

Author(s): MELO 3D Project Team, 2011

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Melo3Ds

Presentation to LSA-ITC: Enhancing Undergraduate Education Through the Deployment of Quality Learning Objects



JimileeK, "book, laptop",
Flickr

2/3/12

Brenda Gunderson and Nancy Kerner
University of Michigan at Ann Arbor

The Goal

**To improve education by integrating
quality cross-discipline and
course-specific Learning Objects (LOs)
into undergraduate courses**

.Learning Resources

Any web-based teaching tool (e.g., tutorial, collection,)

Learning Objects (LOs)

Interactive web resources that lead students to learning goals via informed pedagogy

- **Learning Resources**

Any web-based teaching tool (e.g., tutorial, collection,)

- **Learning Objects (LOs)**

Interactive web resources that lead students to learning goals via informed pedagogy

The Proposed Solution

The Project

Enhancing Undergraduate Education Through
the Deployment of Quality Learning Objects



Funding

NINI Grant (New Initiatives/New Infrastructure)
from UM LSA-ITC (Instructional Tech Committee)

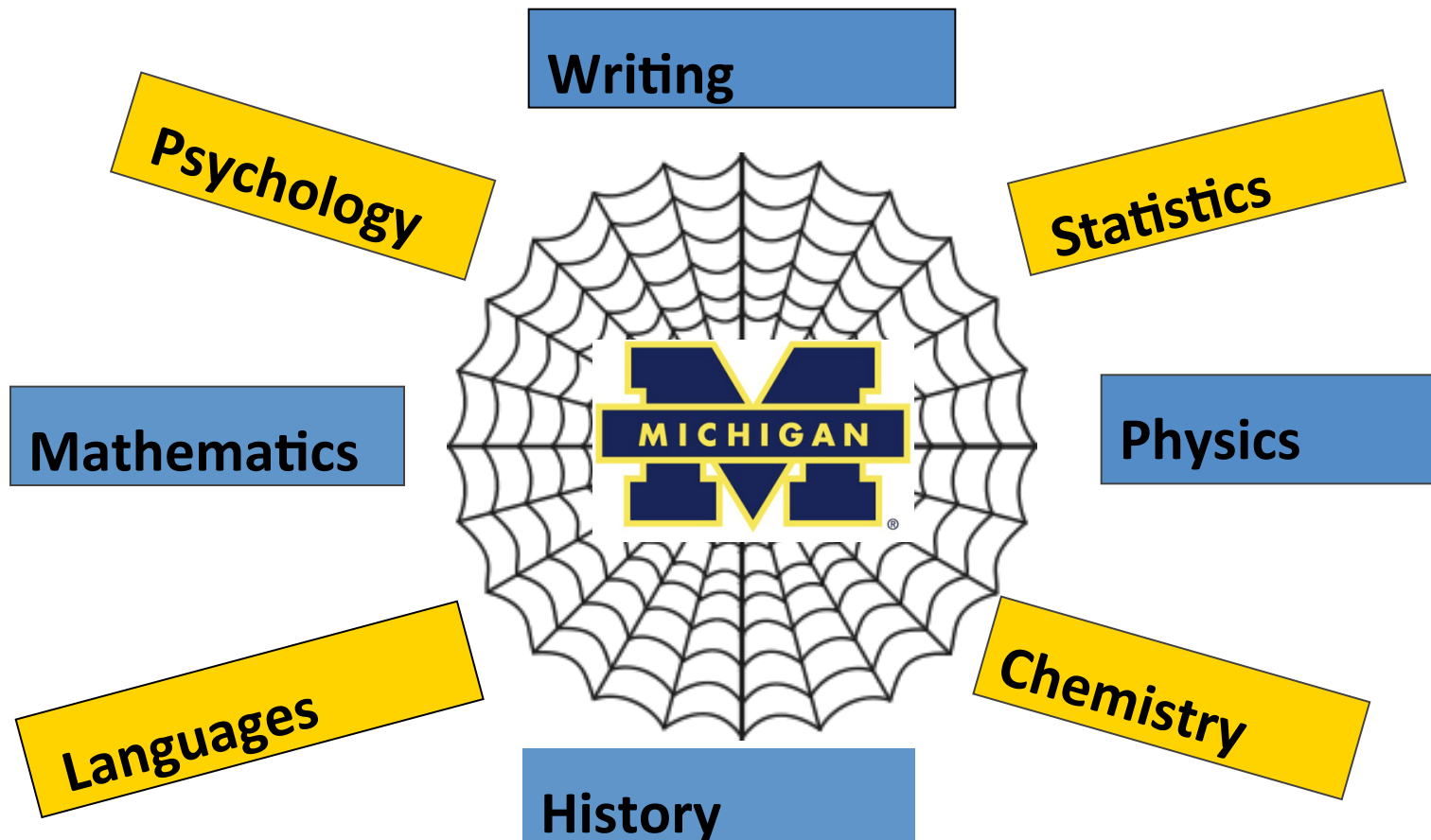
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Academic Gateway



MELO Gateway Courses



Total Enrollment = ~ 15,000 students/year

The MELO SOLUTION

- **Educate graduate students** across disciplines to access, evaluate, design LOs; and to create quality course-specific and cross-discipline LO collections.
- Graduate students **disseminate these LO collections and designed LOs** to relevant faculty for integration into undergraduate courses



