

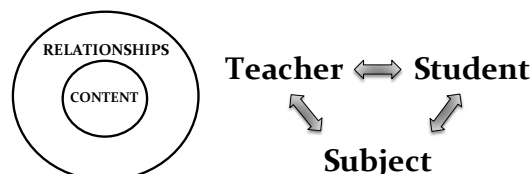
## Technology-Infused Teaching for Engagement & Student Success

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## Deep, Sustained Learning Comes from Building Relationships

Teaching & Learning  $\neq$  Transfer of Information



## How can use of TECHNOLOGY promote learning?

<p><b>Well-organized professor</b> <i>makes material accessible</i></p>	<p><b>Engaging lecture presentation</b> <i>keeps students active and focused</i></p>	<p><b>Variety of teaching methods employed</b> <i>audio, visual, hands-on</i></p>
<p><b>Well-defined learning outcomes and clear expectations</b> <i>know what the goal is and how to achieve it</i></p>	<p><b>Professor cares about student's learning</b> <i>Should this matter? Why does it?</i> <b>Affective Domain</b></p>	<p><b>Abundant and timely feedback provided</b> <i>assessment, keep on track, improve</i></p>
<p><b>Student has interest in subject matter</b> <i>easier to make the needed commitment</i></p>	<p><b>Reasonable work/academic schedule</b> <i>time available to dedicate to class work</i></p>	<p><b>Student is healthy: sleep/diet/exercise</b> <i>receptive mind/body</i></p>

## Skeptical Philosophy: I don't use technology for the sake of technology.

- PowerPoint presentations can be boring and passive; a "chalk" talk is much more engaging!
- Teaching with Technology, my personal journey
  - 1996 Website [www.cpp.edu/~lsstarkey](http://www.cpp.edu/~lsstarkey)
  - 2000 Distillation [image map](#) (Photoshop)
  - 2001 Online pre-lab quizzes (WebCT/Bb)
  - 2002 Calibrated Peer Review (CPR)
  - 2007 Pre-lab online tutorial [videos](#)
  - 2008 Classroom Response System (iClicker)
  - 2014 Using online homework in Organic Chem Classes...



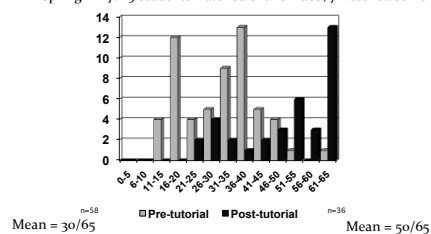
QR Code for my homepage

## Technology for Lab Preparation

- Online Quizzes (WebCT, Blackboard): instant feedback, assessment
- Online Tutorials (Adobe Presenter, Flash/HTML5 animations, filming of demos, captioning)  
<http://www.cpp.edu/~lsstarkey/ochemlab>  
over 35,000 worldwide visitors to website since 2008
- Benefits: unlimited time, asynchronous, reviewable, available in the future (website/YouTube vs. LMS)

## Assessment of Technology Prelab Quiz: Overall Score

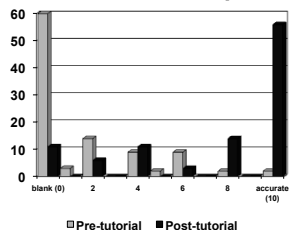
Spring 2007: 29 students watched entire video; 7 watched some



## Assessment of Technology

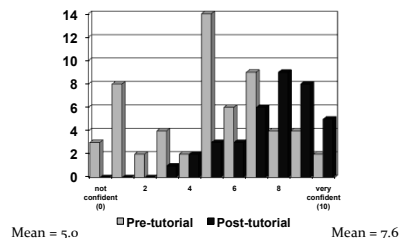
### Prelab Quiz: Sketch Distillation Apparatus

Percent of Students at each Score (Max Score = 10 points)



## Assessment of Technology

### Prelab Survey: Confidence in Running Distillation Experiment



Mean = 5.0

Mean = 7.6

## Tech-Assisted Lab Preparation:

### Student comment

“I have never before taken a lab course at this university where **so much help was provided** for preparing for the lab. Between the Blackboard quizzes and online tutorials I always felt I had enough preparation for the lab, and this helped me **perform better** and **understand** the actual experiment.”

CHM 317L, Fall 2012

## Tech-Enabled Classroom Engagement

- STEM demos, simulations and animations on YouTube [CHM 315](#) (free, no hazards, can pause/watch later, etc.) to find resources: [MERLOT.org](#)
- “Clickers” (CRS) [www.clickerquestions.com](#)
- Kahoot – gameshow-style M/C questions using mobile devices [getkahoot.com](#)
- TodaysMeet – smart phone chat tool [todaysmeet.com/wileyedtech](#)
- Class participation resources, including low-tech! [www.stephenbrookfield.com](#) (Workshop Materials link)



QR Code to play Kahoot

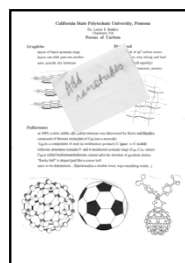


QR Code for TodaysMeet

## Tech-Enabled Communication

- *Public* course home page (vs. LMS) is not restricted to current students: handouts, sample exams, answer keys, clicker questions, links to tutorials/resources, etc.
- Virtual office hours the night before an exam (via LMS or Adobe Connect)
  - broader participation than f2f office hours, chat, Q&A, whiteboard, encourages *supervised* peer-to-peer learning, sessions can be recorded
- Calibrated Peer Review (CPR) writing assignments
- Wikis - sharing resources for research students, extra credit assignment

