

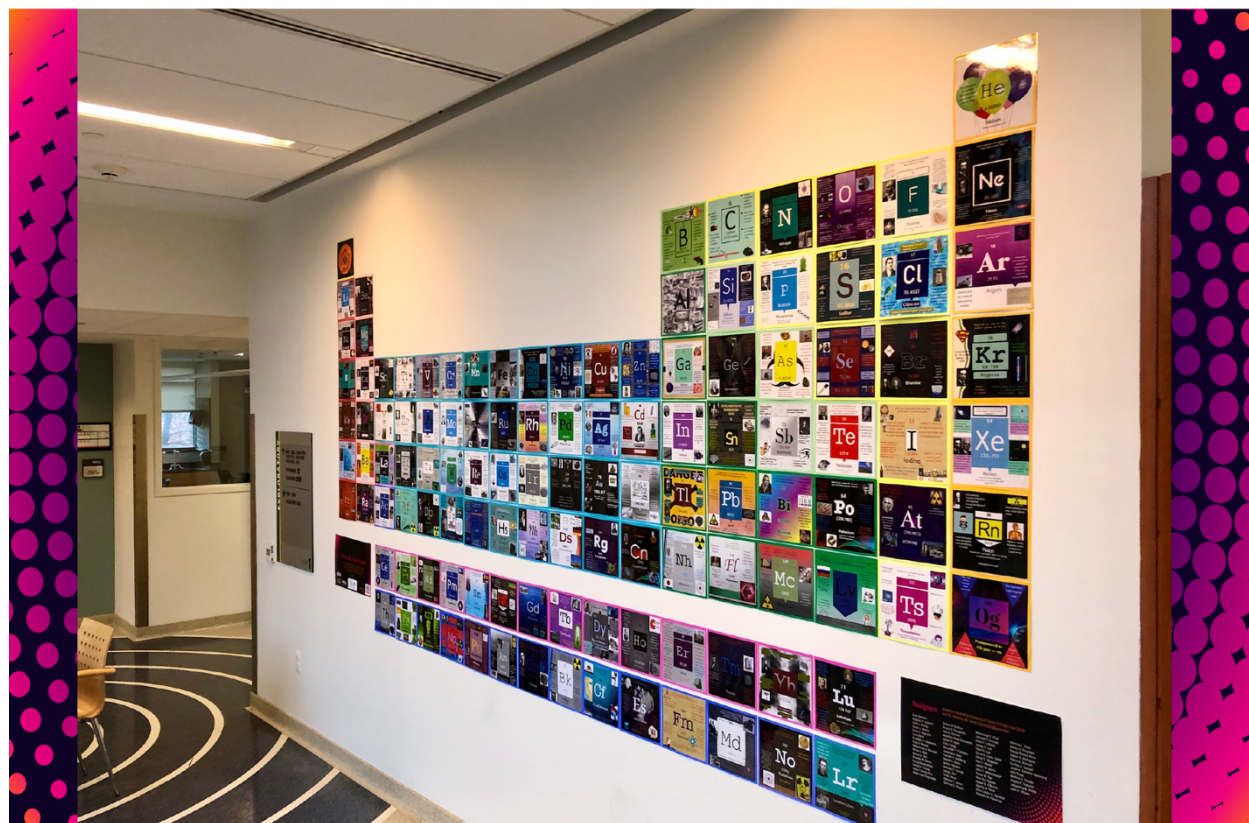
Developing Scientific Communication with Chemistry Infographics

Rebecca M. Jones

In my chemistry classes, I incorporate a creative and engaging semester-long infographic assignment that include best practices like peer review and scholarly inquiry. In General Chemistry for Engineers, students have researched the chemistry of engineering materials. In General Chemistry, students have explored the diverse and varied lives of historical and current chemists. And in Bioinorganic Chemistry, students have created infographics that explore the connections between metals and biology. Across all the iterations, the assignments aim to:

- 1) Assess students on more than just exams
- 2) Create an alternative assignment to a traditional paper, report, or presentation
- 3) Teach a new mode of scientific communication
- 4) Challenge students to visually communicate a chemical idea or concept in which they are interested
- 5) Engage students with current chemical literature
- 6) Promote curiosity

The Periodic Table Project was a version of the assignment offered in Fall 2019 during the 150th anniversary of the periodic table. The resulting wall-sized periodic table is shown below; 49 different students were involved in making the various elements shown below. My favorite part of this activity was creating the “human periodic table” with my class holding their own elements.



In Spring 2019, I created the Once Upon a Chemist assignment for my section of General Chemistry I (CHEM 211). Each student in this large class of 135 selected a chemist and created an infographic which told a story about that chemist. At the end of the semester, I created a website about the assignment and posted the students' work there. Showcasing a diverse and international group of people, this assignment showed how chemistry crosses borders and is relevant to all of us.