OER

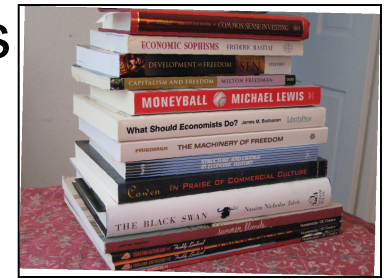
→ **The trainee becomes the trainer**

See “Bottom Up Faculty Development” at

http://conference.merlot.org/2009/Sat_Program.html

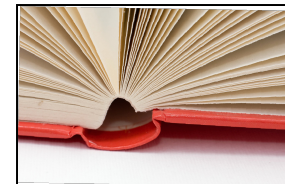
The Outcomes

- **LO course collection**
 - Selection based on course needs and goals
 - Provided within syllabus or on website



muppetspanker, My Unread Pile of Books, Flickr

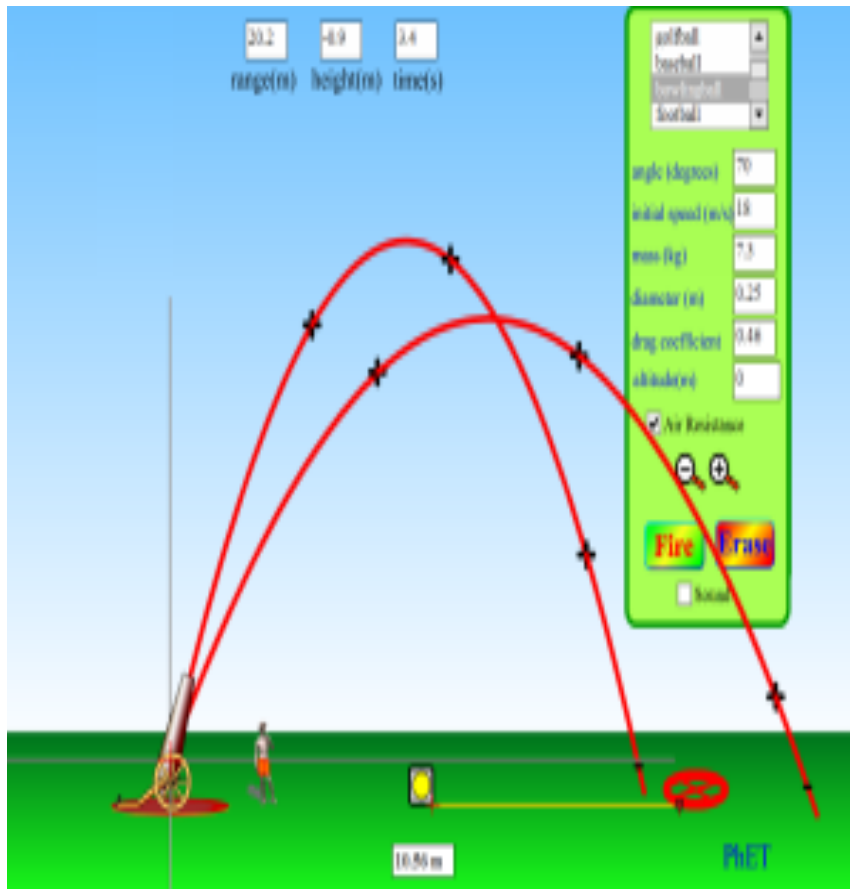
- **LOs tagged for course integration**
 - Choice based on **needs vs type** of LO
 - Choice focused on LOs that address **difficult concepts or skills**



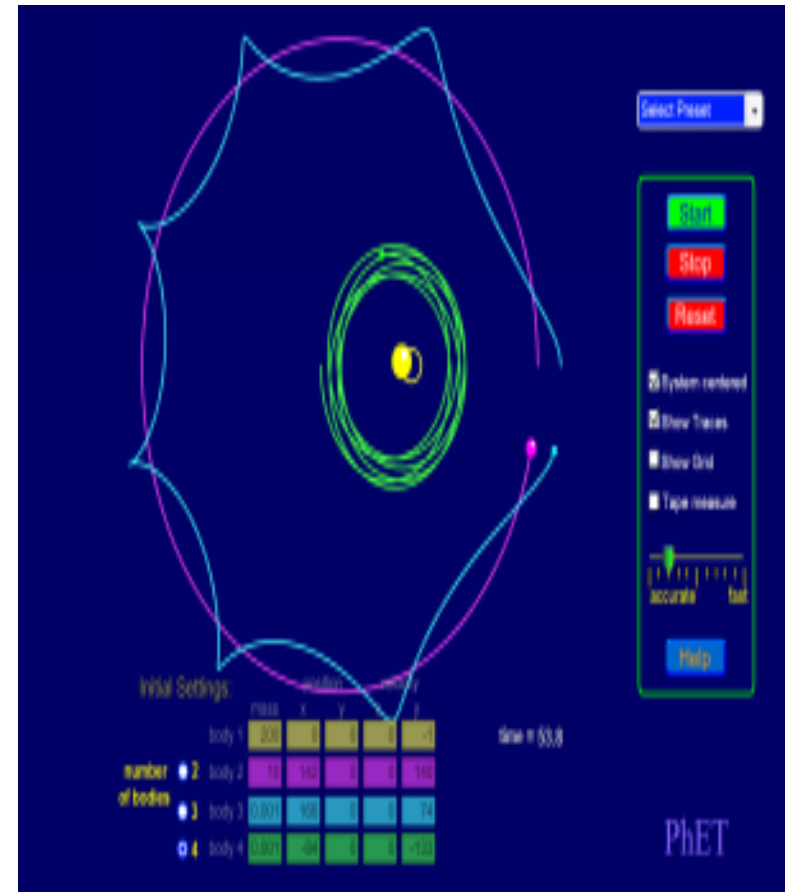
Horia Varlan, "Hardcover book gutter and pages", Flickr

The Outcomes

Select and Integrate LOs (Physics)



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Chosen Java Applets \approx Games = LOs

The Outcomes

Interdisciplinary LO Collection



Matthew Wynn,
Lightbulb!

