

Uniting STEM Learning, Campus Health, and Career Skills: A Service-Learning Approach in Organic Chemistry



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What is Service-Learning?

Service learning is an educational approach that combines academic coursework with meaningful community service, fostering reciprocal learning between students and community partners. Unlike traditional outreach or internships, service learning is characterized by its integration of structured reflection and direct engagement, ensuring that students not only serve but also learn from the communities they work with, and vice versa.

Service-Learning project on Cannabis awareness

Service-Learning in Organic Chemistry (Spring 2025)

- Our organic chemistry lab partnered with UConn Student Health and Wellness (SHaW) for a semester-long service-learning project.
- SHaW's mission is to support UConn's educational goals by promoting the optimal well-being of all students.
- In response to rapid policy changes legalizing medical and recreational cannabis, there is an urgent need for clear, science-based education on responsible use.

Cannabis Chemistry Context

- Cannabis contains 100+ cannabinoids; key examples are tetrahydrocannabinol (THC) and cannabidiol (CBD).
- THC and CBD share similar chemical frameworks, but THC's additional cyclic ring leads to different pharmacological effects.
- THC content is closely associated with cannabis's psychoactive properties.

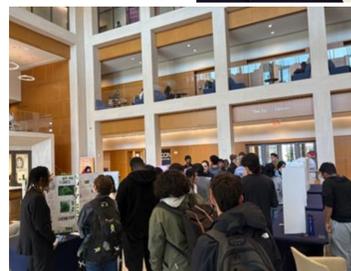
Project Design and Outcomes

- In consultation with SHaW, students created educational brochures and posters on cannabis chemistry and responsible use.
- Expectations were detailed in the syllabus, and an SHaW representative visited early in the semester to outline community needs.
- Students were encouraged to pursue self-directed topics related to cannabis chemistry and health, with ongoing guidance from the instructor and SHaW.
- Brochures produced in the course are now used by SHaW across UConn campuses.
- The semester culminated in a public poster session where students presented their work and engaged with the UConn community.
- At the end of the semester survey containing both qualitative and quantitative questions were conducted.

Thematic Analysis of Student Reflections

Thematic Category	Description of Learning Evidence	Representative Student Comments (2025)
Conceptual Understanding	Applied chemical principles to specific substances	"I can now explain THC vs. CBD structure differences."
Real-World Application	Connected chemistry to healthcare and social challenges	"Showed chemistry's role in responsible cannabis education."
Civic & Ethical Awareness	Reflected on moral and community responsibility	"Realized how science can guide safe use education."
Professional & Personal Development	Improved self-efficacy, teamwork, and science communication	"Increased confidence discussing science publicly."
Engagement & Motivation	Expressed enthusiasm and active learning	"Made me see organic as meaningful and exciting."
Challenges & Growth	Acknowledged personal difficulties and learning process	"Balancing accuracy and accessibility was challenging."

Students Poster Presentation



Pedagogical Integration

Organic Chemistry topic	Cannabis Education Project	Conceptual Link
Functional Groups	Analysis of phenolic hydroxyls and alkenyl groups in THC and CBD; exploration of the effect on receptor selectivity and psychoactivity.	Demonstrates how chemical functionality modulates biological activity across two drug classes.
Structure-Function Relationships	Visualization of isomeric differences between THC and CBD; discussion of structural motifs responsible for agonist vs. modulator behavior.	Reinforces how minor structural variations translate to distinct physiological and behavioral outcomes.
Stereochemistry	Exploration of stereochemical effects in THC's trans vs. cis conformations and their influence on CB ₁ binding.	Strengthens understanding of stereochemical control of pharmacological activity.
Societal Health Applications	Public education on responsible cannabis use and differences between medicinal and recreational products.	Links chemical understanding to community health and evidence-based awareness.

Why Career Readiness and Incorporating NACE [National Association of Colleges and Employers] competencies?

