

***Mixing elements of e-portfolios with
upper-level chemistry students:
An “alchemist’s dream” or “no reaction”?***

Innovations in Teaching Showcase

13 April 2011

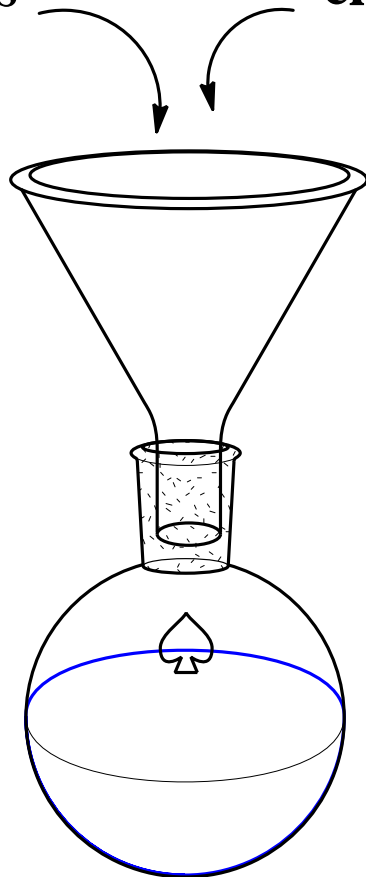
Mary Tefft White Center

Cliff Timpson

Department of Chemistry

e-portfolios

chemistry students



**Agitate gently
for 1 semester**

?

**Alchemist's
Dream**

?

No Reaction

What is an e-Portfolio?

“An e-Portfolio is a purposeful collection of work that demonstrates effort, progress and achievement over time, stored in an electronic container (CD, DVD, WWW).”

Barrett, H. (2006) Digital Storytelling Tools.

Retrieved March 15, 2011 from <http://electronicportfolios.com/digistory/purposes.html>

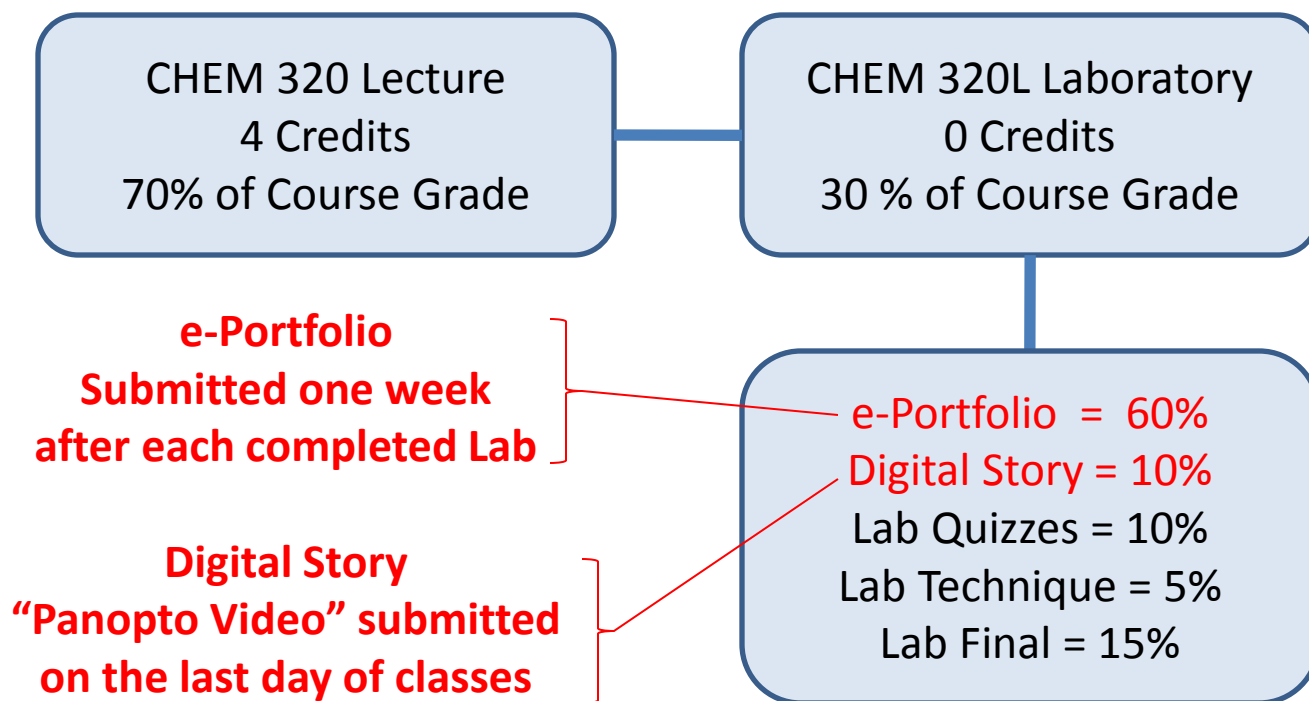
General Types of e-Portfolios

- **Developmental Portfolio**
 - Documents a progression over time.
 - May be tied to learning outcomes or rubrics.
- **Reflective Portfolio**
 - Includes, as a central component, a personal reflection by the author on content and/or personal growth.
- **Representational Portfolio**
 - Showcases specific achievements or the author's notable attainment of goals.
 - Career Portfolios

Why consider e-portfolios in a science course?