- Undergraduate students have different levels of academic training
- Success in undergraduate education demands a solid foundation in a variety of basic academic skills

Examples:

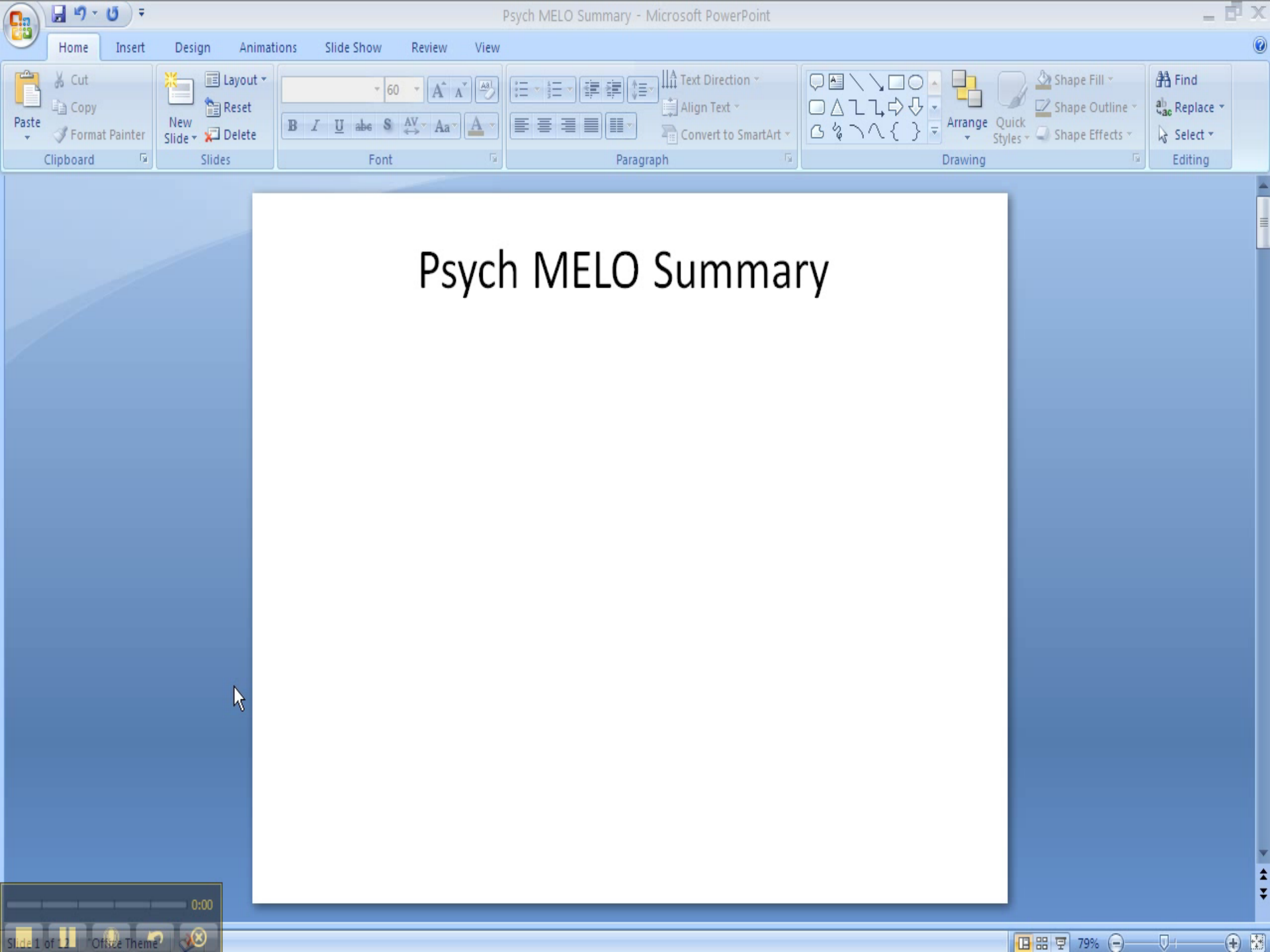
Writing skills

Working in Groups

Presentation skills

Study skills

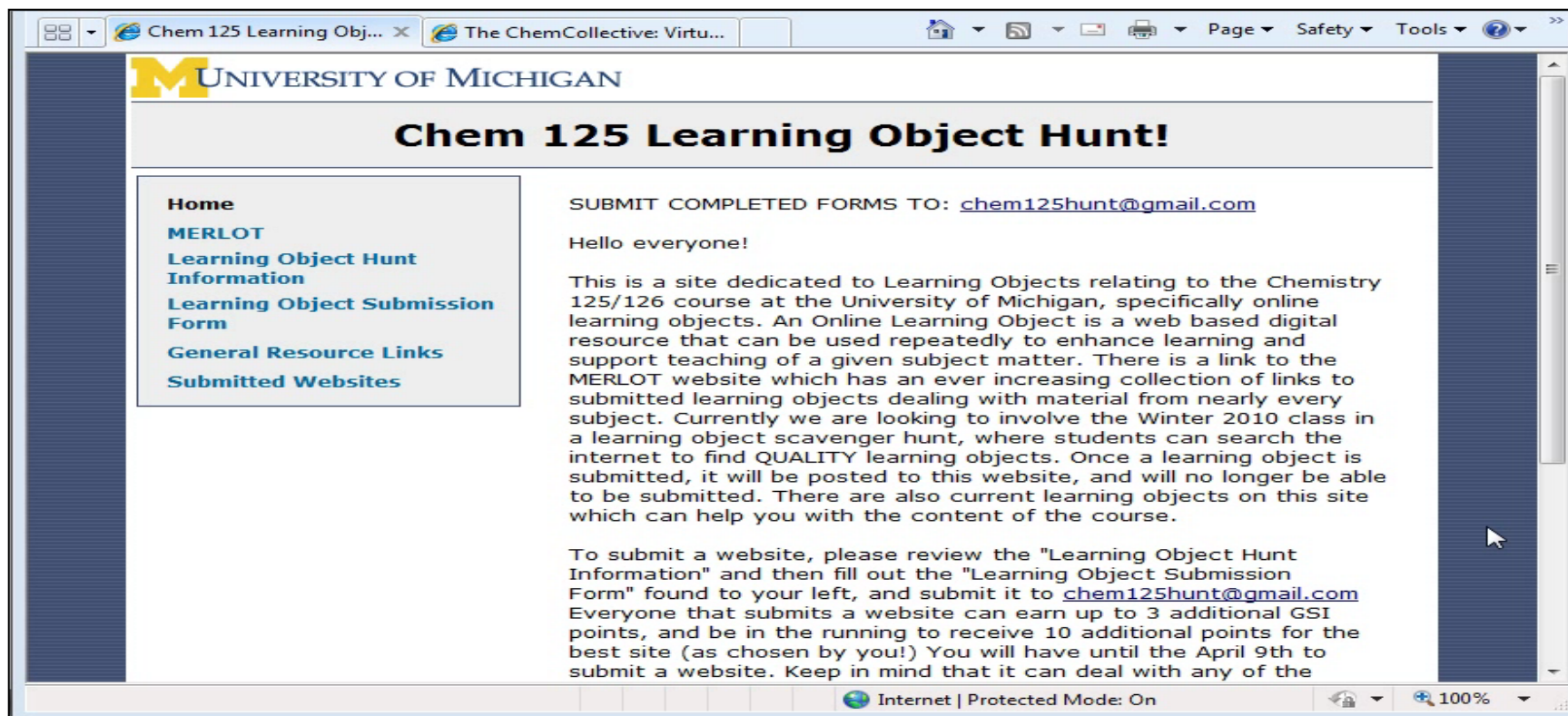
- How can we work towards leveling the playing field?



Psych MELO Summary

The Outcomes

Innovative LO Collection Building



- Students submit ~ 100 LOs with reviews and recommendations for course implementation
- Students voluntarily author LOs!

The Outcomes

Integration of LOs into Pre-labs (Chem)

E1 Pre-Laboratory Report (page 1/1)

Name: _____ Team #: _____ Date: _____ Section: _____

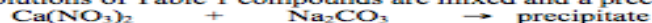
View the website http://preparatorychemistry.com/Bishop_Elem_Prop_frames.htm (Chapter 4 animations) and complete Table 1 below before answering pre-lab questions 1 - 3. Use the *CRC Handbook* in the SLC or online at <http://www.lib.umich.edu/> to record the solubility data in Table 1. Click "Find Databases" and enter CRC Handbook of Chemistry and Physics. Click on Section 4 of the *Handbook*: Properties of the Elements and Inorganic Compounds and expand this to Physical constants of Inorganic compounds.

Table 1. Solubility of Ionic Compounds

Cation	Anion	Compound	Solubility (g/100g H ₂ O)
Ca ²⁺	NO ₃ ⁻	Ca(NO ₃) ₂	
Ca ²⁺	CO ₃ ²⁻	CaCO ₃	
Na ⁺	NO ₃ ⁻	NaNO ₃	
