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# Green Chemistry Education

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Executive Director  
Beyond Benign

# Outline

- Beyond Benign Introduction
- Answering Questions:
  - What is the current state of Green Chemistry education?
  - What are the key barriers to adopting Green Chemistry education practices?
  - Where are the opportunities?
  - What is the role of companies ensuring an “army” of students trained in green chemistry?
  - How can companies best support the development of green chemists?
- Green Chemistry Commitment



At Beyond Benign we are dedicated to providing future and current scientists, educators and citizens with the tools to teach and learn about green chemistry and sustainable science in order to create sustainable materials and products grounded in sustainability principles. Through this pro-active approach, materials and products can be developed that are sustainable from the beginning design stage through the manufacturing stage of a product lifecycle.



[www.beyondbenign.org](http://www.beyondbenign.org)

## K-12

- Curriculum Development and Teacher Training
  - Green Chemistry
  - Green Math & Engineering
  - Biotechnology
  - Over 150 lesson plans available on-line for download (free!)
- On-Line Courses for Teachers
  - Green Chemistry 101
  - Advanced Green Chemistry

## Community

- K-12 and Community Outreach
  - K-12 classroom visits
  - Community events
  - Informational/promotional events
- Community Building (Regional and International)
  - Current Initiatives:
    - New England
    - India
    - Bangladesh

## Workforce Development

- Academia
  - Curriculum Development and Training
    - Toxicology and Environmental Health Sciences for Chemists
  - Resources and Tools
  - The Green Chemistry Commitment
- Workforce
  - Technical Training
    - Green chemistry training for workers
    - iSUSTAIN™ Green Chemistry Index



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# What is the current state of Green Chemistry education?

- We are doing much more than ever before!
- Green Chemistry is being incorporated in to K-12 science courses.
- Green Chemistry is being introduced at the college/university level.
- Green Chemistry is being taught to practicing chemists and business leaders.

# What is the current state of Green Chemistry education?

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- Green Chemistry is being introduced at the college/university level.
- Green Chemistry is being taught to practicing chemists and business leaders.

*...are we changing the education of scientist to enter the workforce better prepared to design green chemistry solutions?*