## Teaching Innovation Inspired by Faculty Learning Community (CPP FCPD)



### Old-school approach

- Handout from ~1997
- Previous goal: revise handout


### Tech-assisted approach

- Make a wiki!
- Extra credit assignment [PBWorks.com](#)

## Nanotube Wiki

VIEW EDIT

★ NanoWiki

last edited by  Jessica Oei 2 hours ago

### Fullerenes, Nanotubes and Nanotechnology

*This is a place to share something interesting you have learned about nanotubes in particular or if your entry a title, add your name, and summarize your findings IN YOUR OWN WORDS a few on Add Link). Click on "save" at the bottom and you're done!*

"Nanotechnology's Big Impact" [ChemMatters article](#)

**Buckyball Film Cameo (Dr. Starkey):** When I was in grad school, NOVA came to UCLA when they (buckyball). They wanted some "SoCal-looking" people for an opening scene, so they found three like in southern California, right? The real joke is that ALL THREE of us are originally from Conner they filmed their intro to "Race to Catch a Buckyball" which aired in 1995.

Nanotubes In Medicine -- Ashley Deuschle  
Carbon nanotubes (CNTs) are cylindrical in shape and composed of carbon atoms which in return

## Nanotube Wiki: Student Comment

"Asbestos warning' on nanotubes (By Jonathan Fildes Science and technology reporter, BBC News) **As a Biology major, I thought that looking and researching about nanotechnology would be dull and boring. It proved to be really interesting.** There are so many wonderful things being written about nanotubes and how they can make a huge impact despite their "nano" size. I was wondering if there were any sort of risks that came along with this new technology. I came across an article that was put out by BBC News about the possible negative effects of nanotubes. The researches compared the molecular structure to that of asbestos, which earlier cause a pandemic of lung disease in the 20th century.... As a bio major, its interesting and **exciting to see the worlds of Ochem and Bio clash.** Here is the link to the article. I found it really interesting. :)"

## Tech-based teaching supplements to improve student success

- Skill-building, drill-type quizzes (create in LMS or available from publisher)
- Online homework system - immediate feedback, autograding
- Adaptive learning (e.g., ORION) – measures competency level for each SLO and customizes assignments to be strategically focused
- Collection of Mobile learning [resources](#)

## Making videos for the flipped classroom & beyond

- Online lectures – search YouTube, [Educator.com](#), [EdX](#)
- Create your own! "Old school-style" recording of narrated homework solutions (iPhone) [3D sketch](#) [reagent table](#)
- Latest technology: transparent [lightboard!](#) (Biology [example](#))
- Record and edit videos with Camtasia (screen capture/voice) Tutorials: <http://tiny.cc/CreatingPedagogicalVideos> Examples: Engineering [tutorial](#) and [solved problem](#)
- Lecture-capture w/iPad apps - can export videos to YouTube Explain Everything [cyclohexane](#) and Docrer [CPP Engineering](#)

## Sharing your work

- Private (LMS) or Public (webpage link, MERLOT)
  - Include [captioning](#) for accessibility (Hablas Español? Si!)
- Maximum exposure: make a YouTube channel!
- ChemistryConnected, created in 2012, has over 365,000 views and over 750 subscribers
  - Pre-lab tutorials, solved problems, demos of hands-on elementary school science activities
  - Over half the views have come from outside the U.S. (200 different countries)

<http://www.youtube.com/user/ChemistryConnected>

## Chemistry Connected YouTube Channel

Geography	time (minutes)* @ ↓
United States	311,994 (55%)
India	39,245 (6.9%)
Canada	27,526 (4.8%)
United Kingdom	25,502 (4.5%)
Australia	13,484 (2.4%)
South Africa	12,641 (2.2%)
Iraq	10,403 (1.8%)

## Making it Academic – SoTL Research

Turn your innovation into a research project!

- Formulate a question
- Collect data (can be a great “wow” factor)
  - Get IRB approval (Human Subjects)
  - Pre- vs. Post-Intervention
  - Quantitative and Qualitative data
- Perform assessment; analyze data
- Share results with colleagues and the world!
  - Conference paper, Ed. Journal article, RTP

## Getting Buy-In and Support from Students, Faculty, Institution

- Poorly implemented technology is unlikely to succeed
- If you are enthusiastic, students are likely to be too
- Explain WHY you do what you do – pedagogy matters!
- Share data and testimonials and data with colleagues
- Institutional Support: workshops, summer institutes, release time, mini-grants, free iPads (!), Faculty Learning Communities (clicker, SoTL, technology)

## Variety in Teaching = Engaged Students

- Audiovisual presentations blows away text
- Interactive lessons exercise different “muscles”
- Teaching to learning styles is a “neuromyth,” but captioning benefits ALL learners
- Online tools offer asynchronous and mobile delivery, pause button, unlimited replay, etc.
- Most students need more than textbook support! Online homework and adaptive learning tools enable immediate feedback/formative assessment

## Tapping into the Affective Domain

- **How the student feels about the class affects learning!** (technology-infused learning can be fun, interesting, engaging, informative, helpful, shiny and new)
- **How the teacher feels about the class affects teaching!** (technology-infused teaching can be fun, interesting, engaging, invigorating, efficient, shiny and new)
- **Students learn better if they feel the instructor cares about their learning.** *Students appreciate the effort you put in to support their learning.*  
Does a better attitude about you, about the class, about the subject = better learning? Encourages productive persistence!

## Support & Acknowledgments

**CPP Faculty Center for Professional Development**  
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*Summer Institute + Course Release + Stipend*

**CSUPERB Grant (CSU Biotech. Education & Research)**  
*Summer stipend to create pre-lab tutorials*

## References

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