

Supporting Information

Exploring Curriculum Adoption of Green and Sustainable Chemistry in Undergraduate Organic Chemistry Courses: Results from a National Survey in the United States

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Contents

Administered "Incorporation of Green Chemistry into Organic Chemistry" survey.....	1
Fig. S1 Resources utilized in learning about green chemistry topics.....	16
Fig. S2 Resources utilized in learning about UN SDGs.....	16
Fig. S3 Self-reported factors limiting incorporation of green chemistry.....	17
Fig. S4 Self-reported factors promoting incorporation of green chemistry.....	17

Incorporation of Green Chemistry into Organic Chemistry

Start of Block: Consent Form

NDSU **North Dakota State University**

Department of ----Chemistry and Biochemistry
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Fargo, ND 58108-6050

Title of Research Study: Exploring Curriculum Adoption of Green Chemistry via National Survey

Dear Professor \${m://LastName}:

My name is Krystal Grieger. I am a graduate student in the Department of Chemistry and Biochemistry at North Dakota State University, and I am conducting a research project to determine the extent that green chemistry is incorporated into the traditional two semester organic chemistry curriculum and what factors affect its incorporation.

Because you are an organic chemistry professor, you are invited to take part in this research project. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

There are no likely risks to you if you participate in this study. There are no direct benefits to you for being in this study. However, your participation may guide future green chemistry curriculum development and identify factors which should be addressed to increase incorporation of green chemistry into the curriculum.

It should take up to 25 minutes to complete the questions about incorporating green chemistry into the organic curriculum. This study is anonymous. That means that no one, not even members of the research team, will know that the information you give comes from you.

If you have any questions about this project, please contact me at Krystal.Grieger@ndus.edu or contact my advisor at Alexey.Leontyev@ndsu.edu. You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701.231.8995, toll-free at 1-855-800-6717, by email at ndsu.irb@ndsu.edu, or by mail at: NDSU HRPP Office, NDSU Dept. 4000, P.O. Box 6050, Fargo, ND 58108-6050.

Thank you for your taking part in this research. If you wish to receive a copy of the results, please contact Krystal Grieger at Krystal.Grieger@ndsu.edu or Dr. Alexey Leontyev at Alexey.Leontyev@ndsu.edu.

Eligibility:

1. You are over 18
2. You have taught organic chemistry in the last 5 years

Q1.2 ELECTRONIC CONSENT: Please select your choice below. You may print a copy of this consent form for your records.

Clicking on the "Agree" button indicates that

- You have read the above information.
- You are eligible to participate.
- You voluntarily agree to participate.
 - Agree (1)
 - Disagree (2)

Skip To: End of Survey If ELECTRONIC CONSENT: Please select your choice below. You may print a copy of this consent form fo... = Disagree

End of Block: Consent Form

Start of Block: Qualifying Questions

Q2.1 In the last five years, which of the following organic chemistry courses have you taught? Please choose **all** that apply.

- Survey (1 semester organic chemistry course) (1)
- Traditional (2 semester organic chemistry course) (2)
- General, Organic, and Biochemistry (1-2 semester survey course) (3)
- Majors section of organic chemistry course (4)
- Other. Please specify. (5) _____
- I have not taught organic chemistry in the last five years. (6)

Skip To: End of Survey If In the last five years, which of the following organic chemistry courses have you taught? Please... = I have not taught organic chemistry in the last five years.

End of Block: Qualifying Questions

Start of Block: Survey

Q3.1 The nature and scope of green chemistry has been evolving and changing. How would **you** define "green chemistry"?

Q3.2 Was **green chemistry** incorporated in the organic chemistry course that you took as an undergraduate?

- Yes, green chemistry was explicitly incorporated. (4)
 - Yes, some aspects of green chemistry were incorporated, but the connections were not made explicit. (9)
 - No, green chemistry was not incorporated. (10)
 - I am unsure whether green chemistry was incorporated. (11)
-

Q3.3 Please rate your familiarity with each of the following **Green Chemistry** topics.

