Studio Classroom Design for Seamless Integration of Hands-on Learning

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Motivation for Studio Classrooms

- Learn By Doing experiences at relevant times
- Ongoing formative assessments
- Use technology in real-time for
  - Simulations / visualizations
  - Data analysis / graphical interpretation

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An Integrated Lecture–Laboratory Environment for General Chemistry

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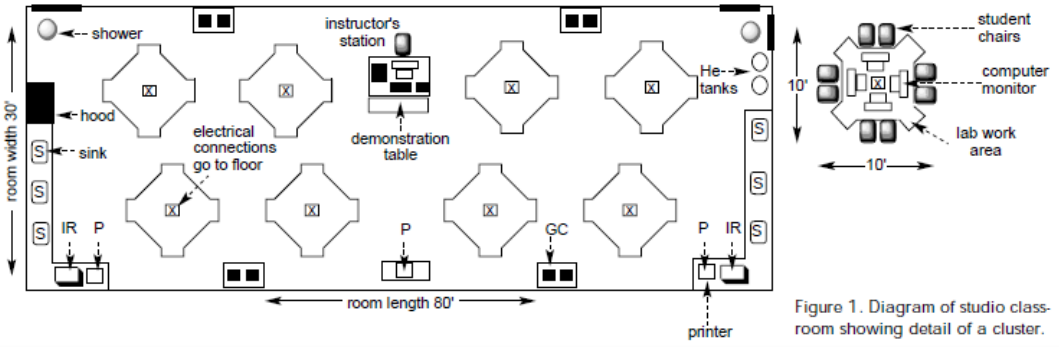

Figure 1. Diagram of studio classroom showing detail of a cluster.