On the last day our class meets, my students present their infographic projects in a Gallery Walk. Students see again those infographics they peer reviewed and see how they were changed. Personally, I love seeing what they chose to research and how they communicated what they learned about their topic. This was most evident to me in Spring 2023, when I first taught Chemistry in the Kitchen (CHEM 460). CHEM 460 includes an independent research project where students ask a research question, design and carry out the kitchen experiments, interpret the results, and then present their projects to the public. The students presented their posters at the Research Poster Gallery Walk (Figure 1) and many brought samples of their experiments to share. I was truly delighted to see the enthusiasm and growth in each of my students and I believe everyone in attendance witnessed how much these students had learned in this course. Figures 2 and 3 show some images from a gallery walk in CHEM 271. Without question, these Gallery Walks are a way I see that my students have been learning.



Welcome! **Research Poster Gallery Walk**
 Chem 460: Chemistry in the Kitchen
 Monday May 15, 2023

Perfectly Crispy: The Chemistry of Frying Potatoes Miguel Sales Mendez, BS Chemistry, May 2023	Effects of Various Syrups on Saltwater Taffy Mia Russell, BS Biochemistry, December 2022
Investigating the Role of Gelation Ingredient in Gummy Bears Marissa Harter, BS Chemistry, May 2023	The Chemistry Behind the Color and Flavor of Soft Pretzels Juliana Pinheiro, BS Chemistry, May 2023
Relative Heat of Fermented Hot Sauces James Walnut, BS Biology, May 2023	Exploring Chemical and Physical Changes in Dulce de Leche Gerald Flores, BS Chemistry, May 2023
Alternative Sweeteners for Cheesecakes Fahad Rahu, BS Chemistry, May 2023	Whipping Up A Healthier Chocolate Mousse Alan Nuhais, BS in Chemistry-Biochemistry, May 2023
Sugary Perfection: Infusing Simple Syrups Aasia M. AlBaker, BS Chemistry concentration Biochemistry, May 2023	Comparison of Traditional and Coconut Caramels Wilson Plummer, BS Biology, May 2023
Exploring Marshmallows Dr. Rebecca M. Jones Department of Chemistry & Biochemistry, rjones22@georgia.edu	

GEORGE MASON UNIVERSITY Department of Chemistry and Biochemistry
 CHEM 460: Chemistry in the Kitchen
 Spring 2023 Dr. Rebecca M. Jones

Figure 1: Photo from and visitor handout for the Research Poster Gallery Walk for Chem 460 in Spring 2023

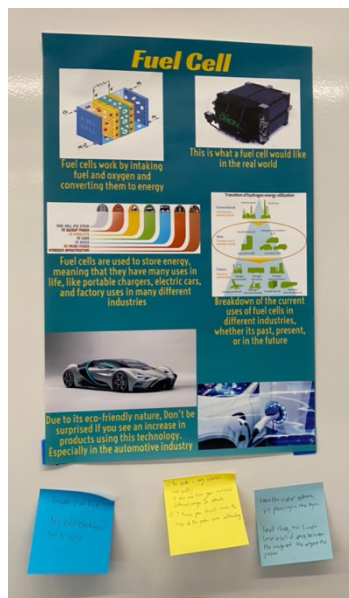


Figure 2: Student infographic on Fuel Cell and three post-its below with peer comments.

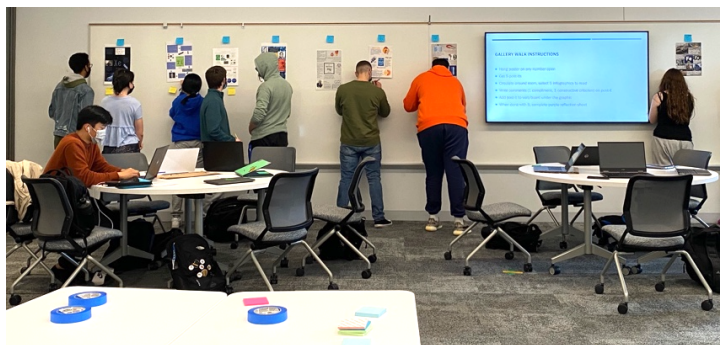
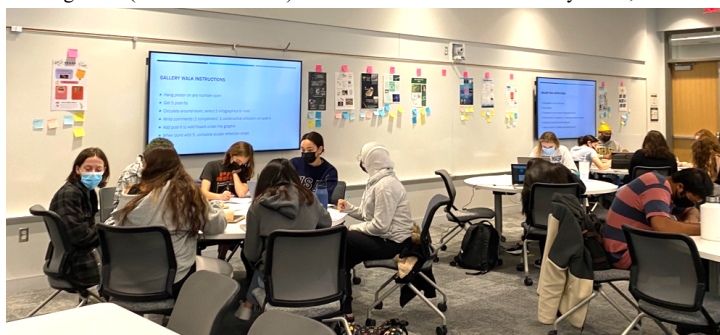


Figure 3: (Above and below) Photos from CHEM 271 Gallery Walk, Fall 2021



The table below shows a summary of the different versions of this assignment over the past 8 years, with the first row describing the assignment title and the first column representing the varying assignment components. The evolution and regular updates to this assignment demonstrate my commitment to growing and changing as an educator.