# Green Chemistry Education: **Current State**



K-12

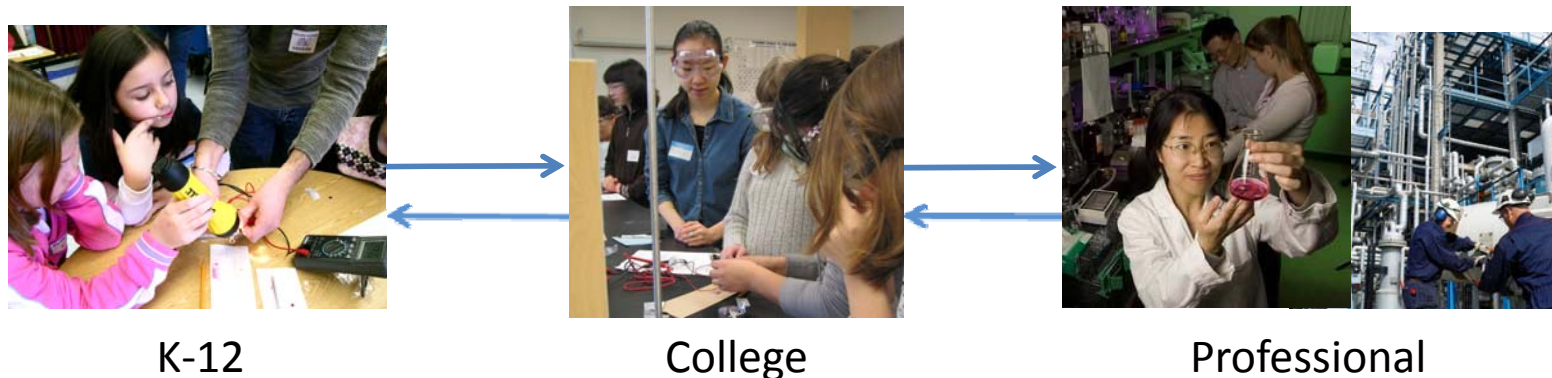


College



Professional

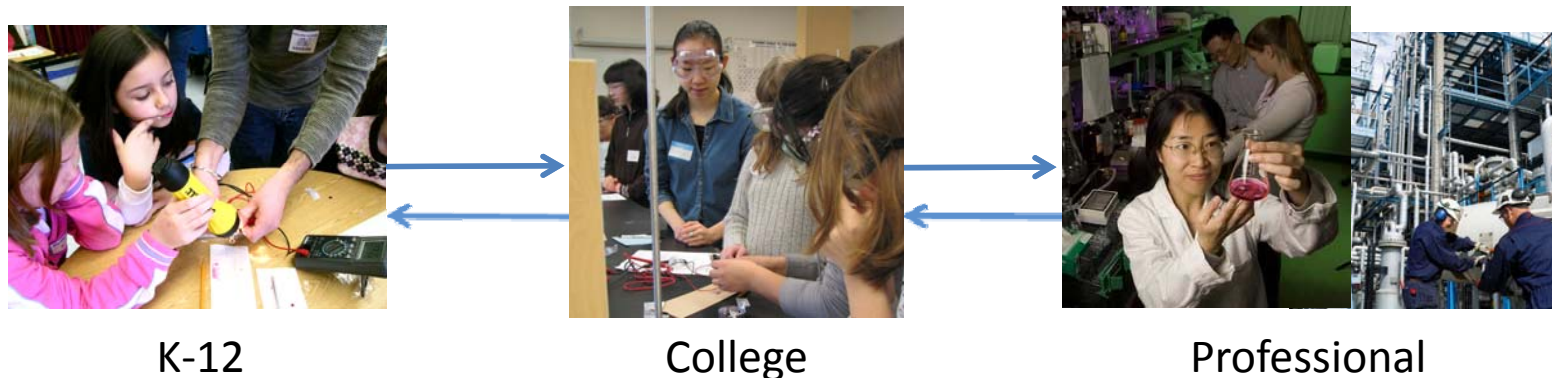
# Green Chemistry Education: **Current State**