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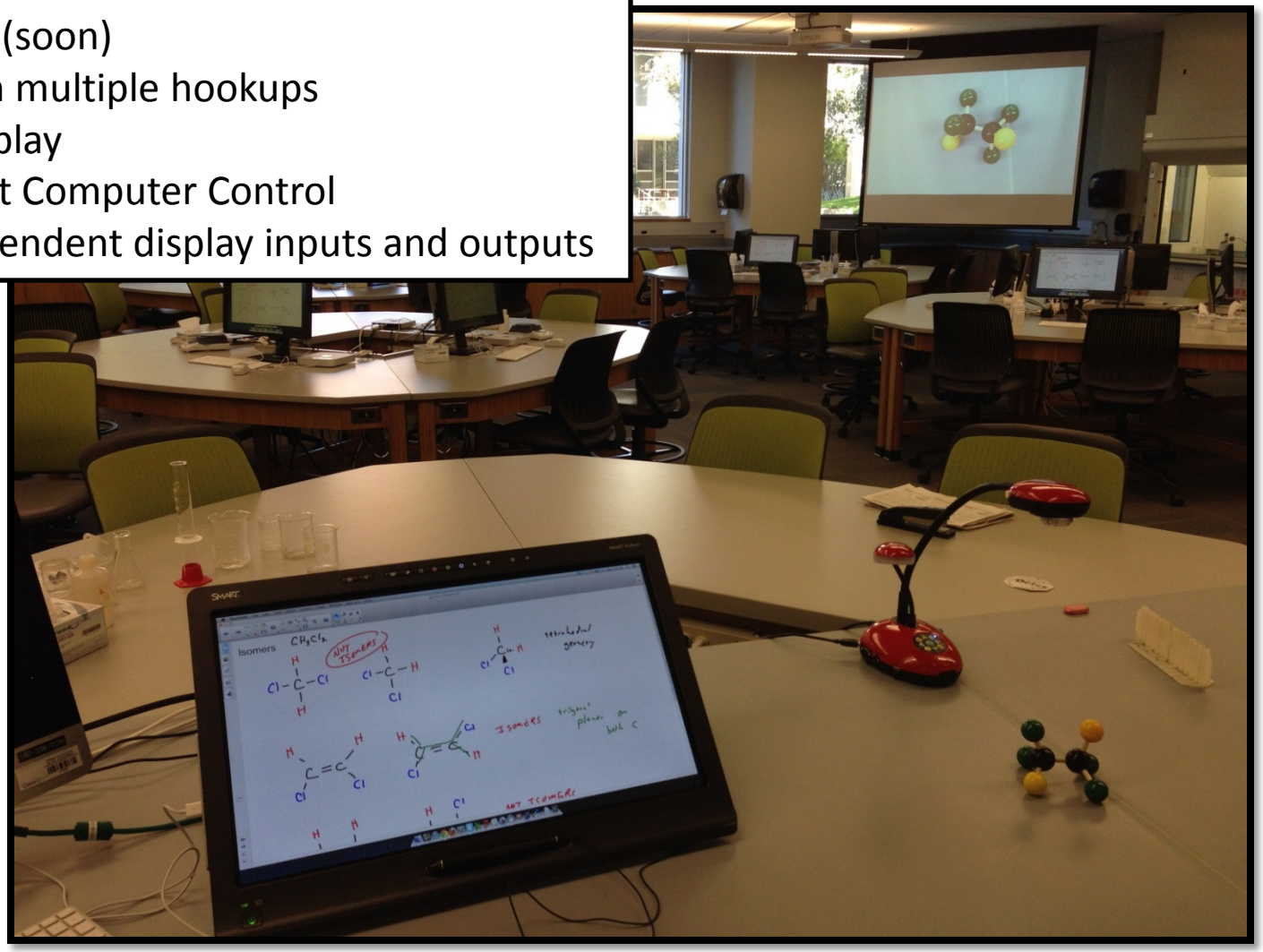
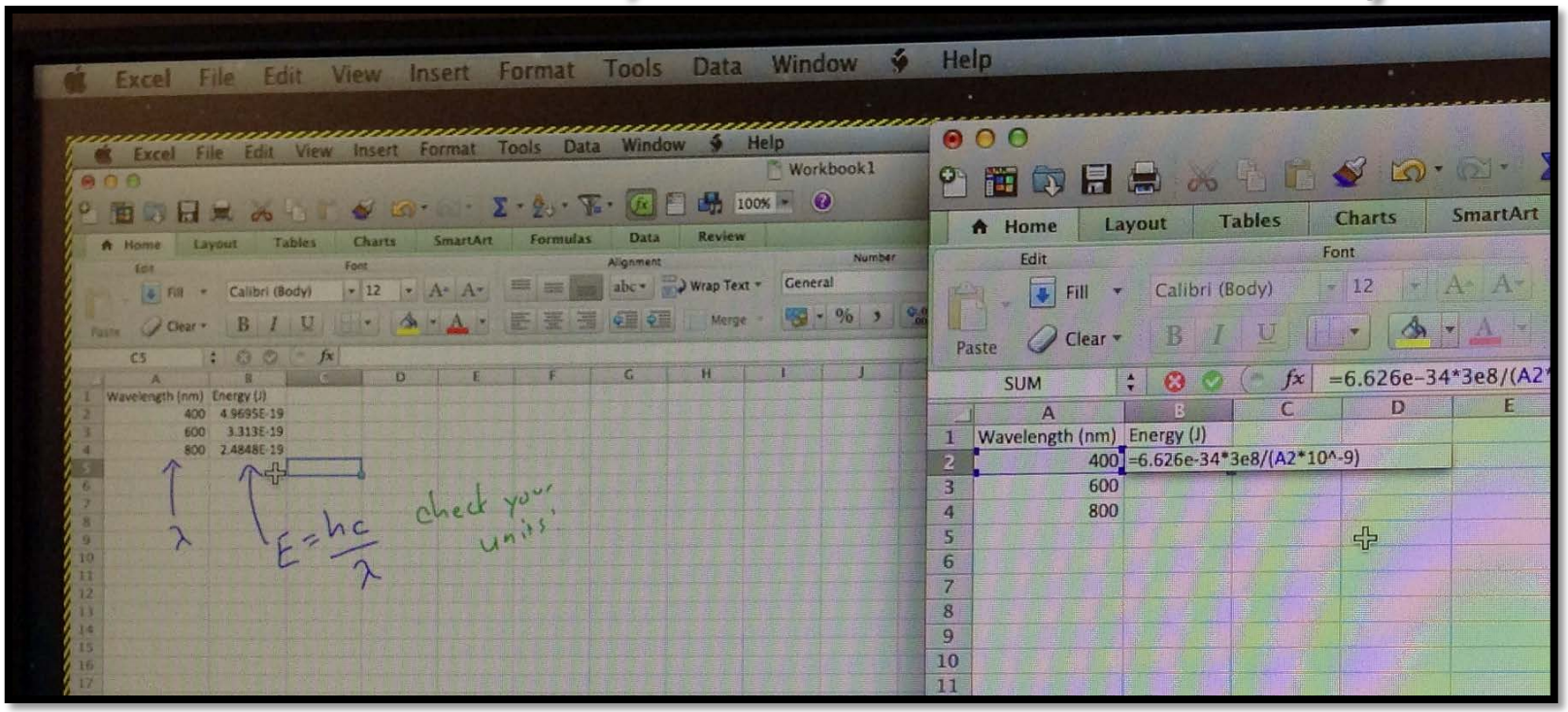
Studio Layouts

