

Introduction to Green Chemistry in the High School Chemistry Classroom

Online Course Syllabus – Updated March 2, 2022

Introduction to Green Chemistry in the High School Classroom

Colorado School of Mines Course Code: CT-1158-22M (graduate credit is available and there will be a sign-up process the first week of the course)

Class Meeting Information

This is an online class to be completed between June 13 and August 8, 2022. The first week of class is an Orientation week for you to become familiar with the process, syllabus and technical requirements. Please familiarize yourself with the tools available on this system. This course will last for 8 weeks and assignments and forum discussion are due every week coupled with 3 virtual classes: June 29, July 14 and July 28, 2022.

Instructor Information

Name: Cassandra Javner

Email: chjavner@gmail.com I will check e-mail every business day and respond by Monday if emailed over the weekend.

Cassandra Knutson is a Beyond Benign Certified Lead Teacher. Cassie earned her Master's in Education with Technology Integration from St. Catherine's University in 2018. With several American Chemical Society's Journal of Chemical Education publications Cassie is well versed in developing and implementing green chemistry with her students and leading other educators with her experience. In 2018 Cassie and her team from University of Minnesota were awarded the ACS Committee on Environmental Improvement Award for Incorporating Sustainability into Chemistry.

Prerequisites: High School Teaching experience

Course Description:

Green Chemistry is being widely used in industry and the need for future scientists who understand how to use the 12 principles to drive green innovation is acute. Green Chemistry education must be integrated into the way we teach scientists from the earliest ages. This course will provide an introduction to Green Chemistry and give teachers the skills and knowledge to practice green chemistry pedagogy and procedures in their classrooms.

A broad overview of green chemistry will be given including ways that green chemistry is being used in industry. Lesson plans for teachers to use will be introduced which include all of these concepts as well as laboratory activities that can replace those that are currently used by

teachers but are dangerous to human health and the environment. These new learnings are intended to be integrated into the content and standards that teachers are already required to teach and a portion of the work for this class will be developing implementation plans for each teacher. A survey of the available resources to teachers will be explored and those that are available for free download will be emphasized.

Course Objectives

After completing this course, the student will be able to:

- Explain the 12 principles of green chemistry
- Give examples of how these 12 principles are being use in industry to make the world more sustainable.
- Give examples of materials they can use to bring an understanding of green chemistry to their students.
- Understand all of the educational and support materials available to High School teachers in the area of green chemistry.
- Identify those lab activities that are of concern to the health and safety of the environment and human health.
- Develop a course plan that weaves green chemistry lesson plans and lab activities through their existing curriculum

Required readings:

All required readings will be given to students in the form of PDF or web-linked documents. No book purchases are required although throughout the course students will be given recommendations for further reading if they wish to purchase these. The Green Chemistry community has made the majority of these resources available for free for educators and this class will encourage teachers to use those resources.

Forum Participation:

The asynchronous forums constitute the online class discussion and are a *substantial portion (40%)* of your grade. I expect you to participate by posting substantive comments to the forums when assigned. The questions are designed upon the readings and assignments for the week but you are also encouraged to post comments related to general teaching and pedagogy and just general teacher sharing. In addition to posting your own thoughts and ideas, please respond to at least one person's posting for each lesson, you should learn more from your peers here than you can from me so please take advantage of their classroom implementation ideas and tips. The questions I post will not have right or wrong answers and you will be scored on thoughtful participation not on correct content. The purpose of this is to generate student-student interaction. Of course, I invite you to participate much more than the minimum. You may also be learning at different times so please revisit discussion forums often even if you have fulfilled your requirement there. You can set the online learning portal to send new posts to your e-mail if that is an easier way to keep track of the conversations.

PLEASE NOTE: I will not force the forum postings to come to you via email. You can come to the forum at your convenience, and/or you can choose individually for all discussion forum postings to be delivered to your email address. But for the sake of not forcing your inboxes to get filled up with postings, I will leave it to you to decide what method works best. Should you choose not to receive posts by email, you'll have to be responsible for frequently visiting the discussion forums to keep track of the postings.