	Very Familiar (1)	Familiar (2)	Somewhat familiar (3)	Not familiar (4)	Have not heard of it before (5)
a. Reaction efficiency: minimizing the quantities of chemicals (reactants, reagents, solvents, etc.), energy and water used to make a product (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Efficiency metrics: calculating the efficiency of reactions or processes, for example through process mass intensity, atom economy or other efficiency metrics (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Process efficiency: reducing the number of synthetic/process steps to produce chemicals, materials and products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Renewable sources: utilizing renewable feedstocks in place of petroleum feedstocks (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Catalysis: replacing stoichiometric reagents with catalytic reagents (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Lifecycle impacts of chemicals: understanding how chemicals are produced and the social, environmental and economic impacts of their extraction or manufacture (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Chemicals in the environment: understanding the fate, persistence and degradability of man-made chemicals in the environment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Chemical hazards and exposure: identifying environmental, safety and health hazards, as well as potential sources of exposure. Selection and design of chemicals that are less hazardous alternatives to known chemicals and products (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Recycling: recycling reagents, solvents, or materials (47)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.4 How did you learn about these **Green Chemistry** topics? Please choose **all** that apply.

- Conferences (1)
 - Seminars (2)
 - Workshops (3)
 - Coursework (either undergraduate or graduate) (4)
 - Peer network (5)
 - Organization resources (such as ACS Green Chemistry Institute or Beyond Benign) (6)
 - Online resources (7)
 - Journal articles (8)
 - Textbooks (9)
 - I have not learned about these green chemistry topics. (10)
 - Other. Please specify. (11) _____
-

Q3.7 Please rate your familiarity with the **United Nations (UN) Sustainable Development Goals**.

- I am knowledgeable about the goals and can relate them to organic chemistry. (1)
- I am familiar with the goals but not sure how to relate them to organic chemistry. (2)
- I have heard of the goals, but do not know what they are. (3)
- I have not heard of the UN Sustainable Development Goals. (4)

Display This Question:

If Please rate your familiarity with the United Nations (UN) Sustainable Development Goals. != I have not heard of the UN Sustainable Development Goals.

Q3.8 How did you learn about the **United Nations Sustainable Development Goals**? Please choose **all** that apply.

- Conferences (1)
 - Seminars (2)
 - Workshops (3)
 - Coursework (either undergraduate or graduate) (4)
 - Peer network (5)
 - Organization resources (such as ACS Green Chemistry Institute or Beyond Benign) (6)
 - Online resources (7)
 - Journal articles (8)
 - Textbooks (9)
 - I have not learned about the the United Nations Sustainable Development Goals. (10)
 - Other. Please specify. (11) _____
-

Q3.9 Please rate your familiarity with the **Planetary Boundaries**.

- I am knowledgeable about the Planetary Boundaries and can relate them to organic chemistry. (1)
 - I am familiar with the Planetary Boundaries but not sure how to relate them to organic chemistry. (2)
 - I have heard of the Planetary Boundaries, but do not know what they are. (3)
 - I have not heard of the Planetary Boundaries. (4)
-

Display This Question:

If Please rate your familiarity with the Planetary Boundaries. != I have not heard of the Planetary Boundaries.

Q3.10 How did you learn about the **Planetary Boundaries**? Please choose **all** that apply.

- Conferences (1)
- Seminars (2)
- Workshops (3)
- Coursework (either undergraduate or graduate) (4)
- Peer network (5)
- Organization resources (such as ACS Green Chemistry Institute or Beyond Benign) (6)
- Online resources (7)
- Journal articles (8)
- Textbooks (9)
- I have not learned about the the Planetary Boundaries. (10)
- Other. Please specify. (11) _____

Q3.11 Please answer the following questions based on a traditional 2 semester organic chemistry course that you teach.

Q3.12 How important is it for current chemistry and related science graduates to understand the following **Green Chemistry** topics?

	Extremely important (1)	Very important (2)	Moderately important (3)	Slightly important (4)	Not at all important (5)
a. Reaction efficiency : minimizing the quantities of chemicals (reactants, reagents, solvents, etc.), energy and water used to make a product (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Efficiency metrics : calculating the efficiency of reactions or processes, for example through process mass intensity, atom economy or other efficiency metrics (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Process efficiency : reducing the number of synthetic/process steps to produce chemicals, materials and products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Renewable sources : utilizing renewable feedstocks in place of petroleum feedstocks (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Catalysis : replacing stoichiometric reagents with catalysts (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Lifecycle impacts of chemicals : understanding how chemicals are produced and the social, environmental and economic impacts of their extraction or manufacture (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Chemicals in the environment : understanding the fate, persistence and degradability of man-made chemicals in the environment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Chemical hazards and exposure : identifying environmental, safety and health hazards, as well as potential sources of exposure. Selection and design of chemicals that are less hazardous alternatives to known chemicals and products (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Recycling : recycling reagents, solvents, or materials (47)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.14 How important is it for current chemistry and related science graduates to understand the **United Nations Sustainable Development Goals**?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not at all important (5)
-