Awareness			
Support			
Resources			

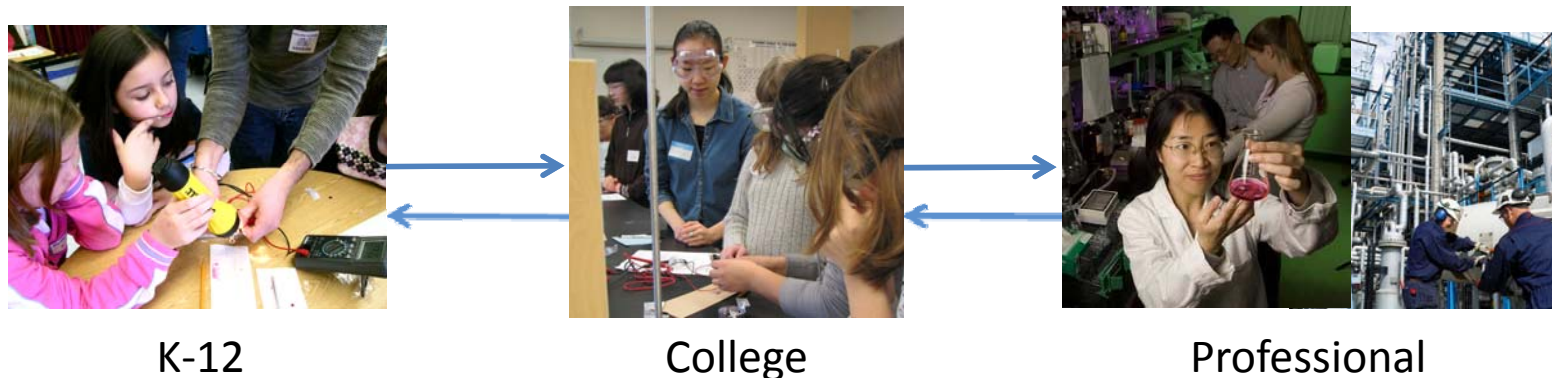


# Green Chemistry Education: **Current State**



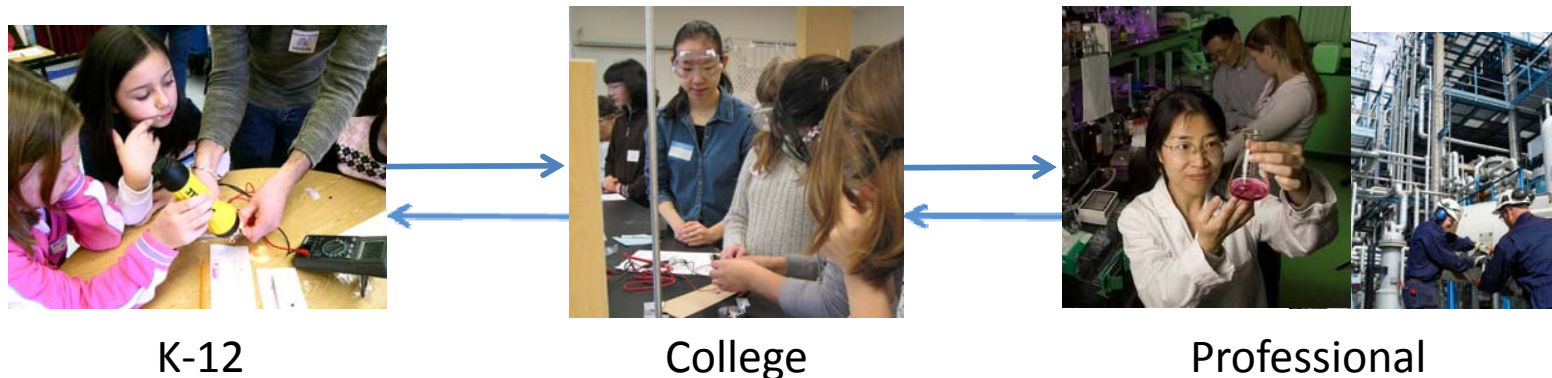
Awareness	Conferences Informational Resources	Conferences Student Workshops Informational Resources Green Chemistry Journals	Conferences Student Workshops Informational Resources Industrial Workshops Green Chemistry Journals
Support	GCEdNet GC State/Regional Networks	GCEdNet GC State/Regional Networks EPA: P2/P3 Grants NSF/NIH: scarce	GC State/Regional Networks ACS GCI Roundtables GC3
Resources	<b>Curricula:</b> Beyond Benign/GEMs <b>Textbooks:</b> ACS Chemistry in Context/Chem. Comm. (some GC) <b>Professional Development:</b> Beyond Benign/ACS	<b>Curricula:</b> GEMs/J.Chem.Ed./Green Chemistry Journals <b>Textbooks:</b> Some side bars/essay within texts, not integrated <b>Professional Development:</b> Oregon Summer Workshop/ACS/Beyond Benign	<b>Professional Development:</b> WBI/Beyond Benign ACS GCI Internal Seminars/Workshops

# Green Chemistry Education: **Current State**



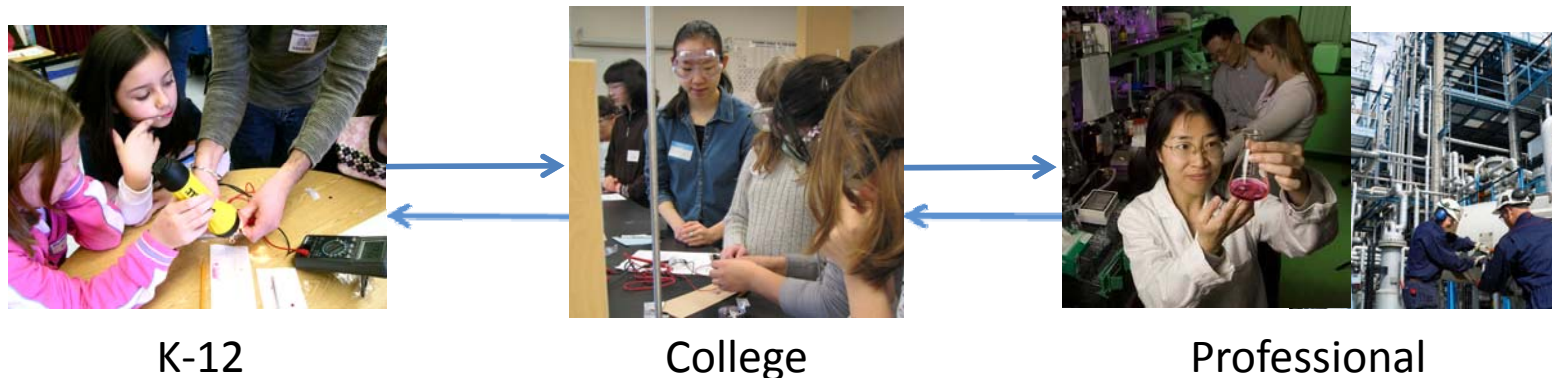
Awareness	Conferences Informational Resources	Conferences Student Workshops Informational Resources Green Chemistry Journals	Conferences Student Workshops Informational Resources Industrial Workshops Green Chemistry Journals
Support	Peers Administrative Financial	Peers Administrative Financial	Peers Administrative Financial
Resources	Curricula Textbooks Professional Development	Curricula Textbooks Professional Development	Curricula Professional Development