Na ⁺	CO ₃ ²⁻	Na ₂ CO ₃	

1. How do cations and anions such as Na⁺ and NO₃⁻ remain separated (dissociated) from each other in the presence of water?
2. What solubility generalizations can be made about ionic compounds, if both the cation and anion are singly or multiply charged based on the Table 1 solubility data?

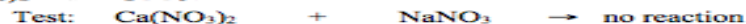
3 – 4. Aqueous solutions of Table 1 compounds are mixed and a precipitate forms:



3. Identify and record the new combination of ions possible after mixing of Ca(NO₃)₂ and Na₂CO₃ _____

Based on the solubility data in Table 1, what is the likely identity of the precipitate?
_____ Why?

4. What do the test results below tell you about the precipitate formed in the reaction of Ca(NO₃)₂ and Na₂CO₃?



The Outcomes

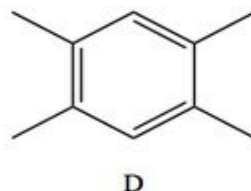
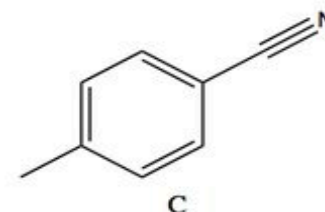
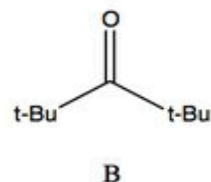
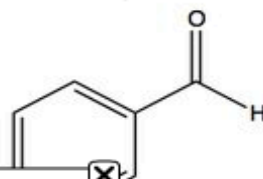
Online LO Pre-Labs with VoiceThread (Org chem)



Discussion 1; Final Week (1/3)



Chose one of the compounds below and explain what you would expect it's H-NMR and C-NMR would look like. How many unique signals? What is the splitting in the H-NMR? Where would you expect the peaks to be in the spectrum? If someone has already commented on one structure, chose another. If they are all taken, look at the other analyses your peers have provided and determine whether you agree or disagree.