	Infographic Project	Infographic Project	Infographic Project	Infographic Project	Once Upon a Chemist	Periodic Table Project	Once Upon a Chemist	Once Upon a Bioinorganic Chemist	Elements in Engineering	Elements in Engineering	Bioinorganic Infographics	Elements in Engineering	Elements and Chemical Materials in Engineering	Bioinorganic Infographics	Elements and Chemical Materials in Engineering
CHEM Course	441	446	446	446	211	271	211-H	446	271	271	446	271	271	446	271
Semester Year	FA15	FA16	FA17	FA18	SP19	FA19	SP20	FA20	FA20	SP21	FA21	FA21	SP22	FA22	FA22
Number of students	9	29	33	28	135	92	48	36	78	48	31	54	40	23	74
Student selected topic	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Literature article		√	√	√				√			√			√	
Restricted size			√	√	√	√	√	√	√	√	√	√	√	√	√
Rough draft		√	√	√	√	√	√	√	√	√	√	√	√	√	√
Peer review		√	√	√	√	√	√	√	√	√	√	√	√	√	√
Gallery walk		√	√	√							√	√	√	√	√
Public Display					√	√									
Post-survey			√	√							√	√	√	√	√
Recorded Presentation								√	√	√	√				
Online Discussion Forum								√	√	√	√	√	√	√	√

Tabulated summary of the different iterations of the semester-long infographic assignments in Dr. Rebecca Jones's chemistry classes.

Here are the key characteristics of this assignment that I have learned are important to include:

- 1) Allow students to choose their own topic, but given them some direction.
- 2) Decide on a size and provide a template that can easily be modified.
- 3) Show examples of infographics, ideally from past classes.
- 4) Require a first draft and include peer review.
- 5) Celebrate the end of the assignment with a Gallery Walk.

The rubric I developed for this assignment is provided on the next page. These creative and engaging assignments challenge students to communicate chemistry in a new way and enable learning on new levels.

Infographic Rubric

Infographic Rubric © 2024 by Rebecca M. Jones is licensed under [CC BY-NC-SA 4.0](#)

Component	Advanced	Proficient	Emerging	Novice
<i>Focus</i>	<ul style="list-style-type: none"> ○ Organizational structure (specific title and introduction, sequenced material within the body, transitions, and key points) is clearly and consistently observable, is skillfully employed, and makes the content of the presentation cohesive. 	<ul style="list-style-type: none"> ○ Organizational structure (specific title and introduction, sequenced material within the body, transitions, and key points) is clearly and consistently observable within the presentation. 	<ul style="list-style-type: none"> ○ Organizational structure (specific title and introduction, sequenced material within the body, transitions, and key points) is intermittently observable within the presentation. 	<ul style="list-style-type: none"> ○ Organizational structure (specific title and introduction, sequenced material within the body, transitions, and key points) is not observable within the presentation.
<i>Content</i>	<ul style="list-style-type: none"> ○ A variety of types of content and supporting materials (explanations, examples, illustrations, references) make informative reference to information or analysis that significantly supports the presentation and establishes the presenter's credibility/authority on the topic. 	<ul style="list-style-type: none"> ○ Content and supporting materials make appropriate reference to information or analysis that generally supports the presentation. 	<ul style="list-style-type: none"> ○ Content and supporting materials make appropriate reference to information or analysis that partially supports the presentation. 	<ul style="list-style-type: none"> ○ Insufficient supporting materials make reference to information or analysis that minimally supports the presentation.
<i>Language</i>	<ul style="list-style-type: none"> ○ Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. ○ Grammar, mechanics, spelling, usage, and sentences are all properly used and without error. 	<ul style="list-style-type: none"> ○ Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. ○ Grammar, mechanics, spelling, usage, and sentences are properly used without errors. 	<ul style="list-style-type: none"> ○ Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. ○ Grammar, mechanics, spelling, usage, and sentences are properly used with minimal errors. 	<ul style="list-style-type: none"> ○ Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. ○ Grammar, mechanics, spelling, usage, and sentences contain multiple errors.
<i>Composition</i>	<ul style="list-style-type: none"> ○ Visual components are clear, informative, and well-organized. Very effective use of color, text, and negative space. Extremely pleasing and professional in appearance. 	<ul style="list-style-type: none"> ○ Visual components are mostly clear and organized. Good use of color, text, and negative space. Generally pleasing in appearance. 	<ul style="list-style-type: none"> ○ Visual components are somewhat clear and informative but lack finesse. Use of color, text, and negative space is adequate. 	<ul style="list-style-type: none"> ○ Visual components are unclear, uninformative, and not organized. Distracting use of colors, dominance of text and poor handling of negative space.
<i>Overall</i>	<ul style="list-style-type: none"> ○ An infographic that communicates ideas with clarity and fluency, virtually error-free ○ Developed and presented a very clear and successful chemical story 	<ul style="list-style-type: none"> ○ An infographic that is clear and has few errors. ○ Developed and presented a satisfactory chemical story 	<ul style="list-style-type: none"> ○ An infographic with limited clarity and/or some errors. ○ Developed and presented a chemical story with minor flaws 	<ul style="list-style-type: none"> ○ An infographic that includes sufficient errors to limit or obscure relevance and impede understanding. ○ Developed and presented unclear or unsuccessful chemical story