Q3.15 How important is it for current chemistry and related science graduates to understand the **Planetary Boundaries**?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not at all important (5)
-

Q3.16 *The following questions will ask you about your incorporation of **Green Chemistry** into your organic chemistry lecture curriculum.*

Q3.17 Which of the following Green Chemistry topics do you **explicitly** or **implicitly** address in your classroom activities and course assessments?

Explicit instruction refers to providing clear learning goals for the topic and actively integrating it into the classroom activity and/or course assessments.

Implicit instruction refers to presenting the topics without defining clear learning goals for them. The topic is addressed but in the background and not the focus of the classroom activity and/or course assessment.

	Classroom Activities			Course Assessments		
	Explicitly (1)	Implicitly (2)	Not Addressed (3)	Explicitly (1)	Implicitly (2)	Not Addressed (3)
a. Reaction efficiency: minimizing the quantities of chemicals (reactants, reagents, solvents, etc.), energy and water used to make a product (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Efficiency metrics: calculating the efficiency of reactions or processes, for example through process mass intensity, atom economy or other efficiency metrics (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Process efficiency: reducing the number of synthetic/process steps to produce chemicals, materials and products (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Renewable sources: utilizing renewable feedstocks in place of petroleum feedstocks (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Catalysis: replacing stoichiometric reagents with catalysts (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Lifecycle impacts of chemicals: understanding how chemicals are produced and the social, environmental and economic impacts of their extraction or manufacture (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Chemicals in the environment: understanding the fate, persistence and degradability of man-made chemicals in the environment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Chemical hazards and exposure: identifying environmental, safety and health hazards, as well as potential sources of exposure. Selection and design of chemicals that are less hazardous alternatives to known chemicals and products (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Recycling: Recycling reagents, solvents, or materials (47)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.18 Who has given you feedback regarding your integration of these **Green Chemistry** topics?

- Students (4)
- Colleagues (2)
- Administration (1)
- I did not receive feedback. (3)

Display This Question:

If *Who has given you feedback regarding your integration of these Green Chemistry topics?* = Students

Q3.19 What type of feedback from **students** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If *Who has given you feedback regarding your integration of these Green Chemistry topics? = Colleagues*

Q3.20 What type of feedback from **colleagues** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If *Who has given you feedback regarding your integration of these Green Chemistry topics? = Administration*

Q3.21 What type of feedback from **administration (ie. department chair/dean/provost/ect.)** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If *Who has given you feedback regarding your integration of these Green Chemistry topics? != I did not receive feedback.*

Q3.22 What effect has the received feedback had on your incorporation of the **Green Chemistry** topics into the curriculum?

Q3.31 *The following questions will ask you about your incorporation of **Planetary Boundaries** into your organic chemistry curriculum.*

Planetary boundaries aim to "define the environmental limits within which humanity can safely operate". They include climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, biogeochemical flows, freshwater use, land-system change, and biosphere integrity (Steffen et al., 2015).

Reference: Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). *Planetary boundaries: Guiding human development on a changing planet. Science, 347(6223).*
<https://doi.org/10.1126/science.1259855>

Q3.32 Have you incorporated the **Planetary Boundaries** into the organic chemistry class that you are teaching?

- Yes, I explicitly incorporate Planetary Boundaries throughout the semester. (1)
- Yes, I incorporate some aspects of Planetary Boundaries into the organic chemistry class that I teach. (4)
- No, I have not incorporated the nine planetary boundaries into the organic chemistry class that I teach. (5)

Display This Question:

If Have you incorporated the Planetary Boundaries into the organic chemistry class that you are teach... != No, I have not incorporated the nine planetary boundaries into the organic chemistry class that I teach.

Q3.33 How do you assess the concept of **Planetary Boundaries** that is covered in your classes? Please choose **all** that apply.