The H-NMR for molecule D would have two unique signals, one at 0.9 ppm and one at 5.3 ppm and the C-NMR would have three unique signals. The signal at 0.9 ppm would be highly integrated, whereas the other signal would not be quite as integrated. The signal at 0.9 ppm is also more shielded, thus representing the CH₃ group, while the other signal is less deshielded due to the pi bonds in the ring. The signal at 5.3 ppm would represent an internal hydrogen atom. The splitting for the signal at 0.9 ppm would be a doublet because there is only the one neighboring hydrogen, thus according to the n+1 rule this would be a doublet. The splitting for the signal at 5.3 ppm would be a quartet because using the n+1 rule and the three neighboring hydrogens, it would be split into a quartet. Magnetic anisotropy due to the ring could also potentially be moving the signals more downfield.



comment



The Outcomes

Online LO Pre-labs with Voice Thread (Org chem)



Ctools Analytics:

Average of 230 LO views a week

Only 48 students have access

VoiceThread:

For the last week in lab:

Discussion 1: 119 views, 16 comments

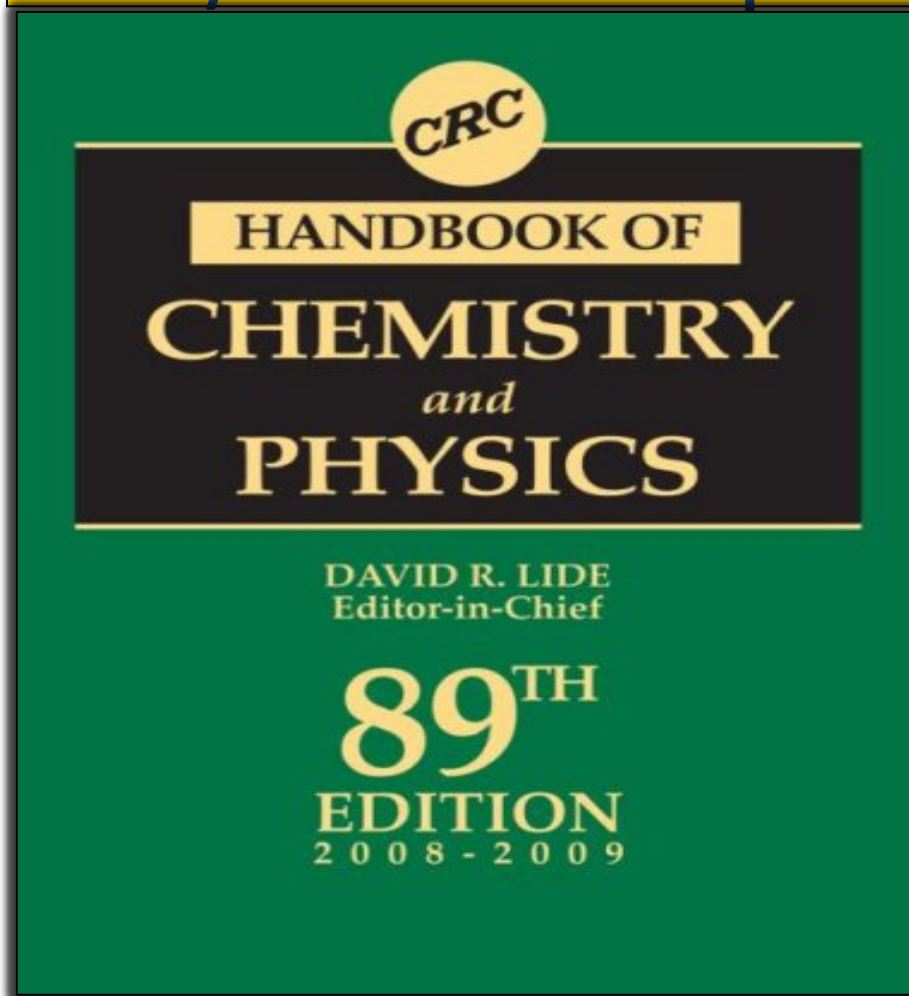
Discussion 2: 72 views, 17 comments

Discussion 3: 91 views, 15 comments

Students are visiting the site **multiple times!**

The Outcomes

Video/Audio Screen Capture (Chemistry)



- **Screen captured resource tutorials**

The Outcomes

Video/Audio Screen Capture (Writing)

African American Foodways

Anne Yentsch's essay, "Excavating the South's African American Food History", is essentially a great piece of academic writing because of the **structure and organization** she uses to portray her purpose. Yentsch sets up a very scholarly **compare and contrast** essay that shines light on the issue of "Foodways during Slavery" and "Foodways after Emancipation". **The way that the essay is organized** reinforces her argument into a very compelling and effective article that brings realizations to a subject that has never really been questioned. Through Yentsch's article the reader can see a distinct culture shift by African American's in the South during these two time periods. The reader may argue that her argument is so lucid because of **how the essay is organized**. Yentsch moves in **chronological order** from the struggle of slaves obtaining food to what food was available, and how they cooked it. She then moves on to talk about recipes that were created by slaves, the food that defined them and their exodus from slavery into the real world. Because of the **evidence-based academic article** that Yentsch is putting forth, strong **first person narratives**, along with **comparison between to time periods**, is crucial to effectively attest that slave foodways progressed from pre to post- civil war.

In the introduction of the essay, Yentsch talks about her professional training as an archaeologist and the **order** in which they relay information. She points out several interesting concepts in the second and third paragraph on the second page that appear to foreshadow her preceding essay. First, "what is critical is the connection between present and past, between

Christine Mo..., 11/24/09 8:22 PM
Comment: It seems like you have a lot going on in this first paragraph. Her compare/contrast strategy is plenty of material for an analysis paper like this one, but this introduction suggests that you'll also be analyzing the chronological order of the essay, and her use of evidence. If all of these ideas "fit" into compare/contrast, their relationship to that larger idea needs to be made clear. If they don't fit, they probably need to be eliminated from the essay, so you can keep your focus.

