Making and using screencasts.

Wednesday 5 June
Morning: Putting active and blended learning into practice
9am-11am Making and using screencasts. Screencasts are a central feature of blended learning. They are not recorded lectures, but are a screen capture of a tablet PC screen; it is not a video of a person. Why are a few 6-minute screencasts better than a 50-minute lecture? Because screencasts are limited to a narrow subject, students like them and use them. We have received more positive feedback from students on screencasts than on anything else we have done in teaching. They have advantages over textbooks: diagrams can be presented sequentially instead of all at once, and presenting a diagram with a verbal explanation minimizes cognitive overload. Getting the best value out of screencasts requires good teaching practices. This session introduces you to the practical aspects of 1. preparing screencasts and 2. Incorporating screencasts into your teaching to engage students improve learning, 3.

Making and Using Screencasts

Janet deGrazia and John L. Falconer
Chemical and Biological Engineering
University of Colorado Boulder

How would you like to have this student feedback?

“The lectures are fantastic.”   “The lectures are amazing. ”
“I learned a lot from the textbook. “
“I like the book.”    “I love the textbook!.”
“I think the lectures are fantastic and incredibly helpful.”
“I found the textbook extremely useful.”
“I think the textbook is very VERY helpful,”
“I think that the lectures were unbelievably effective…..”
“The lectures were extremely helpful for understanding material and preparing for exams”

Student feedback on screencasts

“Screencasts are fantastic.”  “Screencasts are amazing. ”
“I learned a lot from screencasts. “
“I like screencasts .”  “I love screencasts !.”
“I think screencasts are fantastic and incredibly helpful.”
“I found screencasts extremely useful.”
“I think screencasts are very VERY helpful,”
“I think that screencasts were unbelievably effective…..”
“Screencasts were extremely helpful for understanding material and preparing for exams”
Screencasts are used

**Pressure-Enthalpy Diagram**: > 136,000 views

---

**What is a screencast?**

*Video of person & board*

> 50 minutes + Multiple topics

*Tablet PC screen capture*

3 - 10 minutes, One topic

Inclined manometer
Watch a screencast on your phone or computer or tablet

http://www.learncheme.com/screencasts
https://www.youtube.com/user/LearnChemE
Questions?

Screencast content is similar to what would be done in class

How are these screencast videos better than a live lecture?

- Short, one topic
- Student’s use @ their pace, stop
- Free up class time
Advantages

- Students like them
- Students watch on their schedule (24/7)
- Students control pace: start/stop/replay
- More active than lecture
- Free class time for active learning
- Short
- Minimize cognitive overload (figure and text in textbook)
- Material sequenced in time (compared to text)

Triple effect evaporator
Screencast: Triple effect evaporator  https://youtu.be/brxp3Su01UY

Objective: Explain how a triple effect evaporator works to concentrate a dilute solution (usually solute in water) using significantly less energy than a single-effect evaporator.

The vapor from the first evaporator is used to evaporate the liquid in the second evaporator, which is operating at a lower temperature and pressure than the first evaporator.
How is it worse?

- Not good
- Can’t ask question
- Not focused

Disadvantages

- “Students can’t ask questions”
- “Instructor can’t see if students are getting it”
What are the advantages of lecturing and writing notes on board instead of just handing out notes to students?

Do screencasts work?
- Online > face-to-face, more cost effective [1]
- Flipped classroom- students take responsibility, ownership; outperformed students in traditional lectures [2]
- Screencast usage correlated with performance [3]
- Multimedia use yields better performance [4]
- Video + sound more effective than still pictures + text [5]

2. Bergmann, Sams, Learning and Leading with Technology 1, 22 (2008).
Chemical equilibrium [Musallam]

<table>
<thead>
<tr>
<th>Instruction</th>
<th># correct of 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 min lecture</td>
<td></td>
</tr>
<tr>
<td>50 min lecture + 11 min SC</td>
<td></td>
</tr>
</tbody>
</table>


Why are we talking about screencasts?
We recorded more than 1,000 screencasts on LearnChemE


Screencasts are used

- 25 million play/downloads
- > 94,000 subscribers on YouTube
Student feedback is extremely positive

How to use screencasts

- Cannot make office hours
- Exam review
- Supplement text
- View before class
- Help solve HW
- Students lack pre-requisites
- Online course?
- Student who are hesitant to ask
Types of screencasts

Example problems: Adiabatic compression
https://www.youtube.com/watch?v=Gag_HoWILnE#t=1m30s
Introduction to a topic: Flow work  YouTube:

Software tutorial: Calculate VLE
How to use interactive simulations: Psychrometric Chart

Reading a Psychrometric Chart
Download the PDF file to view the simulation using the free Wolfram CDF player.
Explain a diagram or procedure: Using a ternary phase diagram

https://www.youtube.com/watch?v=gGYHXhcKM5s
Diagrams in screencasts

- Diagrams and verbal explanation at same time enhances learning
- In textbook, diagrams + referring text in different locations; if cannot be understood independently, demands placed on working memory


D.A. Muller, Designing Effective Multimedia for Physics Education, PhD dissertation, University of Sydney, Australia (2008).

