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Viper Faculty Development Workshops: A New Model for the Creation of New Teaching Materials

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VIPEr Faculty Development Workshops: A New Model for the Creation of Teaching Materials

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SoTL Commons, Savannah, GA
March 26, 2014
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DUE TUES- Type 2-1225792

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Jeffrey Raker, University of Southern Florida, assessment

Mellon Foundation Inter-institutional Grants for Faculty Enhancement
NITLE Western Regional Instructional Innovation Fund
NSF-CCLI Phase 1 (DUE-0737030)
NSF-TUES Phase 2 (DUE-1225792)
GLCA New Directions Initiative Award
AALAC Workshop Fund
cCWCS
Division of Inorganic Chemistry

Mellon 23 & AALAC
Introduction to IONiC and VIPER

Face to face and virtual: The way IONiC builds its community

Workshop: Format, implementation, synergies

Assessment and Follow up: Professional development and benefits

Best Practices and Outreach: How can our community help other groups and vice versa?
Problems

• Narrow/deep specialization
• Must cover whole field
• Course taught at different levels
• Hard to find/adapt the work of other instructors
• Hard to stay current in the content
• Hard to stay current in pedagogy
Visible Teaching

- Share best practices (and failures!)
- Share expertise

“Great teachers emerge, they touch the lives of their students, and perhaps only through some of those students do they have any influence on the broad art of teaching. For the most part, their insights die with them, and subsequent generations must discover anew the wisdom that drove their practices.”


- **General Teaching Resources**
  - 116 objects

- **Fundamentals of Inorganic Chemistry**
  - 169 objects

- **Coordination Chemistry**
  - 84 objects

- **Main Group Chemistry**
  - 55 objects

- **f-block Chemistry**
  - 11 objects

- **Bioinorganic Chemistry**
  - 46 objects

- **Organometallic Chemistry**
  - 87 objects

- **Solid State and Materials Chemistry**
  - 83 objects

**Inorganic Chemistry News**
- Dinuclear Copper(I) Complexes of Phenanthroline-Functionalized NHC Ligands
- (N-Phosphinoimidazolate)Iron Pre-Catalysts for the Room Temperature Hydrosilylation of Carbonyl Compounds with Broad Substrate Scope at Low Loadings
What faculty want....

Easy to contribute, implement, customize
Bite-sized
Diversity of materials
Assessment is integrated
Learning Object (noun)

"a collection of content items, practice items, and assessment items that are combined based on a single learning objective"

- 475+ Learning Objects
- 233,000 downloads in 6 years
- 4.4/hr
- 680+ registered faculty users
Many Activity Types

- Five Slides About
- In-Class Activity
- Lab Experiments
- Literature Discussion
- Problem Set
- Textbook
- Web Resources and Apps
A different approach: Publish then filter

Introducing Inorganic Chemistry - First Day Activities

Object Type: In-Class Activity
Posted August 31st, 2010 by Barbara Reisner, James Madison University
Last updated: March 19, 2011.
- Subdiscipline: General Teaching Resources
- Course Level: First year, Second year, Upper Division
- Topics Covered: Chemical literature

Description:
Every time I teach inorganic, I always ask myself the question: “What’s the best way to motivate the course and get the students excited?” A long time ago, I decided it’s important to start with some music. (Until last year, Tom Lehrer’s The Elements was my favorite. As a TMBG fan, I’ve switched to Meet the Elements.)

This year I decided to take 15 minutes today and ask my students: What is Inorganic Chemistry? I had them brainstorm in small groups of 3-4, write their definitions down, and share them with the group. Based on their definitions, inorganic chemistry is...
(1) chemistry that doesn't contain carbon.
(2) chemistry that doesn't contain hydrocarbons.
(3) the chemistry of the transition metals and their effect on the atoms around them.
(4) studying how the size and orientation of molecular orbitals affect ionic bonds.
I then took the opportunity to open up the current issue of ACS journal Inorganic Chemistry and look at the titles and graphics to demonstrate the diversity of the field and help them refine their definitions.

What do you do to start off your inorganic courses?
I did this the first day of class (yesterday!). I first asked the students to define inorganic chemistry and got the standard answers ("not" organic chemistry, etc.), then I gave them some photocopied tables of contents from *Inorganic Chemistry*. I asked them to note what they saw that was expected and unexpected. For "expected" they said: metals, spectroscopy, structure and bonding. For "unexpected" they said: nonstoichiometric compounds, lots of stuff on magnetism, and lots of computational chemistry. We didn't spend long on this and it was fun.

Oh, and by the way, ACS journals now allow you to print the table of contents very easily. When you view the contents on line, there's a little box (currently labeled "new feature") that lets you view them three different ways. One of the views is "print view."

— Joanne Stewart, *Hope College*, Jan 13, 10:33 PM #

I've asked this same question every semester I've taught inorganic. As a means of learning names quickly, I have the class fill out notecards with some basic personal information and their answers to the question "what is inorganic chemistry". After that, I share the individual student comments anonymously. Over the years, I've gotten similar responses to Barbara's question and it has been a great way to engage their brains on day 1.

