Decline of offerings amidst state cuts.

Many States Have Cut School Funding This Year

Change in spending per student, inflation-adjusted, FY11 to FY12

<table>
<thead>
<tr>
<th>State</th>
<th>Change in Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisconsin</td>
<td>-$635</td>
</tr>
<tr>
<td>New York</td>
<td>-$585</td>
</tr>
<tr>
<td>California</td>
<td>-$484</td>
</tr>
<tr>
<td>Ohio</td>
<td>-$399</td>
</tr>
<tr>
<td>Texas</td>
<td>-$399</td>
</tr>
<tr>
<td>Michigan</td>
<td>-$371</td>
</tr>
<tr>
<td>Illinois</td>
<td>-$318</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>-$295</td>
</tr>
<tr>
<td>Utah</td>
<td>-$256</td>
</tr>
<tr>
<td>Colorado</td>
<td>-$248</td>
</tr>
<tr>
<td>Arizona</td>
<td>-$231</td>
</tr>
<tr>
<td>Iowa</td>
<td>-$228</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>-$208</td>
</tr>
<tr>
<td>Georgia</td>
<td>-$176</td>
</tr>
<tr>
<td>Alaska</td>
<td>-$130</td>
</tr>
<tr>
<td>Hawaii</td>
<td>-$128</td>
</tr>
<tr>
<td>Montana</td>
<td>-$117</td>
</tr>
<tr>
<td>Kentucky</td>
<td>-$87</td>
</tr>
<tr>
<td>Mississippi</td>
<td>-$72</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>-$66</td>
</tr>
<tr>
<td>Maine</td>
<td>-$49</td>
</tr>
<tr>
<td>Virginia</td>
<td>-$269</td>
</tr>
<tr>
<td>South Carolina</td>
<td>$90</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>$113</td>
</tr>
<tr>
<td>Maryland</td>
<td>$269</td>
</tr>
</tbody>
</table>

Student Demographics

Colleges | Math Skills | Major | AHC | Units | Work | Kid | Military | ESL | Gender

- %
  - 100
  - 90
  - 80
  - 70
  - 60
  - 50
  - 40
  - 30
  - 20
  - 10
  - 0

- No Answer
- Univ
- Comm C
- SDCCD
- MMC
- No Answer
- Statistics
- Calculus
- Trigonometry
- Algebra
- Geometry
- Others
- Allied Health
- Science
- Nursing
- M
- F

Chem-Path to Writing Chemical Name and Formulas

July 2012
There Exist a Need to Help
Allied Health Students with Fundamentals

Interactive tutorials with smart-pen technology.

Use ChemED ChemPath as vehicle to master concepts in chemistry.

Tutorial development, Deployment and Results.
Names and Formulas Vernacular

There is a need to know how to write chemical names and formulas.
Chemical Nomenclature is a Foreign Language to Students

How many times have you heard your students say, chemistry is like a foreign language?
Students need to know, the importance of chemical nomenclature.

Special Assignment:

Death by DHMO
Planning
What should be in the Tutorial?

Background Information Fundamentals

Practice Worksheet on MSDS

Rules to Chemical Names and Formulas

Examples via Multimedia

Relevancy Fun Activity

Interactive Guide
The Week of Infamy
Using ChemPath as the Portal
The Week of Infamy
Using ChemPath as the Portal

What doesn’t kill you will make you stronger.
Focal Question

Will students who complete the nomenclature tutorial and the corresponding worksheet activities, master chemical nomenclature at a 90% proficiency level?
Chem Ed Research

Theory: Information Processing & Problem Solving

Quantitative Methodology: Achievement

Group & Subgroup: Two courses, traditional and online ...

Validity: Given to advance students

Reliability: Given as pretest...