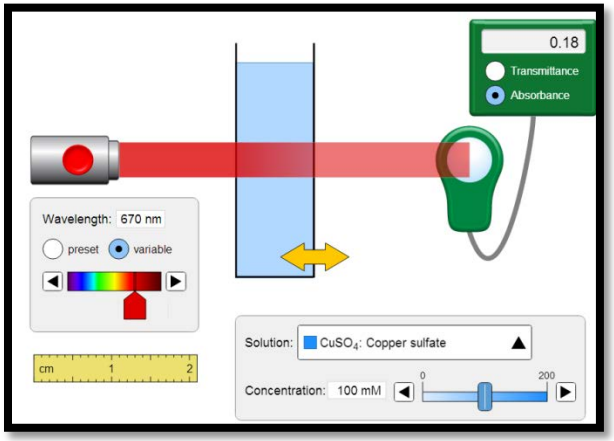
Flexible Technology

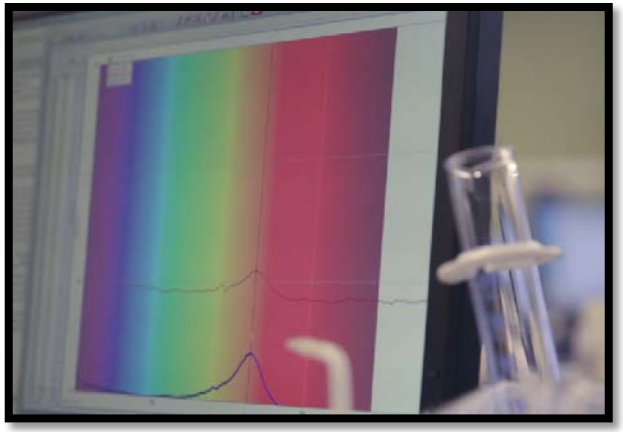
- White boards
- Document camera
- Hood cameras (soon)
- Projectors with multiple hookups
- Digital Pen Display
- Faronics Insight Computer Control
- Multiple independent display inputs and outputs