As most of my inorganic students have already had organic, we then talk about some of the differences...some engaging conversation usually ensues when I show the class molecules in which carbon has more than 4 bonds!

— Rebecca M. Jones, *Austin Peay State University*, Jan 23, 04:58 PM #

I did a version of this on this first day using Joanne's extension with the table of contents from IC. I gave each group a different issue and asked them to note what they saw that was unexpected. The biggest surprises were the dna/proteins and the computational aspects. This also gave me a chance to plug the fact that it's the 50th anniversary for IC.

I think it went well and certainly got the attention of a few students. It also prompted a brief spontaneous discussion of what non-innocent ligands are!

— Amanda Reig, *Ursinus College*, Feb 2, 04:56 PM #
Community Building

Blogs

Forums

Facebook
VIPER Community Survey 2014

- Surveyed registered faculty users
- 54% use it once a month or greater
- 78% have downloaded LOs
- 61% have used LOs in their classes
- 26% have created LOs
### Why do you use particular LOs? (Important + Very Important)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of incorporating</td>
<td>81%</td>
</tr>
<tr>
<td>Clear Description and Title</td>
<td>77%</td>
</tr>
<tr>
<td>Attached Teaching Guide/Faculty-Only</td>
<td>71%</td>
</tr>
<tr>
<td>Clearly Stated Learning Goals</td>
<td>68%</td>
</tr>
<tr>
<td>Attached Student Handouts</td>
<td>68%</td>
</tr>
<tr>
<td>On a topic that outside is your specialty</td>
<td>59%</td>
</tr>
<tr>
<td>References to the Scientific Literature</td>
<td>55%</td>
</tr>
<tr>
<td>Attached Assessment Tools (e.g., rubrics)</td>
<td>50%</td>
</tr>
</tbody>
</table>
Benefits to Students / Faculty

“..In my first year teaching inorganic, I relied on my own sophomore-level college course as a model, but found that there wasn't a good fit between the course I'd taken and the senior-level course I was then being asked to teach. In my second and third years I worked very hard to bring the course "up" in standards and challenge for the students. VIPEr was a huge resource for me. Specifically, I relied on the textbook reviews to get myself a much better set of books to consult. I downloaded learning objects to use as in-class activities and homework problems. I read forum conversations. Gradually my class improved, and VIPEr was a major reason for the improvement.”
“I have seen new ways to think about the teaching of numerous topics. Even when I do not adopt a learning object, looking at the work of my colleagues often influence me to try new pedagogic approaches that hopefully lead to better learning.”

“I have been able to use more active learning and I have been able to include more of the current literature.”
“I used this page to start on my inorganic course. I built the course from the ground up and the VIPER community was there to support me by providing useful tools, LOs, and tricks that work in the classroom. The community is warm and caring and wants faculty to succeed. It is a great place to share good ideas as well as things that do not work well. My students have done a number of the LOs that are posted and it has improved student performance and ability in my classroom and in graduate school."

“ I have found good learning resources that I have incorporated into my classes. I have found a community of professionals that I can work with to improve my professional life, through conversations, motivation, help with questions, and new ideas.”
Community of practice

A group of people who share a craft and/or a profession. By sharing information and experiences members learn from each other, and have an opportunity to develop themselves personally and professionally

(Lave & Wenger 1991)

- Social Presence  Wasko and Faraj, 2000
- Motivation  Ardichvilli, Page & Wentling, 2003
- Collaboration  Sveiby & Simon, 2002
Virtual and Face-to-face

- Launched website at National Meeting
- Symposium each year at the National Meeting
  “Undergraduate Research at the Frontiers of Inorganic Chemistry (703 presentations total over 6 years) 35%”

- Happy hour 16%

How do we get better participation?

“Legitimate Peripheral Participation”
Jean Lave and Etienne Wenger
Better community = better online community
Content Development Workshops

- Regional
- Chemical Education Conferences
- National
Faculty will learn the latest advances in Inorganic Chemistry

Faculty will:
• create and use teaching materials incorporating these advances and informed by current research on learning
• include guidelines and results for the assessment of student learning.

The materials will be disseminated to the global inorganic teaching community through VIPEr.
The active IONiC community will grow.
Back To Grad School (B2GS)

- Bring faculty together with experts in the field to learn cutting edge science and review content needed to understand it.

- Combine this content knowledge with an introduction to best practices in active learning/pedagogy

- Use team collaboration to develop quality content and community that lasts beyond the bounds of the workshop.
B2GS Faculty Development Workshops

2012  cCWCS

VIPer: Inorganic Chemistry at the Frontiers of Catalysis
University of North Carolina

2013 TUES

VIPer: Solid State Materials for Alternative Energy Needs
Penn State University

2014 TUES

VIPer: Bioinorganic Applications of Coordination Chemistry
Northwestern University
**Blue Solids**

Sleight, Subramanian, Spaldin, JACS, 2009, 131, 10784.
DOI: 10.1021/ja908066

**Shannon Prewitt radii**

- In$^{3+}$: 94 pm (CN = 6)
- Mn$^{3+}$: 72 pm (CN = 6)
- Y$^{3+}$: 104 pm (CN = 6)

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**Pedagogy and Content!**
Experts!