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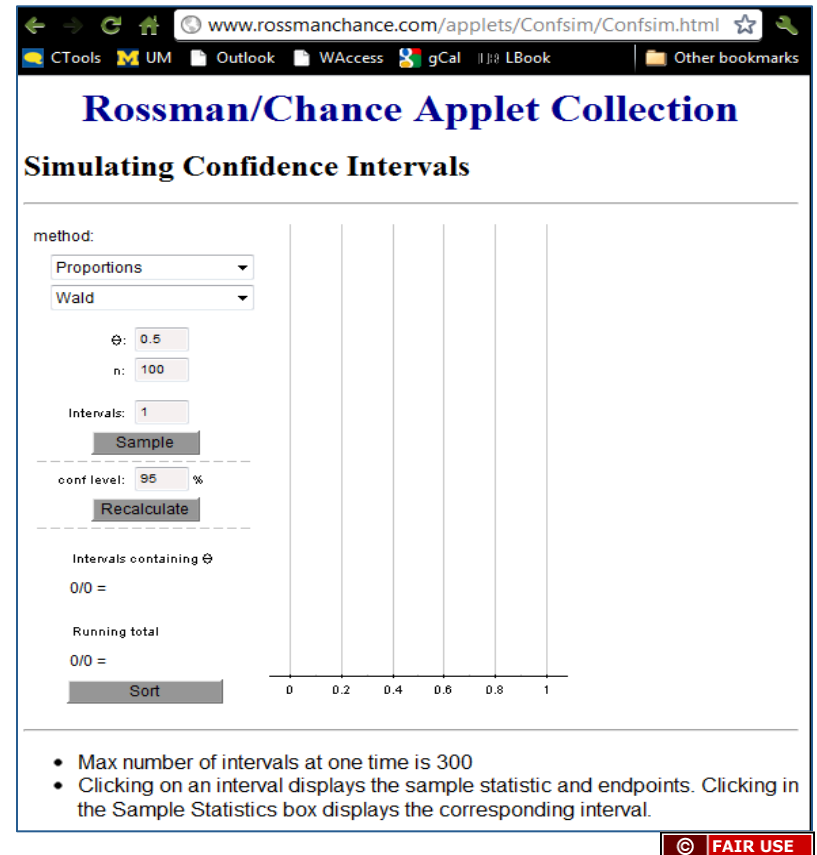
- **Video captured feedback for written documents**
 - personalized feedback on student papers.
- **Screen captured tutorials**
 - how to construct a concept map for writing

<http://www.screencast.com/users/cmodey/folders/Jing/media/8bd96754-d693-4b5e-ba59-952afb2f2e4d>

The Outcomes

Video/Audio Wrapping of Imperfect LOs

- Simulating Confidence Intervals
- Authors: Beth Chance, Allan Rossman (CP)



<http://www.rossmanchance.com/applets/Confsim/Confsim.html>

Advantages of LO?

- Addresses fundamental concept.
- Provides excellent visual demonstration.
- User can adjust controls.

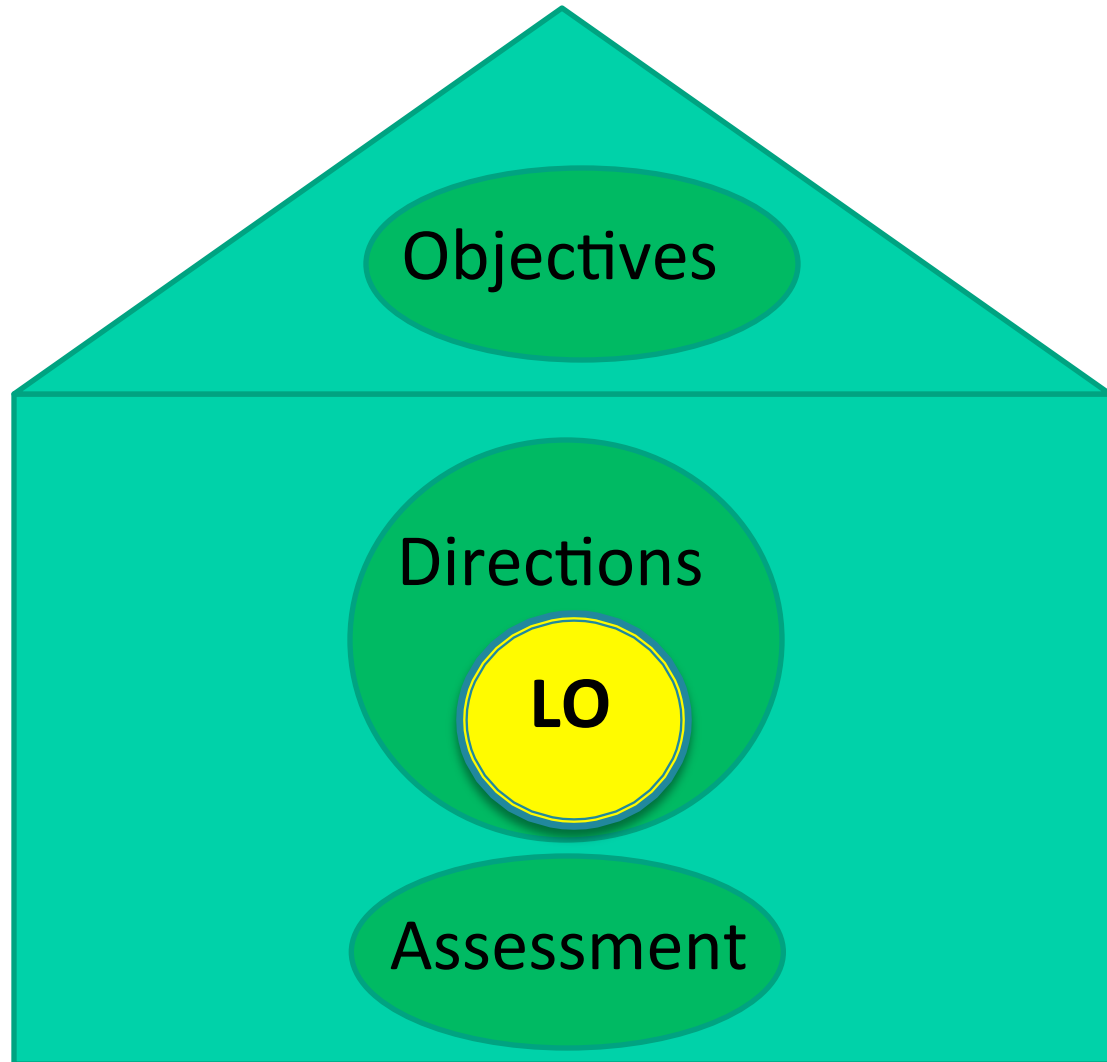
Disadvantages of LO?