# Green Chemistry Education: **Current State**



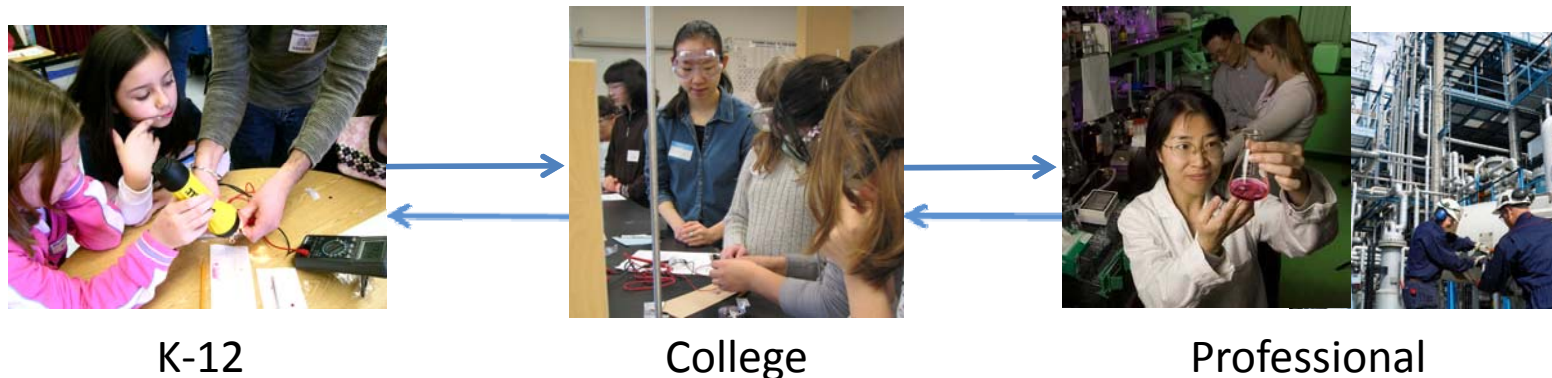
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Support	<p><b>Peers</b> Administrative Financial</p>	<p><b>Peers</b> Administrative Financial</p>	<p>Peers Administrative Financial</p>
Resources	<p>Curricula Textbooks Professional Development</p>	<p>Curricula Textbooks Professional Development</p>	<p>Curricula Professional Development</p>

# Green Chemistry Education: **Current State**



Awareness	<p>Conferences Informational Resources</p>	<p>Conferences Student Workshops Informational Resources Green Chemistry Journals</p>	<p>Conferences Student Workshops Informational Resources Industrial Workshops Green Chemistry Journals</p>
Support	<p><b>Peers</b> Administrative Financial</p>	<p><b>Peers</b> Administrative Financial</p>	<p>Peers Administrative Financial</p>
Resources	<p><b>Curricula</b> <b>Textbooks</b> <b>Professional Development</b></p>	<p><b>Curricula</b> <b>Textbooks</b> <b>Professional Development</b></p>	<p>Curricula Professional Development</p>

# Green Chemistry Education: **Barriers**



<b>Awareness</b>	<p>Conferences Informational Resources</p>	<p>Conferences Student Workshops Informational Resources Green Chemistry Journals</p>	<p>Conferences Student Workshops Informational Resources Industrial Workshops Green Chemistry Journals</p>
<b>Support</b>	<p>Peers Administrative <b>Financial</b></p>	<p><b>Peers</b> <b>Administrative</b> <b>Financial</b></p>	<p><b>Peers</b> <b>Administrative</b> Financial</p>
<b>Resources</b>	<p>Curricula <b>Textbooks</b> <b>Professional Development</b></p>	<p>Curricula <b>Textbooks</b> <b>Professional Development</b></p>	<p>Curricula Professional Development</p>