- Practical Motivation:
 - Electronic manipulation of data commonplace
 - Ease of organization and presentation
 - Enhancement of notebook skills
 - Archival of course information
- Pedagogical Motivation:
 - Get students to “think outside the box”
 - Enhance cognitive links to other courses/disciplines
 - Get students to reflect on their “scientific maturation”

Integrating e-Portfolios into the Inorganic Chemistry Course



Inorganic Chemistry Laboratory

CHEM 320L

- Offered annually, every fall semester
- Populated with juniors and seniors
- Enrollments generally 6 – 13 students
- Fall 2010 semester, enrollment = 7
 - B.S. Chemistry Major = 4
 - B.S. Chemistry and B.S. Biology = 2
 - B.S. Biology and B.A. Chemistry = 1

Schedule of Laboratory Experiments

Fall 2010 CHEM 320L

Laboratory Experiments

Tentative Dates

- | | |
|---|---------------------------|
| x. Lab Check-In / Safety /Waste Instructions | 13 September |
| 1. Preparation of Iron(III) Oxalate
Bench Top Synthesis / Crystallization Techniques | 20 September |
| 2. Analysis of Iron(III) Oxalate Complex
Colorimetric Analyses, Redox Titrations | 27 September
4 October |
| 3. Linkage Isomerism: An Infrared Study
Bench Synthesis, FT-IR/Uv-Vis study | 12 October
18 October |
| 4. The Paramagnetic Complex $\text{Mn}(\text{acac})_3$
Synthesis, NMR/Gouy Balance | 25 October
1 November |
| 5. Cobaloximes: Models of Vitamin B_{12}
Inert atmosphere / Bioinorganic | 26 October
2 November |
| 6. The 1-2-3 Semiconductor
Synthesis of $\text{YBa}_2\text{Cu}_3\text{O}_7$ | 8/15 November |
| 7. Investigation of Ruthenium Complexes
Electrochemistry, Fluorescence Spectroscopy | 22/29 November |
| 8. Lab Final Exam (Cumulative) and Digital Story Due | 6 December |

E-portfolios
For each lab

Remember the new 3-R's
Record-Report-Reflect

not Reduce, Reuse and Recycle
which are the old 3-R's
or the really old
Readin', Ritin', 'Rithmatic which
mostly don't start with R's anyway!

e-Portfolios
Inorganic Chemistry
CHEM 320 Fall 2010



This is submitted to the
instructor within one week
of completing each
laboratory experiment

Submit via email to
Dr. Timpson as a zipped folder

e-Record
An electronic record of what
you did IN THE LABORATORY
a.k.a. your e-notebook

This is done in lab and
is a collaborative effort
among all the students in
your group(s) .

This info is freely
accessible on Bb to all
students.

20% of Lab Grade

e-Report
Proof that you understand
the science behind what you
accomplished

This is done outside of lab
and is **NOT** done in
collaboration with other
students in your group(s).

This info is NOT accessible
on Bb to all students.

30% of Lab Grade

e-Reflect
Documentation of your
evolution of knowledge
in the course

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and is **NOT** done in
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10% of Lab Grade

e-Record

An electronic record of what
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- ☀ Your e-notebook should include **all** of the detail that would normally be included in a traditional paper notebook plus...
- ☀ It should also include links to MSDS sheets for your chemicals
- ☀ It should also include links and/or embedded files for all your data
- ☀ It should include properly formatted tables and figures where appropriate

e-Report

Proof that you understand the science
behind what you accomplished

- ☀ Your e-report should include a factual summary of what was accomplished. This is also known as an **Abstract**.
- ☀ Your e-report should include a brief **Introduction** that sets the stage for the investigation. What is the relevance and/or the importance of the investigation?
- ☀ Your e-report should briefly summarize the details regarding the quality and source of the chemicals used, the instruments utilized, and/or any other **Experimental** details.
- ☀ Your e-report should include properly formatted **Tables** and **Figures** to illustrate the **Results** obtained in your investigation. If these have been done properly in the e-notebook section, it should be a simple matter of cutting and pasting it into this section.
- ☀ Your e-report should also include a brief and targeted **Discussion**.
- ☀ Your e-report should end by clearly stating any **Conclusions** that you have drawn from the investigation.

e-Reflect

Documentation of your evolution of
knowledge in the course

- ☀ This should be a thoughtful reflection on what you have learned and how it fits into your professional maturation process.
- ☀ Your reflection does not have to be a “diary” but it should reveal your own thoughts and scientific opinions. Specifically, what did you learn in this class that you did not know before?
- ☀ There is no right or wrong, but you will be assessed on the quality and depth of your introspection.
- ☀ Images, embedded files, audio, music, video and any other “creative” expressions will be considered a plus especially if they add value and/or “richness” to the reflection.
- ☀ Most importantly, have fun and make the e-portfolio a part of you!