- Learning Objectives?
- Directions?
- Terminology/Notation unknown to our students

Instead of:



My students will see:



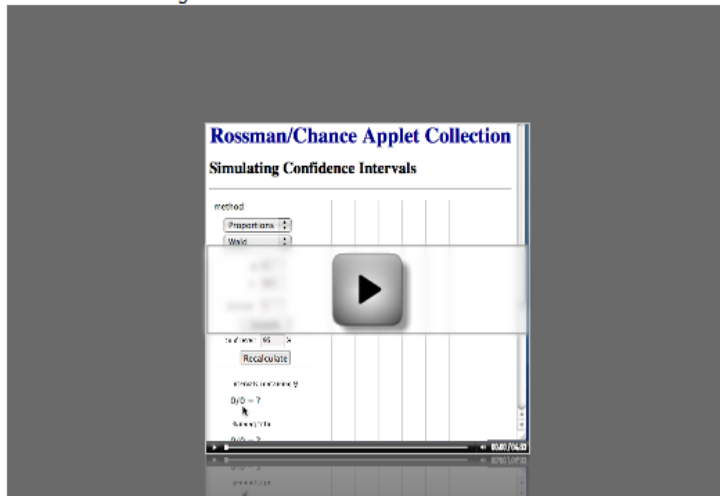
The Fully Wrapped LO = PreLab 03

Lesson03:

In this lesson, you will generate confidence intervals for estimating a population proportion. You will be able to set the value of the (usually unknown) population proportion, the sample size, and the confidence level. You also are able to decide how many samples will be generated and a confidence interval based on each sample will be computed and displayed. The applet graphs the intervals and those which did contain the true proportion are shown in green, while the intervals that did not contain the true proportion are in red. The true proportion is shown by a blue line on the graph. Trying different settings will allow you to make comparisons and draw some important conclusions about how confidence intervals work.

Lesson:

Watch the following video about how to use the confidence interval simulator.



Simulation Link:

The simulation may be found [here](#).

Assignment:

Check Ctools for due date and submission details.

For each of the questions below, use the applet to help you address the question. **Submit your 1-2 sentence summary for each question directly inline to your GSI Ctools site Assignment for prelab3 (or as instructed on your class Ctools site).**

- 1 - Set the confidence level to 99% and the sample size to 100.
 - (a) What is the long run proportion of confidence intervals that contain the population proportion?
 - (b) Does this long run proportion depend on the sample size n ? (Try some other sample sizes keeping the confidence level at 99%)
- 2 - What happens to the length of the confidence intervals as the confidence level increases? Compare some intervals at the 90%, the 95%, the 99% confidence levels (keeping the population proportion and the sample size n the same).
- 3 - What happens to the length of the confidence intervals as the sample size increases? Compare some intervals made using samples sizes of $n = 30$, $n = 50$, and $n = 100$ (keeping the population proportion and the confidence level the same).

The Outcomes

Innovative LO Designs

A New Interactive and
Entertaining Redox Applet

Chemistry Cage Match: The Battle For The Electron

Learning Objective: To understand the principles of Redox in terms of a variety of chemical properties

The Red Corner

BIO:

Row: 4

Family: 11

Weight: 63.54

Size: 0.72

Strength: 1.9

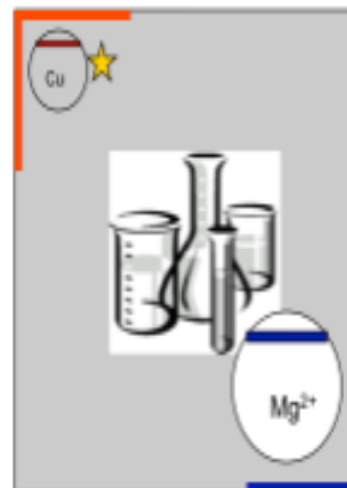
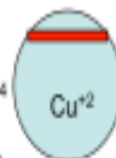
Configuration: $3d^9$

★ WINNER ★

Weight: Atomic Mass

Size: Ionic Radius

Strength: Electronegativity



The Blue Corner

BIO:

Row: 3

Family: 2

Weight: 24.32

Size: 1.6

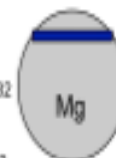
Strength: 1.2

Configuration: $3s^1$

Weight: Atomic Mass

Size: Ionic Radius

Strength: Electronegativity



The Outcomes: LOs Created

Name That Scenario

This site gives you a chance to practice recognizing the appropriate situations in which to apply various statistical procedures. You will be presented with a series of ten real world statistics scenarios. Your task is to select the most appropriate statistical procedure for each scenario.