# Green Chemistry Education: **Barriers**



K-12

College

Professional

Awareness

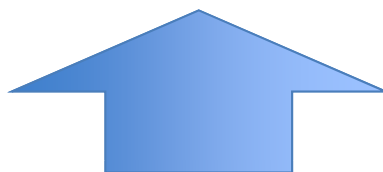
Support

Resources

***A systematic national/international unifying approach to Green Chemistry education does not yet exist***

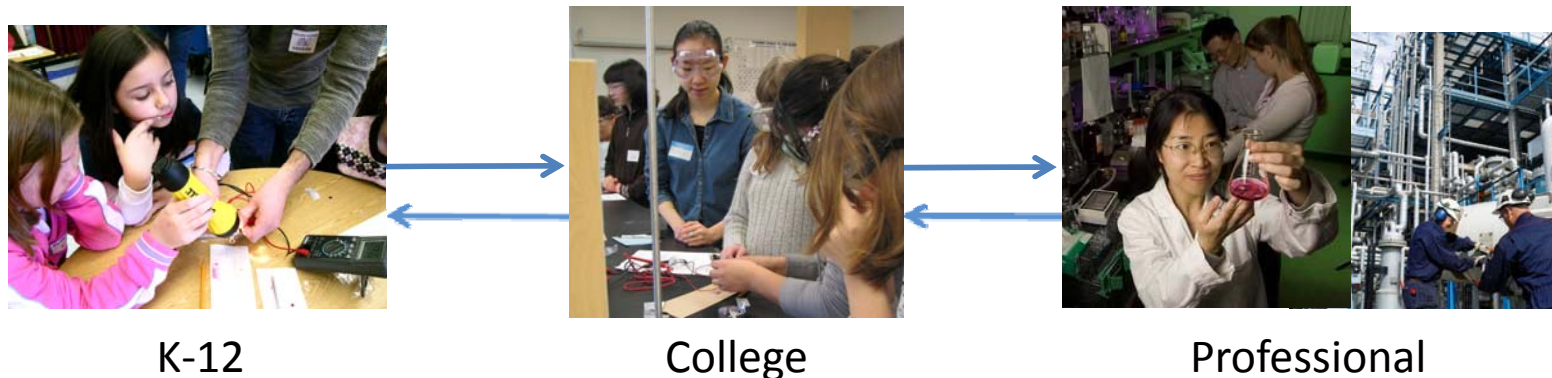
# Green Chemistry Education: **Opportunities**

## **Green Chemistry Commitment**



*A systematic national/international  
unifying approach to Green Chemistry  
education*