Assessment of achievement: Pre & Post Lab Q, Exam, Final
Infrastructure
Navigating through ChemPath

Part 1
Background Information Fundamentals
Rules to Chemical Names and Formulas

Part 2
Interactive Guide
Examples via Multimedia

Part 3
Relevancy

Part 4
Practice Worksheet on MSDS
Fun (?) Activity
Using the Resources from ChemDL

Shows importance and utilization in the everyday life.
Building Interaction

Shows importance and utilization in the real world
### List of Multimedia Examples

#### B. Example Videos

Submitted by fgarces on Thu, 07/14/2011 - 15:52

1. Practice

A. Formulas to Names

**Type I: Ionic Compounds with Elemental anions**

<table>
<thead>
<tr>
<th>Group I (Cation)</th>
<th>Group II (Cation)</th>
<th>Misc (Cation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental Anion (-1)</td>
<td>CsCl</td>
<td>BaCl₂</td>
</tr>
<tr>
<td>Elemental Anion (-2)</td>
<td>Cs₂O</td>
<td>BaO</td>
</tr>
<tr>
<td>Elemental Anion (-3)</td>
<td>Cs₃N</td>
<td>Ba₃N₂</td>
</tr>
</tbody>
</table>

**Type II: Ionic Compounds with Polyatomic anions**

<table>
<thead>
<tr>
<th>Group I (Cation)</th>
<th>Group II (Cation)</th>
<th>Misc (Cation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental Anion (-1)</td>
<td>CsClO₃</td>
<td>Ba(NO₃)₂</td>
</tr>
<tr>
<td>Elemental Anion (-2)</td>
<td>Cs₂SO₄</td>
<td>BaCO₃</td>
</tr>
<tr>
<td>Elemental Anion (-3)</td>
<td>Cs₃PO₄</td>
<td>Ba₃(PO₄)₂</td>
</tr>
</tbody>
</table>

**Type II: Ionic Compounds with Elemental anions**

<table>
<thead>
<tr>
<th>+1 Oxidation (Cation)</th>
<th>+2 Oxidation (Cation)</th>
<th>+3 to +7 Oxidation (Cation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental Anion (-1)</td>
<td>CuCl</td>
<td>CuCl₂</td>
</tr>
<tr>
<td>Elemental Anion (-2)</td>
<td>Hg₂O</td>
<td>PbS</td>
</tr>
<tr>
<td>Elemental Anion (-3)</td>
<td>Ti₃N</td>
<td>Ni₃N</td>
</tr>
</tbody>
</table>

**Type II: Ionic Compounds with Polyatomic anions**

<table>
<thead>
<tr>
<th>+1 Oxidation (Cation)</th>
<th>+2 Oxidation (Cation)</th>
<th>+3 to +7 Oxidation (Cation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytomict Anion (-1)</td>
<td>CuClO₄</td>
<td>Cu(NO₃)₂</td>
</tr>
<tr>
<td>Polytomict Anion (-2)</td>
<td>Hg₂SO₄</td>
<td>PbCO₃</td>
</tr>
<tr>
<td>Polytomict Anion (-3)</td>
<td>Ti₃PO₄</td>
<td>Mn₃(PO₄)₂</td>
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</tbody>
</table>
Assess Learning via Worksheet and Crossword Nomenclature

Worksheet scenario and Crossword Nomenclature
Deployment

<table>
<thead>
<tr>
<th>IRB:</th>
<th>Submit on 8/9</th>
<th>Reviewed 9/2</th>
<th>Approved 9/23</th>
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</thead>
<tbody>
<tr>
<td>Study Conducted for</td>
<td>Fall</td>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>9/26/11</td>
<td>2/27/12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activities
- Lab Worksheet
- X-Word Sheet
- Quiz
- Midterm
- Final

Take Action! DEPLOY NOW! CLICK HERE!
## Consent

<table>
<thead>
<tr>
<th>Consents Conducted for</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roster/Finish/Consent</td>
<td>202 / 184 / 143</td>
<td>103 / 89 / 74</td>
</tr>
</tbody>
</table>

### Activities

- Lab Worksheet
- X-Word Sheet
- Quiz
- Midterm
- Final

### Spring 2012

- Total Roster
- Completed Course
- Participated
- Enrolled in OL Lec
What did I get myself in to...

...oodles of data
What did I get myself in to...