Tom Mallouk VIPER Workshop Talk
Collaboration!
How Many Atoms Are In A Nanowire?

Object Type: Problem Set
Posted June 27th, 2013 by Robert Q. Topper, Cooper Union
Carrie Read Spray, Eastern Nazarene College
Jeremiah Duncan, Plymouth State University
LaRico J Treadwell, Louisiana State University
Sabrina G. Sobel, Hofstra University
Last updated: August 27, 2013.

- Course Level: Upper Division
- Topics Covered: Chemical literature, Extended structure, Physical properties, Symmetry
- Prerequisites: General Chemistry
- Corequisites: No Corequisites

Description:
This is a single problem. In this problem students use a provided image of the unit cell of CuInSe2 and information about the cell dimensions to estimate how many atoms are in a cylindrical nanowire synthesized and characterized by Mallouk and coworkers. We are grateful to Prof. Mallouk for providing the included figure, and for his helpful assistance.

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Size</th>
<th>Hits</th>
<th>Last Download</th>
</tr>
</thead>
<tbody>
<tr>
<td>HowManyAtomsInaNanowire.docx</td>
<td>92.56 KB</td>
<td>4</td>
<td>2 weeks 2 days ago</td>
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<tr>
<td>HowManyAtomsInaNanowire.pdf</td>
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<td>7</td>
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<tr>
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<td>96.54 KB</td>
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<td>2 weeks 2 days ago</td>
</tr>
<tr>
<td>AnswerKey HowManyAtomsInaNanowire.pdf</td>
<td>134.94 KB</td>
<td>4</td>
<td>1 week 20 hours ago</td>
</tr>
</tbody>
</table>

Learning Goals:
After completing this problem, students should be able to:

1. Count the total number of atoms in a unit cell using knowledge about different unit cell positions.
2. Use geometry to calculate unit cell volume and cylinder volume.
3. Compare cylinder volume to unit cell volume to calculate total number of atoms in a nanowire.

Suitable as Exam Question:
Yes (suitable as an exam question)

Related activities: Crystal Lattice Structures Web Site
Looking at Solid State Structures
Solid State Structures
Solid State Crystal Structure
Solid state, Semiconductors, Electrochemistry, and Nanowires for Solar Cells: Discuss!

Web Resources:

Evaluation Methods:
Each of the stated learning goals may be independently assessed: the correct calculation of the number of atoms in the displayed unit cell; the correct calculations of the unit cell volume and the cylinder volume; and the combination of these three elements to obtain the number of atoms in the cylinder.
Fun!
Participant quotes

“Please keep doing these! As inorganic chemists we need more interaction with each other! This has been a wonderful experience!”

“…Overall, I believe this is one of the best experiences I've ever had at a conference/workshop. Given, this is a unique experience unlike a conference, but I probably walked away with more added knowledge and at a deeper level than any conference. I am sure that this is due to my engagement in the entire week…”

“The ‘rockstars’ did a great job with their talks - they really seemed to understand the goals of the workshop. I was also very impressed with how much time they gave us - they were full participants and didn't just drop in to give the talks.”
Workshop outcomes

On a 3 point scale (1= none, 3=large enhancement) of how the knowledge of participants was affected by the workshop:

VIPER Learning Objects  2.91
Active Learning Strategies  2.65
Literature Discussions  2.61
Professional Development Opportunities

- Inorganic Faculty
- Pedagogy
- Graduate Students
- Career Advice
- Technology
- IONiC Leadership Council

Cutting Edge Science
- Fundamentals
- Assessment
- New Learning Materials

Content Experts
Professional development

- Learn new areas of inorganic chemistry (bioinorganic, materials, catalysis)
- Learn new pedagogy/technology
- Chance to publish
- Place to find external reviewers
- Mentoring
- Research scientists have “broader impact”
Follow-up activities

Accountability Check-ins
- Testing of LOs, commenting, posting assessment data

Virtual Meet-ups
- Share how we’ve used VIPEr, testing of particular LOs
- Pedagogical discussions

PUBLiSH CLuB
- Peer-supported professional development goals
Plans for project assessment

- Outside assessment expert (Jeff Raker, USF) observing and interacting with participants
- Post workshop survey
- Group interviews at the workshop
- Individual interviews after the workshop (6 months- 1 year out)
Some Future Directions

- Virtual Workshop participants
- Partnership with GLCA Expanding Collaboration Initiative
Affecting Change

Solid Virtual Foundation

Spread the word face-to-face:
National Meetings
Regional/Specialty Consortia
Research Conferences
Educational technology meetings

Get the word out “in print”:
Educational Lit
Technology oriented publications
Outreach to Primary Research Lit

The personal touch:
Mini Workshops
Workshops

Kinesthetic learning: GLCA Workshop participants make a M-M quadruple bond
Advice to other communities

- Learn best practices but tailor to your audience
- Delegate the technology
- Combine virtual with face to face
- Professional development “wins” for participation
- Swag/branding is important!
How you can help us...

- Share
- Adapt and adopt
- Advice on where to share
Questions?