- Exams (1)
- Quizzes (2)
- Homework/Assignments (3)
- Student projects (4)
- Class papers (5)
- Lab reports (6)
- Informal classroom observations (7)
- I do not assess student knowledge about planetary boundaries. (8)
- Other: Please specify. (9) _____

Display This Question:

If Have you incorporated the Planetary Boundaries into the organic chemistry class that you are teach... != No, I have not incorporated the nine planetary boundaries into the organic chemistry class that I teach.

Q3.34 Who has given you feedback regarding your integration of **Planetary Boundaries** into the curriculum?

- Students (4)
- Colleagues (2)
- Administration (1)
- I did not receive feedback. (3)

Q3.35 What type of feedback from **students** have you received?

Display This Question:

If Who has given you feedback regarding your integration of Planetary Boundaries into the curriculum? = Students

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of Planetary Boundaries into the curriculum? = Colleagues

Q3.36 What type of feedback from **colleagues** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of Planetary Boundaries into the curriculum? = Administration

Q3.37 What type of feedback from **administration (ie. department chair/dean/provost/ect.)** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of Planetary Boundaries into the curriculum? , I did not receive feedback. Is Not Displayed

Q3.38 What effect has the received feedback had on your incorporation of **Planetary Boundaries** into the curriculum?

Q3.39 The following questions will ask you about your incorporation of the **United Nations (UN) Sustainable Development Goals** into your organic chemistry curriculum.

Established in 2015, the 17 UN Sustainable Development Goals provide guidelines "for equitable and responsible development, respectful of humans and ecosystems" (Anastas *et al.*, 2021). The UN Sustainable Development Goals are listed below.

- | | |
|---|---|
| 1. No poverty | 10. Reduced Inequalities |
| 2. Zero hunger | 11. Sustainable cities and communities |
| 3. Good health and well-being | 12. Responsible consumption and production |
| 4. Quality education | 13. Climate action |
| 5. Gender equality | 14. Life below water |
| 6. Clean water and sanitation | 15. Life on land |
| 7. Affordable and clean energy | 16. Peace, justice, and strong institutions |
| 8. Decent work and economic growth | 17. Partnerships |
| 9. Industry, innovation, and infrastructure | |

Reference: Anastas, P., Nolasco, M., Kerton, F., Kirchhoff, M., Licence, P., Pradeep, T., Subramaniam, B., Moores, A. (2021). The power of the United Nations Sustainable Development Goals in Sustainable Chemistry and Engineering Research. *ACS Sustainable Chemistry & Engineering*, 9(24), 8015–8017. <https://doi.org/10.1021/acssuschemeng.1c03762>

Q3.40 Have you incorporated the **UN Sustainable Development Goals** into the organic chemistry class that you are teaching?

- Yes, I explicitly incorporate the UN Sustainable Development Goals throughout the semester. (1)
- Yes, I incorporate some aspects of the UN Sustainable Development Goals into the organic chemistry class that I teach. (4)
- No, I have not incorporated the UN Sustainable Development Goals into the organic chemistry course that I am teaching. (5)

Display This Question:

If Have you incorporated the UN Sustainable Development Goals into the organic chemistry class that... != No, I have not incorporated the UN Sustainable Development Goals into the organic chemistry course that I am teaching.

Q3.41 How do you assess the **UN Sustainable Development Goals** that is covered in your classes? Please choose **all** that apply.

- Exams (1)
- Quizzes (2)
- Homework/Assignments (3)
- Student projects (4)
- Class papers (5)
- Lab reports (6)
- Informal classroom observations (7)
- I do not assess student knowledge about UN Sustainable Development Goals. (8)
- Other: Please specify. (9) _____

Display This Question:

If Have you incorporated the UN Sustainable Development Goals into the organic chemistry class that... != No, I have not incorporated the UN Sustainable Development Goals into the organic chemistry course that I am teaching.

Q3.42 Who has given you feedback regarding your integration of **UN Sustainable Development Goals** into the curriculum?

- Students (4)
- Colleagues (2)
- Administration (1)
- I did not receive feedback. (3)

Display This Question:

If Who has given you feedback regarding your integration of UN Sustainable Development Goals into th... = Students

Q3.43 What type of feedback from **students** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of UN Sustainable Development Goals into th... = Colleagues

Q3.44 What type of feedback from **colleagues** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of UN Sustainable Development Goals into th... = Administration

Q3.45 What type of feedback from **administration (ie. department chair/dean/provost/ect.)** have you received?