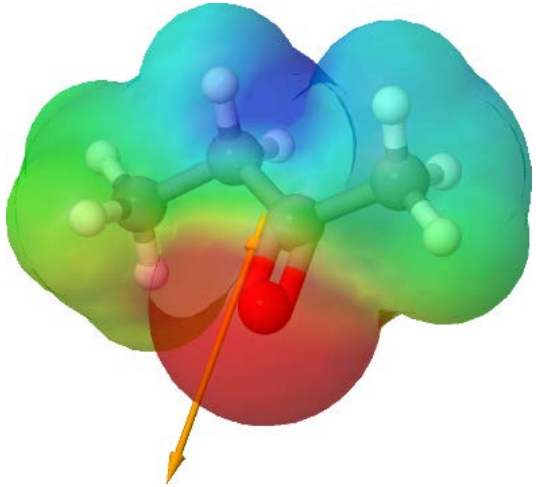


Collaborative, Real-time Analysis









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Implementation Logistics

Curriculum Design

Chemistry 127 Integrated Format Sequence/Pacing Guide

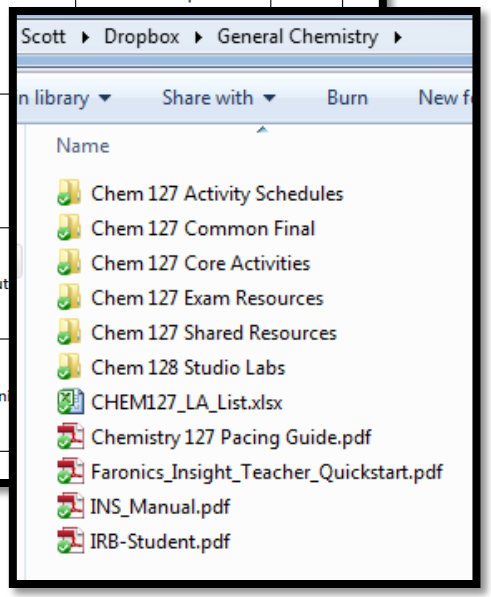
This pacing guide is based on the minimum number of hours that should be available in any given quarter and does not specifically call out the time required for assessment. The number of hours designated for each topic is a suggested guideline and is not a rigid requirement. The specific order of subtopics is also variable depending on instructor preference. Many of the available activities are pre-built and have kits designated for them. There is a repository of activity guides available. Core Activities (that all students should do in some form) are color-coded and numbered and match the activity repository in the Dropbox. Not all of the additional activities have complete associated activities.

The CHEM 127 course is basically broken into three main themes; Atoms, Molecules, and Reactions as described below. The text associated with the course is "Chemistry: The Molecular Nature of Matter and Change" 6th Ed. by Silberberg. The chart below includes locations in the text where specific material is covered.

Last updated 9/16/2013.

Atoms

Topic (Chapter/Sections)	Activities	Hours
Mathematical Toolbox (Chapter 1) • Diagnostic Exam (ACS – California Chemistry Diagnostic) • Dimensional analysis (1.4) and important units (density, molarity, molar mass, Joules, Pressures: atm, torr, mmHg, Pa) • SI prefixes (1.5) • Significant figures and uncertainty in measurements (1.6)	• Diagnostic Exam • 01 - Day 1 Questions	2
Atomic Structure (Chapter 2) • Subatomic particles (2.5) • Atoms/elements (2.5, 2.6) • The mole and molar mass (2.5, 2.6) • Isotopes and relative abundance (2.5)	• PhET: Isotopes	2
Interactions with Light and the Bohr Model (Chapter 7) • Wavelike nature of light (7.1) • Particulate nature of light; photoelectric effect (7.1) • Line Spectra (7.2) • Atomic Emission/Absorption (7.2 and tools of the laboratory)		
Quantum Mechanical Model of the Atom (Chapter 7) • Wave-particle duality, uncertainty principle (7.3) • Schrödinger equation: wavefunctions (Ψ), probability distribut (Ψ^2) (7.4) • Orbitals and quantum numbers (7.4)		
Electronic Structure → Properties (Chapter 8) • Electron Configurations (8.1 – 8.2) • Trends: Z_{eff}, atomic/ionic size, ionization energy, electron affini – 8.4) • Para and diamagnetic atoms/ions (8.4)		



Modular Activities

Learning Assistants

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Moving Forward

Assessment

- Student Performance
- Student Perceptions
  - Attitudes in Science Survey
  - Studio Environment
  - Learning Assistant Support
- Faculty Perceptions
- Learning Assistant Perceptions

Current Courses: CHEM 124, 125, 127, 110

Future Courses: CHEM 128 (winter), ….