... oodles of data
...and more data

...OK, suck it up and lets get to work.
Results: Be careful for what you ask for
Validity Pretest

Science Majors
Fall 2011
Spring 2012
Assessment Scores as indicator of proficiency FY 2011-2012

Quiz2 Midterm Final (Scores)

Raw Scores FY
Qz2 (50pts) Total Class Participated Did not Participate
33.6 (108) ± 8 34.1 (80) ± 8.3 32.3 (28) ± 7
Mid (200pts) 155.8 (112) ± 38.6 160.4 (83) ± 40.1 142.7 (29) ± 30.9
Final (250pts) 175.6 (96) ± 46.7 181.6 (73) ± 47.4 156.4 (25) ± 39.4
## Nomenclature Questions in Final Exam

Expand to Final Exam Questions specific to Nomenclature.

<table>
<thead>
<tr>
<th></th>
<th>Total Class (96)</th>
<th>Participated (73)</th>
<th>Did not Participate (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>58</td>
<td>64</td>
<td>40</td>
</tr>
<tr>
<td>Q2</td>
<td>46</td>
<td>47</td>
<td>44</td>
</tr>
<tr>
<td>Q3</td>
<td>77</td>
<td>78</td>
<td>76</td>
</tr>
<tr>
<td>Q4</td>
<td>44</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>Q5</td>
<td>48 ± 34</td>
<td>53 ± 31.6</td>
<td>32 ± 28.6</td>
</tr>
<tr>
<td>Avg</td>
<td>53.7 ± 23.7</td>
<td>58 ± 22.2</td>
<td>41.5 ± 23.6</td>
</tr>
</tbody>
</table>

*Note: Total Class = 96, Participated = 73, Did not Participate = 25.*
Student-t: Replicate Measurements

<table>
<thead>
<tr>
<th>Final</th>
<th>Total Class</th>
<th>stdev</th>
<th>P</th>
<th>stdev</th>
<th>NonP</th>
<th>stdev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>58</td>
<td></td>
<td>64.2</td>
<td></td>
<td>40</td>
<td>40</td>
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<tr>
<td>2</td>
<td>46</td>
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<td>47</td>
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<td>3</td>
<td>77</td>
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<td>78</td>
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<td>5</td>
<td>48</td>
<td>34</td>
<td>53</td>
<td>31</td>
<td>33</td>
<td>28.6</td>
</tr>
<tr>
<td>Avg</td>
<td>53.7</td>
<td>23.7</td>
<td>58</td>
<td>22.2</td>
<td>41.5</td>
<td>23.6</td>
</tr>
<tr>
<td>N</td>
<td>96</td>
<td></td>
<td>73</td>
<td></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

S(pooled) = 30.5574936
S(pooled) = 22.6863762

\[ t_{calc} = 3.16589421 \]
\[ t_{calc} = 3.51805761 \]

\[ t_{table (99.9)} = 3.291 \]
\[ t_{table (99.9)} = 3.291 \]

\[ t_{calc} > t_{table} \] Significantly different at 99.9 CL but not 99.5 CL

Q5, Significantly different at 99.5% CL

Avg Q1-Q5, Significantly diff at 99.9 CL

Conclusion ...
Conclusion

Working on Tutorial... does improve retention of chemical nomenclature*. ... or does it?

*Not at 90% proficiency
Future

Improve Tutorial-
• Provide more examples of relevancy
• Improve video quality of pen-cast (caption)
• More variety of cross word and word seek puzzles

Deployment-
• Improve direction and instructions of tutorial
• Strict control of when students complete tutorial
• Monitor assessments (lab questions, quiz, midterm, final)

Analysis -
• Detailed analysis and more statistics to see if observations made in last year carries over to fall 2013.
Acknowledgements

"The material is based upon work supported by the National Science Foundation under Grants No. NSF-DUE 1044239 and NSF-DUE 0937796. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation."

ChemED DL, U. Wisconsin: John Moore, Justin Shorb, Linda Faris-Craft

Summit Conf, CER, CU: Diane Bunce, Kelly Neiles, Elizabeth Flens, Matthew Tommey, Lynn Diener

Miramar College for travel support.

... and least I forget my fellow colleagues who all grew stronger from the experience....