- Only **positive** feedback was received. (4)
- Mostly **positive** feedback was received. (5)
- Mixed **positive** and **negative** feedback was received. (7)
- Mostly **negative** feedback was received. (8)
- Only **negative** feedback was received. (9)

Display This Question:

If Who has given you feedback regarding your integration of UN Sustainable Development Goals into th... != I did not receive feedback.

Q3.46 What effect has the received feedback had on your incorporation of **UN Sustainable Development Goals** into the curriculum?

Q3.47 *The following questions will ask about how green chemistry is incorporated within your department.*

Q3.48 How is green chemistry incorporated into the curriculum taught by your department?

- We are **required** to incorporate green chemistry into the curriculum. (1)
- We are **encouraged** to incorporate green chemistry into the curriculum. (2)
- We are **neither encouraged nor discouraged** to incorporate green chemistry into the curriculum. (3)
- We are **discouraged** to incorporate green chemistry into the curriculum. (4)

Q3.49 What is the extent to which green chemistry is incorporated into your department? Please choose **all** that apply.

- Other faculty members in my department incorporate green chemistry into their curriculum. (1)
- Other faculty members in my department are considering incorporating green chemistry into their curriculum. (2)
- I am the only person in my department who incorporates green chemistry into the curriculum. (3)
- I am the only person in my department who is considering incorporating green chemistry into the curriculum. (4)
- No one in our department incorporates or is considering incorporating green chemistry into the curriculum. (5)

Q3.50 *The following questions will ask about factors affecting implementation of green chemistry into your curriculum.*

Q3.51 What factors, if any, affect the incorporation of green chemistry into **your** curriculum?

Q3.52 If you have taught more than one type of organic chemistry class (Survey; Traditional; General, Organic, and Biochemistry; or Majors), how did the type of course affect whether and which aspects of green chemistry were incorporated?

Q3.53 Please rate the following statements from Strongly Agree to Strongly Disagree.

	Strongly Agree (1)	Agree (2)	Disagree (3)	Strongly Disagree (4)
a. I know other faculty who incorporate green chemistry into the curriculum. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. I have adequate resources to incorporate green chemistry into my curriculum. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. I cannot incorporate green chemistry because my curriculum is already too full. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Incorporating green chemistry is not a high priority for me. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Learning green chemistry is not a high priority for my students. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. I do not have enough time to develop new materials to incorporate green chemistry into the curriculum. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. I would benefit from extra guidance for incorporating green chemistry into the curriculum. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. I am unsure which aspects of green chemistry should be incorporated into the curriculum. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. I am involved in organizations focused on green chemistry such as Beyond Benign and ACS Green Chemistry Institute. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. I actively attend seminars on green chemistry at conferences and workshops. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. A lack of resources limits the incorporation of green chemistry into my curriculum. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. I have a network of other faculty with whom I can discuss ways to incorporate green chemistry into my curriculum. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. I would like to have a network of faculty with whom I can discuss ways to incorporate green chemistry into my curriculum. (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n. I cover green chemistry concepts that are not included in the course textbook. (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o. I would incorporate more green chemistry if I had access to premade green chemistry instructional materials and lesson plans. (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p. I would incorporate green chemistry if I had a better understanding of the concepts. (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q. I have a strong understanding of the green chemistry concepts. (17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Survey

Start of Block: Demographics

Q4.1 The following questions will ask about the academic institution where you currently teach.

Q4.2 Do you teach at a public or private institution?

- Public (1)
 - Private (2)
-

Q4.3 What is the highest chemistry degree offered at the academic institution where you currently teach?

- Associate (1)
 - Baccalaureate (2)
 - Master's (3)
 - Doctorate (4)
 - No chemistry degree is offered at my institution. (5)
-

Q4.4 Please indicate the approximate size of your institution's total enrollment.

- Under 1,500 students (4)
 - Over 1,500 and up to 5,000 students (5)
 - Over 5,000 and up to 10,000 students (6)
 - Over 10,000 and up to 20,000 students (7)
 - Over 20,000 and up to 50,000 students (8)
 - Over 50,000 students (9)
-

Q4.5 Please answer the following questions based on the traditional 2 semester organic chemistry course that you most recently taught.

Q4.6 What was the course format?

- Quarter (1)
 - Trimester (2)
 - Semester (3)
 - Other. Please specify. (4) _____
-

Q4.7 Who were the primary decision makers for the inclusion of course content?

