy)

Traditional

Instructor

Students

Student-Centered

Instructor

Student
Key Features of the Classroom

- No “front” to the room
- Multimedia capabilities
- Round tables
- White boards
- Laptops
SCALE-UP Curriculum

- Student-Centered Activities for Large Enrollment University Programs.
- Developed at North Carolina State University.
- Meets ABET guidelines for Engineering courses
- Implementations at MIT, U. of Central Florida, U. of Alabama, American University, Western Kentucky, U. New Hampshire, RIT
- Rooms up to 120 students
Basis for SCALE-UP curriculum

- **ASEE** (American Association for Engineering Education) Survey on job skills
  - Effective problem solving skills
  - Use of computers (communication, analysis and design)
  - Decision making skills
  - Effective oral communication skills
  - **#18** - understanding of the physical and life sciences
Success of SCALE-UP

- Data comparing students in SCALE-UP to students in traditional courses
- **Improved** problem solving
- **Improved** conceptual understanding
- **Improved** attitudes
- **Reduced** failure rates (especially for women and minorities)
SCALE-UP at Southeastern

- Introductory Physics
- Physics for Elementary Teachers
- Upper Level Chemistry/Physics majors courses
Future Plans

• Increase the number and type of “student-centered” courses
• Create a larger, more adaptable classroom
• Expand physics for elementary teachers
• Student-Centered Introductory Chemistry course for large classes
Activity 1
(Physics for Elementary Teachers)

- Examine the motion (speed) of a cart after it is pushed
- Examine the motion of the cart with the fan turned on
- **GOALS:** The nature of force, relation between force and motion (and nature of science)
Simple Harmonic Motion
(Introductory Physics)

• Measure the period of oscillation for a mass on a spring

• Measure the amplitude of oscillation

• **GOAL:** Explore models, force, acceleration, oscillations
Simulations

Projectile Motion

Projectile Speed

Initial Direction of Flight

Position of Projectile

\[ x = 106.07 \text{ m} \]
\[ y = 37.11 \text{ m} \]
\[ \text{time} = 3.75 \text{ s} \]

Velocity of Projectile

\[ V_x = 28.28 \text{ m/s} \]
\[ V_y = -8.49 \text{ m/s} \]
\[ V = 29.53 \text{ m/s} \]