DIRECTIONS

1. Select at least two of the following Procedures.
2. Choose "First Scenario" to begin.

One Proportion

Two Proportions

One Mean

Paired

Independent T-test

ANOVA

Regression

Chi-sq Goodness of Fit

Chi-sq Homogeneity

Chi-sq Independence

First Scenario

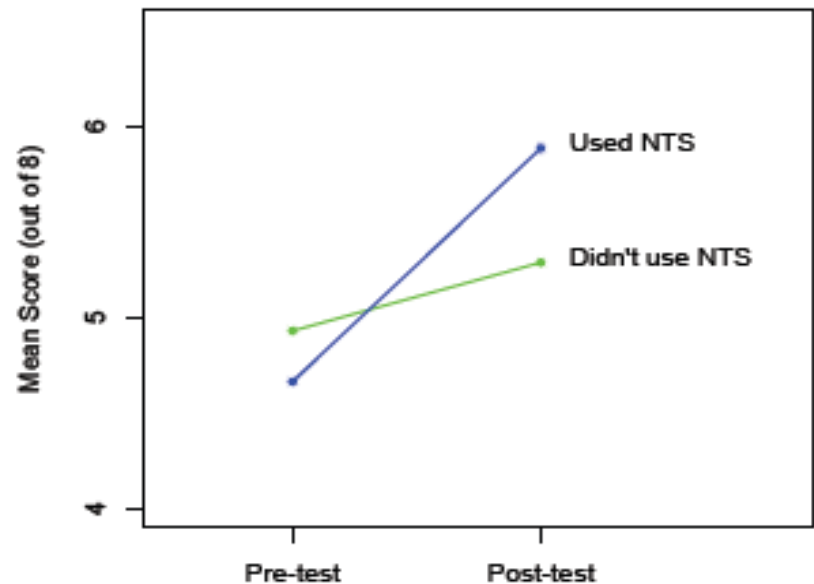
Clear selection

The Outcomes

NTS

- Students took a “pre-test” and “post-test” during lab before and after being given access to the LO.

	Mean Scores (Out of 8)	
	Pre-test	Post-test
NTS	4.66	5.88
	(4.4, 4.9)	(5.7, 6.1)
Control	4.92	5.29
	(3.8, 6.0)	(4.0, 6.6)



The Outcomes

Creation of Inter-disciplinary LOs

Four Characteristics of Good Mathematical Writing

This website focuses on the following four characteristics of good mathematical writing. Each solution should:

1. Begin with a restatement of the question

You **Restate The Problem** by explaining what the problem is asking for *as you understand it*.

2. Include computations with explanations

Computations With Explanations are mathematical expressions which are continually being justified and clarified by prose.

3. Provide figures, graphs, tables, etc. whenever appropriate
4. End with a clear, concise conclusion.

Conclusions are the results of your computations as well as *insightful* observations about these results.

Melo Math Group
Year Summary



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<http://instruct.math.lsa.umich.edu/support/teamhomework/>

The Outcomes


Graduate Student Impact

Porscha McRobbie – Interactive Wolfram LOs for physical chemistry concepts

Porscha McRobbie

Demonstrations 1 - 20 of 20

Subscribe to RSS



The grid contains eight thumbnails of Wolfram Demonstrations:

- Time-Dependent Superposition of Rigid Rotor Eigenstates**: A 3D plot showing the probability density of a rigid rotor in a superposition of eigenstates.
- Rotational-Vibrational Spectrum of a Diatomic Molecule**: A plot showing the energy levels and transitions for a diatomic molecule.
- Temperature-Dependent Rotational Energy Spectrum**: A plot showing the distribution of rotational energy levels at different temperatures.
- Hydrogen Atom Radial Functions**: A plot showing the radial wavefunctions for the hydrogen atom.
- Time Evolution of a Quantum Free Particle in 2D**: A 2D plot showing the probability density of a free particle in two dimensions over time.
- Perturbation Theory Applied to the Quantum Harmonic Oscillator**: A plot showing the energy levels of a harmonic oscillator with a perturbation.
- Time-Dependent Superposition of 2D Particle-in-a-Box Eigenstates**: A 2D plot showing the probability density of a particle in a box in two dimensions over time.
- Time Evolution of a Quantum Free Particle in 1D**: A 1D plot showing the probability density of a free particle in one dimension over time.

- **Professional development and Career Decisions**

Porscha McRobbie: Accepted a position with Wolfram Demos.

Noah Gardner: “Opened me up to a whole new teaching style”; “my favorite part of my graduate school experience. I now intend to teach.... “

Tanya Breault: Considered dropping out of graduate school. Is now “committed to a career in teaching and research”

The Outcomes

➔ New LO Projects

Transforming A Large Lecture To An Interactive Personalized Online Format

Funding

Level 2 Grant

from UM LSA-ITC (Instructional Tech Committee)

- transition from a live lecture to a web-based multimedia online format so as to offer personalized, ultra-accessible teaching and learning opportunities

Transforming Lecture

Why?



 Velkr0, Flickr

- The large (450 seat) lecture hall setting is NOT conducive to active learning

Transforming Lecture

Why?


Students in the large introductory class are heterogeneous with respect to learning styles and background knowledge and...

Transforming Lecture

Stepping Stones to Pedagogical Innovations

► Online Learning Resources




 s_falkow, "Film with Images", Flickr

► Podcasts



 derrickkwa, "podcast_subscribe", Flickr



 Rob Pearce, "Laptop and working lunch. An outside table with a silver laptop, coffee and a sandwich on it", Flickr

► Video Capture of demonstrations



► Software

The Outcomes

Awards, Workshops, Conference Presentations

- Provost's Teaching Innovation Prize (TIP - UM)
(Brenda Gunderson, 2011)
- LO Flipbook Video Award
(Adena Rottenstein, 2011)
- Innovative Use of MERLOT Award (SloanC/MERLOT Intl Conf)
(Nancy Kerner, 2009)
- U-M Enriching Scholarship Workshops (2008 – current)
- MERLOT/Sloan-C Conference Presentations (2009-)
- Graduate students/faculty ➔ MERLOT LO peer reviewers

Overall Outcome

Moving from a model where students are not only engaged learners but also co-teachers



Next Exit

New Ideas

Thank You!

UM LSA-ITC

Any Questions?

Additional Source Information

for more information see: <http://open.umich.edu/wiki/CitationPolicy>

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