- Yourself (1)
 - Yourself and one other person (2)
 - Yourself and several other people (3)
 - Someone else or several other people (4)
-

Q4.8 How many times have you taught this course?

Q4.9 Approximately how many students are typically enrolled in your traditional organic chemistry lecture course sections?

- Less than 50 students (4)
 - 51 - 100 students (5)
 - 101 - 150 students (6)
 - 151 - 200 students (7)
 - 201 - 250 students (8)
 - More than 250 students (9)
-

Q4.10 Which of the following teaching techniques do you regularly incorporate into your curriculum? Please choose **all** that apply.

- Lecture (1)
 - Think-Pair-Share (2)
 - Just-in-Time-Teaching (3)
 - Peer-Led Team Learning (4)
 - Teaching with case studies (5)
 - Process Oriented Guided Inquiry Learning (6)
 - Problem-based learning (7)
 - Flipped classroom (8)
-

Q4.11 *The following demographic questions will be used only for classification purposes.*

Q4.12 What is your gender identification?

Q4.13 How many years have you been teaching in higher education, excluding graduate school teaching?

Q4.14 In what area of chemistry was your highest degree achieved?

- Analytical Chemistry (3)
 - Biochemistry (5)
 - Chemistry Education (6)
 - Inorganic Chemistry (4)
 - Organic Chemistry (1)
 - Physical Chemistry (2)
 - Other. Please specify. (7) _____
-

Q4.15 Is green chemistry part of your research?

- Yes (1)
 - No (2)
-

Q4.16 Have you taught a course on green chemistry?

- Yes (1)
 - No (2)
-

Q110 We are interested in conducting two follow-up studies on the integration of green chemistry into organic chemistry. We are interested in conducting virtual interviews with faculty and we are also interested in collecting survey data from organic chemistry students. If you are willing to participate in either or both of these, please provide your email and indicate which you would be willing to participate in.

- Email Address (1) _____
-

Q111

- Available for follow-up virtual interview (1)
- Able to provide surveys to organic chemistry students (2)

End of Block: Demographics

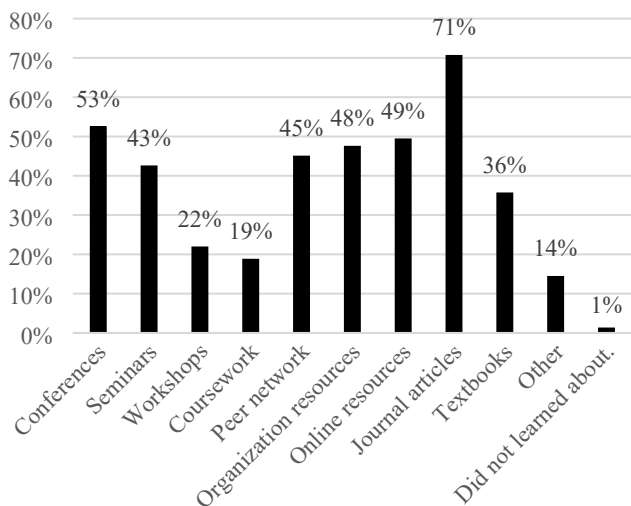


Fig. S1 Resources utilized in learning about green chemistry topics^a

^aSince respondents could select multiple answers, the values do not add up to 100%. Responses classified as other were free responses which included working in industry, teaching a course on it, and through conducting research.