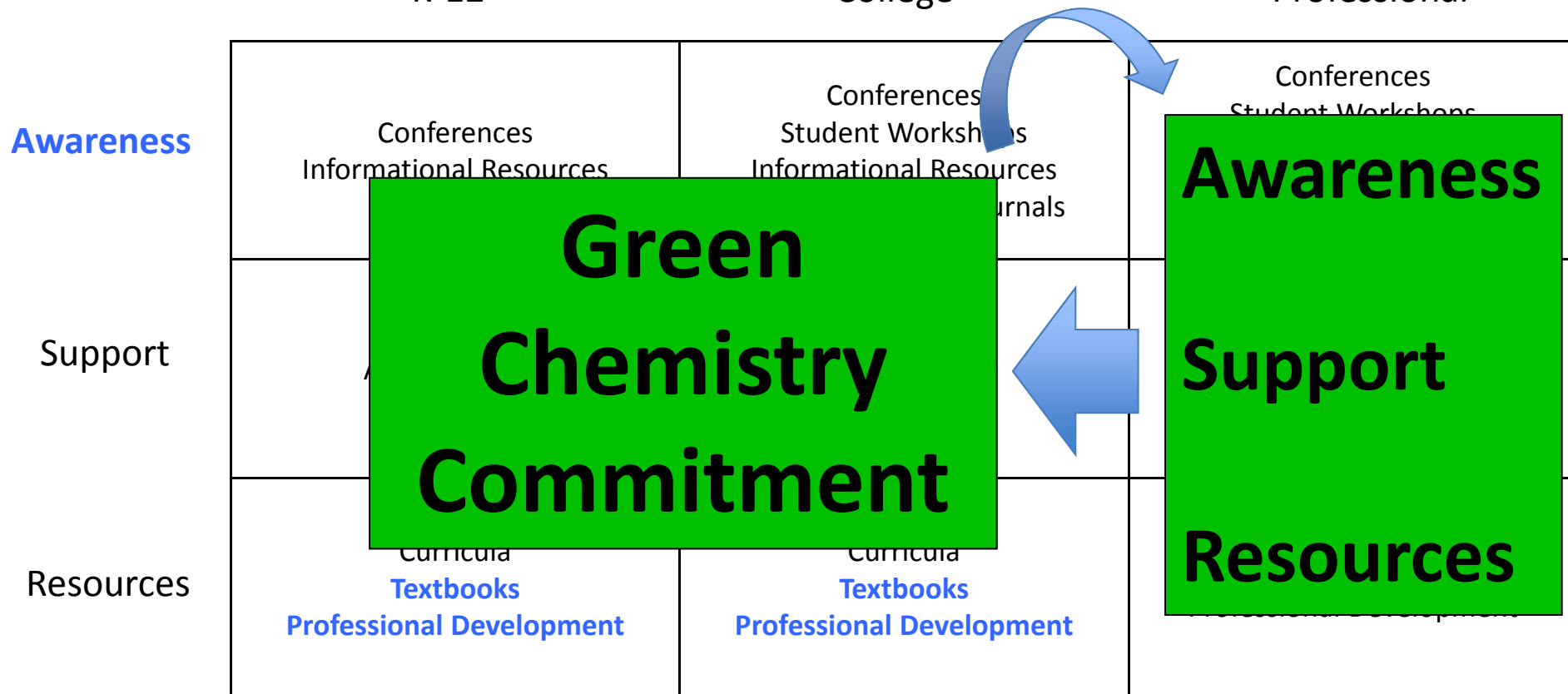
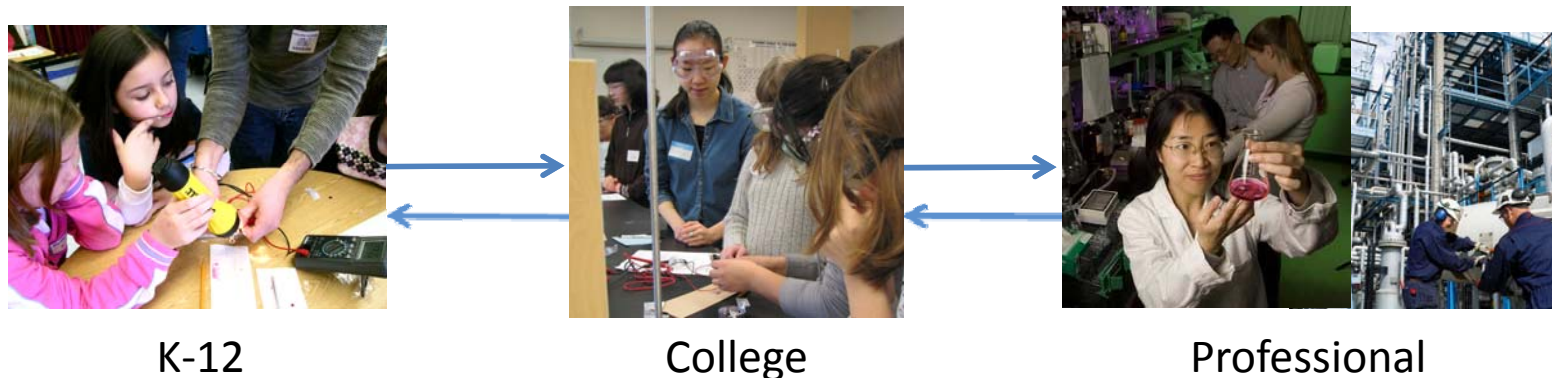
# Green Chemistry Education: Opportunities