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CHEM 320 Fall 2010



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Sample Paper
Notebook

☀ **A sample of what
student notebooks
typically look like**



Sample Electronic
Notebook

☀ **A sample of what an
e-notebook looks like**

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e-Report
Proof that you understand
the science behind what you
accomplished

⚙ This component of
the lab has not changed.

⚙ Students have
"always" submitted
inorganic lab reports in
electronic format.



Sample Lab Report

30% of Lab Grade

e-Reflect
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e-Reflect

Documentation of your
evolution of knowledge
in the course

☀ Reflections ranged
from regurgitation of the
lab reports to clips of
email exchanges.

☀ The better students
evolved their reflections
to explore links to other
courses and articulated
how they have expanded
their knowledge base.

10% of Lab Grade



Sample 1 e-reflect



Sample 2 e-reflect



Sample 3 e-reflect

Digital Story

Documentation of your evolution of
knowledge in the course

- ☀ Due on the last day of class.
- ☀ Worth 10% of laboratory grade (3% of overall course grade)
- ☀ “Panopto” presentation detailing professional evolution as the student moved through the course.
- ☀ Students were encouraged to be creative and to express themselves in novel ways. Outback style...no rules.
- ☀ Panopto movies ranged from ~2 minutes to a little over 9 minutes.
- ☀ **Some brief samples/examples....**

Links to student panopto presentations:

- TC: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=7d49761f-d2d2-4ec9-ad58-9e7ceba829a5>
- LV: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=ccbc8d79-aa88-4feb-8ea4-b456a5046415>
- GP: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=ea2f71dc-6e1c-42be-8fad-43139a7a2f70>
- JA: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=8d524ef5-d7a8-40cd-ab3b-72b61e462a7e>
- HK: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=a578714c-9dd6-4589-a4b8-8cdf3b45ee64>
- TM: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=5a999122-002f-48f7-9353-a57d6817fe73>
- DC: <http://panopto.rwu.edu/Panopto/Pages/Viewer/Default.aspx?id=2e472b54-3b14-41db-80ca-1eb238ed3c32>

Themes that emerged from the Digital Stories

- 5/7 students developed links between lecture and lab.
- 4/7 students stated that they developed a deeper appreciation for the literature.
- 3/7 students stated that it is not enough to memorize a concept, recognized that a deeper understanding of the underlying theory is the key to true comprehension.
- 2/7 made “meaningful” links to other courses/disciplines.
- 2/7 stated that they feel more confident to enter graduate school or workforce.

What the students are saying....

What did you like **most** about incorporating elements of e-portfolios into this course?

- *I really liked having a laptop to record data/take pictures for the notebook.*
- *I feel like I have an awesome notebook that I can save and show off in the future.*
- *I loved the electronic format for the notebook vs. a paper notebook.*
- *The Digital Story with Panopto was a lot of fun but I should have started it much earlier.*

What the students are saying....

What did you like **least** about incorporating elements of e-portfolios into this course?

- *I did not have an easy time with the reflections. I feel like I was way too analytical with them.*
- *I did not like the reflection portion because I lack creativity but it is probably good that I had to force myself to try to be creative.*
- *The e-portfolio (because) having three papers due (e-record, e-report, e-reflect) all at the same time was a lot of work.*

My “unscientific” assessment... based on data set with $N = 7$

e-Notebook



On the right track
toward an “Alchemist’s Dream”

e-Report



Better “yield” than expected

e-Reflect



Back to the drawing board?

Digital Story



Promising initial results
Needs refinement

Acknowledgments

RWU Provost-Sponsored “E-Teaching Academy” Grant, Summer 2010

Dr. Linda Beith, Mr. Shawn Platt, Mr. Russell Beauchemin and all the talented folks in the RWU *Department of Instructional Design*

The Fall 2010 CHEM 320L Inorganic Chemistry Lab Students

Resources

Helen Barrett’s e-portfolio “mega-website”:

<http://electronicportfolios.org/>

Batson, T. (2006) *The Electronic Portfolio Boom: What's it All About?*

<http://campustechnology.com/articles/39299/>

Madden, T. (2007) *Supporting Student e-Portfolios, A Physical Sciences Practice Guide*. The Higher Education Academy. ISBN: 978-1-903815-19-9

http://www.heacademy.ac.uk/assets/ps/documents/practice_guides/eportfolios_JISC.pdf