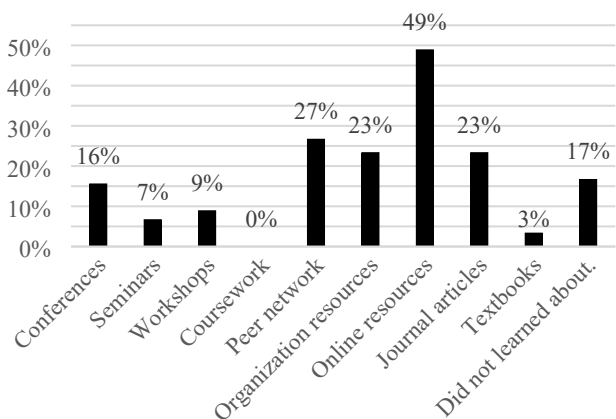


Fig. S2 Resources utilized in learning about UN SDGs

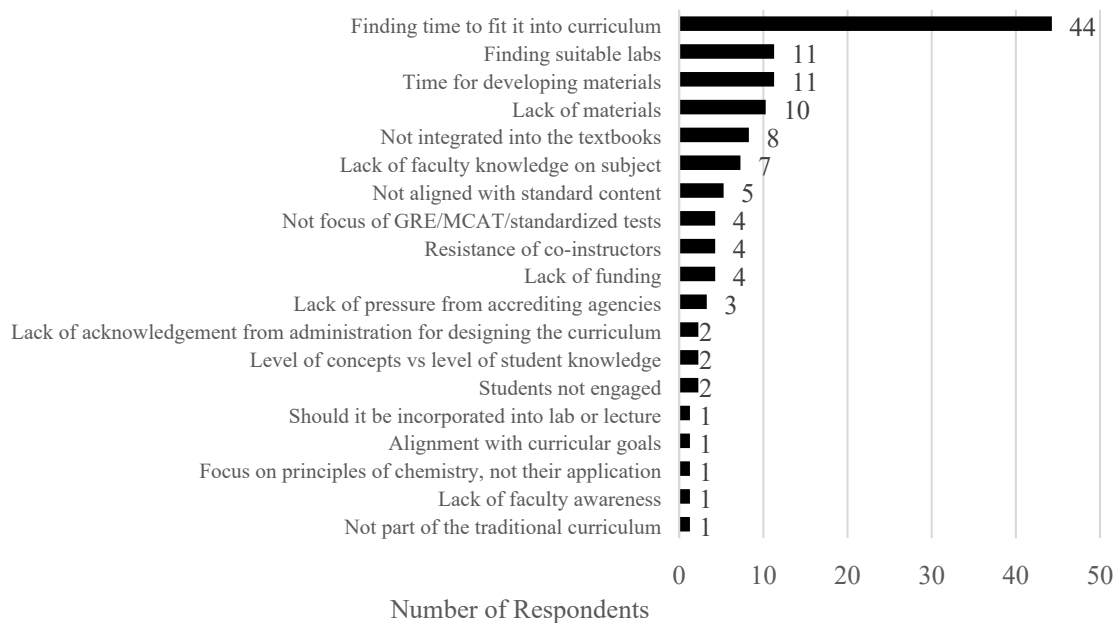


Fig. S3 Self-reported factors limiting incorporation of green chemistry

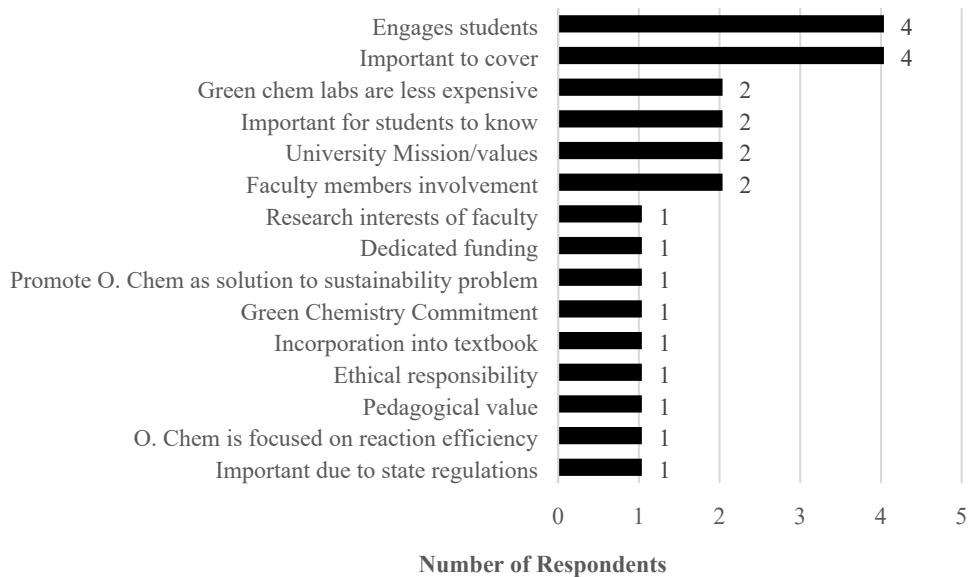


Fig. S4 Self-reported factors promoting incorporation of green chemistry