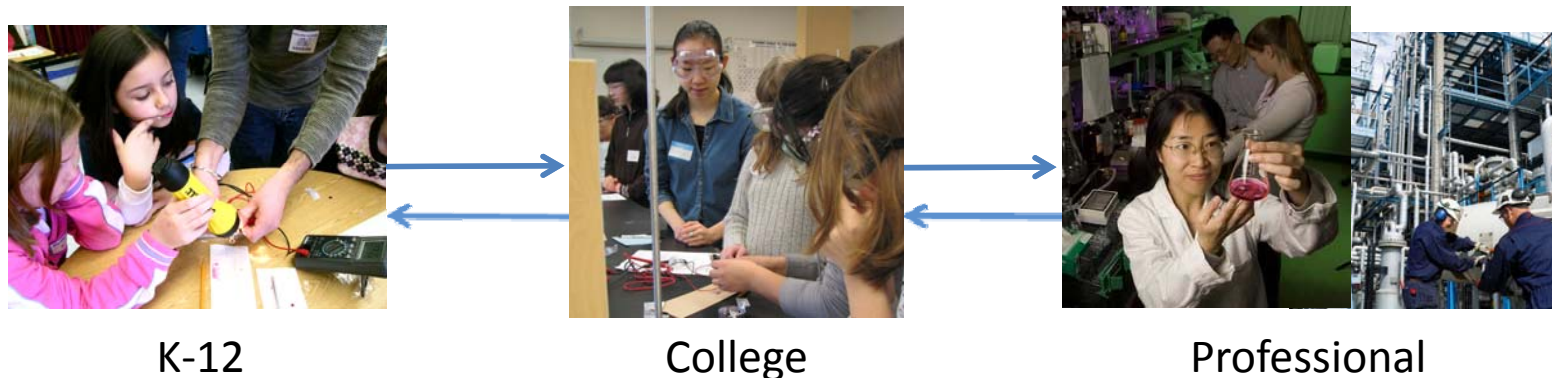
Awareness	Conferences Informational Resources	Conferences Student Workshops Informational Resources Journals	Conferences Student Workshops
	<b>Green Chemistry Commitment</b>		<b>Awareness</b>
	Support	Resources	Support Resources
Resources	Curricula Textbooks Professional Development	Curricula Textbooks Professional Development	



# Green Chemistry Education: **Companies**



# Green Chemistry Education: Companies



	Conferences	Conferences Student Workshops	Conferences
Awareness	<b>Awareness:</b> <ul style="list-style-type: none"> <li>• Student Workshops</li> <li>• Informational Resources</li> </ul>	<b>Awareness:</b> <ul style="list-style-type: none"> <li>• Student Workshops</li> <li>• Informational Resources</li> <li>• Industrial Workshops</li> </ul>	<b>Awareness:</b> <ul style="list-style-type: none"> <li>• Student Workshops</li> <li>• Informational Resources</li> <li>• Industrial Workshops</li> </ul>
Support	<b>Support:</b> <ul style="list-style-type: none"> <li>• Green Chemistry Commitment</li> <li>• Regional/Local Educator Training Workshops</li> <li>• Sponsor teachers/faculty from regional schools/colleges</li> </ul>	<b>Support:</b> <ul style="list-style-type: none"> <li>• Green Chemistry Commitment</li> <li>• Financial                             <ul style="list-style-type: none"> <li>• Philanthropic Giving Programs</li> <li>• Company Foundations</li> </ul> </li> </ul>	<b>Support:</b> <ul style="list-style-type: none"> <li>• Green Chemistry Commitment</li> <li>• Financial                             <ul style="list-style-type: none"> <li>• Philanthropic Giving Programs</li> <li>• Company Foundations</li> </ul> </li> </ul>
Resources	<b>Resources:</b> <ul style="list-style-type: none"> <li>• Curriculum Development</li> <li>• Volunteers/Speakers</li> </ul>	<b>Resources:</b> <ul style="list-style-type: none"> <li>• Informational (i.e., Case Studies for Curricula)</li> <li>• Volunteers/Speakers</li> </ul>	<b>Resources:</b> <ul style="list-style-type: none"> <li>• Informational (i.e., Case Studies for Curricula)</li> <li>• Volunteers/Speakers</li> </ul>
	Professional Development	Professional Development	

# Green Chemistry Education: **Companies**



K-12



College



Professional

**Amy's #1 answer to “how can companies best support the development of green chemists?”**

**Take a position.**

**Tell us what kind of scientist you want to hire.**

**And, hire those scientists.**

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