Survey 440 students about screencasts

95%: useful or very useful
85%: better than textbook at improving understanding
92%: felt more confident about material
Making screencasts more interactive

100 Quiz screencasts

http://www.learncheme.com/screencasts/quizzes/thermodynamics-quiz-screencasts

Thermodynamics: Quiz Screencasts

Material and Energy Balances
- Ideal Gas Properties
- Material Balances Review
- Quality of Steam
- Raoult's Law Explanation
- How to Use a Psychrometric Chart
- Relative and Absolute Humidity

Single-Component Phase Equilibrium
- Pressure-Temp. Diagrams for Single-Component Systems
- The Critical Point
- Introduction to Single-Component Fugacity
- Fugacity Temperature Dependence: Single-Component
- Chemical Potential: Pressure Dependence for Single Component
- Chemical Potential: Temperature Dependence for Single Component
- What is Chemical Potential? Multi-Component
- Single-Component Phase Diagrams
- T-x and P-x Diagrams
- Pressure-Enthalpy Diagram
- Three Parameter Equation of State (EOS) Introduction
- Saturation Pressure from EOS Spreadsheet

Multi-Component Phase Equilibrium
- Law of Raoult's
- What is Fugacity in a Mixture?
- Introduction to Non-Ideal Solutions
- What is an Activity Coefficient?
- Partial Molar Quantities
- Partial Molar Properties: Binary Solutions
- Introduction to Equilibrium for Partially-Miscible Liquids
- Phase Diagram for Partially-Miscible Liquids
- Vapor-Liquid Equilibrium for Immiscible Liquids
- Solid-Liquid Phase Diagrams
- Cooling Curves for a Liquid-Solid System
- Calculate Vapor-Liquid Equilibrium using an EOS

Chemical Reactions and Equilibrium
- The Equilibrium Constant
- Temperature Dependence of Equilibrium Constant
- Inert Effect on Chemical Equilibrium
- Introduction to Heterogeneous Chemical Equilibrium
- Equilibrium Constant Introduction
- Energy Balances on a Semibatch Reactor

Energy Balances and Entropy
- State Function Explanation
- Introduction to First Law: Closed System
- Adiabatic Reversible Process for Ideal Gas
- Introduction to First Law: Open Systems
- Flow Work
- Energy Balance Around a Turbine
- Calculate Work for Reversible & Irreversible Expansion/Compression
- Adiabatic Compression/Expansion, Enthalpy-Entropy Diagram
- Second Law of Thermodynamics
- How to Calculate Enthalpy Changes, Ideal Gases
- How to Calculate Enthalpy Changes: Liquids, Solids, and Phase Changes
- How to Calculate Entropy Changes, Mixing Ideal Gases
- Joule-Thomson Expansion
- Solving a Steam Turbine Problem
- Heat Engine Introduction
- Carnot Heat Engine Calculations
- Power Cycle Introduction
- Pressure-Enthalpy Diagram for Rankine Cycle
- Refrigeration Cycle Introduction
- Departure Function, van der Waals Fluid
Fugacity Temperature Dependence: Single Component

How does the fugacity of a solid change as the temperature increases?

- Increases linearly with temperature
- Does not change much
- Increases exponentially
- Decreases exponentially
How to make screencasts

Tablet PC

Inexpensive microphone

A script
Reverse osmosis (interactive simulation)

Feed salt water at high pressure. Feed flow rate is fixed

The system is isothermal

Membrane only permeable to water

The water flux through the membrane is plotted versus the pressure drop across the membrane.

Pure water at bottom at low P
More concentration salt solution at high P at top
Can increase feed pressure (slider for pressure drop)
Can increase stirring bar rate to minimize concentration polarization on the membrane feed side
Can change salt concentration in feed
blue line - water flux when pure water is fed to the system - flux proportional to $\Delta P$
green line - water flux when salt water is fed to the system
dashed black line - maximum water flux through the membrane
values in diagram on right correspond to the conditions for black dot selected by the pressure drop slider
pressure drop lower limit is 15 atm, but if pressure drop is less than the osmotic pressure (orange dot on the x-axis),
system exhibits osmosis; pure water permeates into the salt water feed.

Uncheck the "show diagram" box to remove the flow diagram

Camtasia software
Microsoft OneNote
Why Prepare Screencasts?

• Advantages of Screencasts for Explaining Diagrams/Graphs
• Using Screencasts to Explain Equations
• Tips for Making Effective Screencasts  Before-After Editing

Preparing screencasts

General:

• Why Prepare Screencasts?
• Advantages of Screencasts for Explaining Diagrams/Graphs
• Using Screencasts to Explain Equations
• Tips for Making Effective Screencasts  Before-After Editing
Camtasia/OneNote:

- Brief Tutorial on Making Screencasts
- Brief Camtasia Tutorial
- Video Tutorial on Camtasia Basics
- Creating Video Tutorials
- Using OneNote
- Using OneNote in Class
- Using OneNote to Prepare Screencasts

**Not professional quality**

Tell objective at beginning

Preparation time: relatively short

Pause during preparation, write, then record

If make mistake, don’t start over from beginning

Post process- remove dead times, errors, add call outs, highlights, zoom

Convert to MP4 file

Closed captioning
Preparing screencasts

- Use principles from research on learning
  - People have separate channels to process visual material and auditory material.
  - People can actively process only a few pieces of information in each channel at a time
- Use relevant visuals to promote learning
- Describe complex visuals with audio only
- Use 1st and 2nd person pronoun
- Less is usually more; Keep short
- Reduce extraneous information
  - No decorative visuals
  - No engaging or nice-to-know information
  - No entertaining and motivational elements such as dramatic stories, pictures, or background music.


One of their students, said, “I think it’s the best idea for teaching I ever had in school. I like being able to work at home on my own, at my own speed.”
www.LearnMechE.com

Only use short screencasts
Check for accuracy