Types of Communication

In an online course, the majority of our communication takes place in the course forums. However, when we have a need for communication that is private, we will use individual email or telephone. I prefer that you contact me by email for individual questions and only call if it's extremely time-sensitive. If you have questions of a general nature, please post them in the general question area so the whole class can participate.

Use of resources

I expect you to make use of materials in an ethical manner. Always cite your sources of information, and if you find you want to leverage someone's ideas, templates, etc., I expect you to credit the appropriate parties. Sadly, it's pretty easy to spot when a student hasn't done so. Thanks in advance for being responsible!

Netiquette

In an online classroom, our primary means of communication is written. The written language has many advantages: more opportunity for reasoned thought, more ability to go in-depth, and more time to think through an issue before posting a comment. However, written communication also has certain disadvantages, such as a lack of the face-to-face signaling that occurs through body language, intonation, pausing, facial expressions, and gestures. As a result, please be aware of the possibility of miscommunication and compose your comments in a positive, supportive, and constructive manner.

Expectations of Students:

I expect you to:

- Attend class fully prepared to discuss all assigned material – share responsibility for the quality of the experience.
- Contribute to the class discussion in a way that enhances the learning process.
- Conduct yourself in class as you would in a business situation (i.e., be courteous, offer constructive criticism, compliment on a job well done, and give thoughtful feedback).
- Provide ongoing feedback with regard to the extent in which this class is meeting your expectations and objectives.
- Complete all course work, reading and assignments by the class end date, not doing so will affect your grade. You may post assignments whenever you wish during the 8-week course.
- Notify me as soon as possible if you have any emergencies or need more time to complete the course. I may or may not be able to accommodate this request.

Expectations of the Instructor:

You can expect me to:

- Review course content, materials, assignments and forum prompts prior to the start of the class
- Post my syllabus to the class prior to the start date
- Post my welcome message prior to the start date
- Facilitate threaded discussions
- Respond to individual email within 48 hours, during business hours. My email address is chjavner@gmail.com

Give you individual feedback on your posted assignments within a week of submission.

- Enjoy teaching you and learning from you!

Evaluation and Grading

In this course you will be evaluated in the following way:

Assignment 1 (Intro to Green Chemistry Assignment)	20%
Assignment 2 (Industry Connections Lesson Plan)	20%
Assignment 3 (Final Curriculum Roadmap)	20%
Participation in class discussion forums	<u>40%</u>
	100%

Grading Scale

- A = 90% – 100%
- B = 80% – 89%
- C = 70% – 79%
- D = 60% – 69%

Content

All course content can be found on the website learning environment at

<https://canvas.instructure.com/>

Course Outline:

Instructional Time 48 hours

Orientation	Lesson 1 – Please use this week to orient yourself with the Canva course delivery system where your course is located at https://canvas.instructure.com/ During this first week you will begin to understand what green chemistry is and what the green chemistry vision for the future is.
Introducing the 12 principles to your students	Lesson 2 – This week you will be getting familiar with the 12 principles, how they are action items and how you might introduce them to your students and use them as a learning and action tool throughout the school year through videos and short reading.
The case for green chemistry	Lesson 3 – This week we will be making the connection between industry, green

in industry	chemistry and chemistry education. You will read about the way that industry is adopting green chemistry and hopefully make the connection about how critical it is that your students understand the role that chemistry has in the goals of sustainability. You will also see how your students will need green chemistry understanding in order to be workforce competitive in the coming century.
Industry connections in the classroom	Lesson 4 – We will look at some lesson plans that incorporate the latest technologies in Green Chemistry and you will develop a lesson yourself that fits into your curriculum and your standards of learning.
The case for replacing labs	Lesson 5 – This week you will consider some of the laboratory activities you do with your students, why you do them and how you might rethink this instructional method.
Replacing your labs	Lesson 6 – This week you will look at some replacement labs created by Beyond Benign and other organizations. You will consider which ones you might use and how this may impact you classroom efficacy and safety.
Implementation Outline	Lesson 7 & 8– The last two weeks of the course will be dedicated to the most important work you will do for this course. Implementation is the key to green chemistry. As Dr. Warner would say, “green chemistry isn’t a concept it is a practice”. Once all the implementation outlines are uploaded you will be able to review them all. Your classmates are the real experts here so please review their plans and use them to help inform your vision.