Many students enroll in Organic Chemistry with aspirations for careers in the medical field, often focusing solely on achieving high grades. However, they may not be aware of the wide range of career paths available beyond becoming a doctor, or the essential skills required to succeed in these roles and secure internships. By introducing NACE Career Readiness Competencies early in their academic journey at UConn, students can begin to see their coursework from a broader perspective. This approach encourages them not only to excel academically, but also to actively explore diverse career options, develop critical professional skills, and gain a deeper understanding of their own strengths and interests. Leveraging resources such as the Center for Career Development empowers students to grow holistically, preparing them for success both inside and outside the classroom.

Competency	New Graduates	Employers
Communication	79.4%	55.2%
Critical Thinking	81.5%	66.1%
Teamwork	86.9%	78.1%
Career & Self-Development	63.9%	47.1%
Professionalism	84.6%	50.0%
Leadership	68.5%	36.8%
Technology	68.1%	81.7%
Equity & Inclusion	81.0%	70.8%



Source: National Association of Colleges and Employers. Data are from NACE's 2022 Student Survey and the 2022 Employer Survey. These are the percentages of employers, students and employers who "very frequently" or "sometimes frequently" use the respective competency.

Course Context

Chem 2443 – Organic Chemistry 1 (3.0 credits)

Format & Enrollment: Traditional lecture setting with an enrollment of 20–45 students. The majority are in their second year of study.

Student Profile: Students enrolled in Chem 2443 are predominantly non-chemistry majors who are preparing for entry into medical, dental, pharmacy, or graduate school. This course is a required prerequisite for these professional and academic pathways.

Course Role: As the foundational course in Organic Chemistry, Chem 2443 is designed to equip students with essential knowledge and skills. The syllabus is carefully aligned with the requirements set forth by the American Chemical Society, ensuring a robust and comprehensive introduction to organic chemistry.

Assignment Structure for NACE Competencies Awareness

Start of the semester students completed pre-impact career readiness survey and NACE career readiness assessment.

During the semester students completed a module designed by University of Connecticut Career Readiness Center, "Decisions and Destinations: Crafting Your Major & Charting Career Paths".

During mid semester guest speak Dr. Vincent Pistrutto who is a research scientist from Pfizer and a UCONN alumni came to the lecture and talked about their career journey.

At the end of the semester students did an in-class presentation describing connection of Organic Chemistry with their intended career goals and how NACE competencies were developed during the course.

Guidelines for the presentation:

Length: Aim for a presentation of approximately 5 minutes.

Focus: Explore how organic chemistry connects to your major or potential career path.

Career Competencies:

Incorporate relevant NACE Career Competencies that will support career journey. Students can choose to highlight one or two competencies in detail and discuss how they relate to their goals.

Grading Criteria for the poster:

Presentations will be evaluated based on:

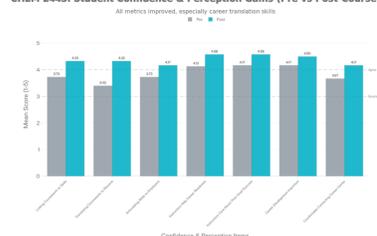
- Visual quality and organization
- Depth and quality of research
- Clarity and engagement of delivery

Both the instructor and your peers will participate in the grading process.

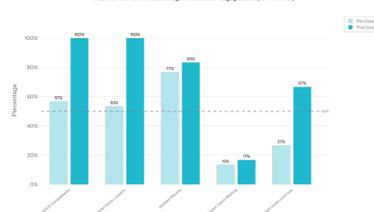
At the end of the semester students completed the NACE career readiness assessment.

Results and Findings

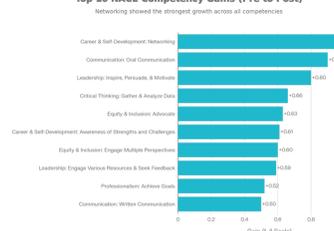
CHEM 2443: Student Confidence & Perception Gains (Pre vs Post-Course)



CHEM 2443: Career Knowledge & Resource Engagement (Pre vs Post)



Top 10 NACE Competency Gains (Pre to Post)



References

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- University of Connecticut Center for Career Development. Integrating Career Competencies. <https://career.uconn.edu/resources/integrating-career-competencies/>