Engaging Students on Marine Debris

Katharine A. Owens
Associate Professor
Department of Politics, Economics, and International Studies
Director, University Interdisciplinary Studies

October 27, 2018
Emeriti Association Meeting
Presentation Overview

* Marine litter
* Past results
* Future plans
The problem of marine litter
Plastics

- Disposable and single-use plastic
- About 20 million tons of plastic reach the ocean annually
- The five oceanic gyres contain approximately 100 million tons of marine debris
- 1950s: 5 million tons annual global production
- 2015: 322 million tons were produced globally
The problem of marine litter

- wildlife
- potentially human health
- water quality
- the economy
Ingestion
Entanglement
Microplastics skimmed from the North Pacific Ocean.

Photo courtesy of J. Foley, C-MORE.
Water quality and human health

- As plastics decompose they leach chemicals into water resources
Economic implications
Outreach and education
My work

- NOAA funding
- Create an open source class
- Pilot it here
- Share results with lawmakers
- Measure impact on students
The Proposal

* From Shore to State House
* NOAA marine debris prevention through education and outreach program
The class

- Introduce students to the issue of marine debris
- Guide them in the process of collecting and tracing the life cycle of debris
- Challenge them to use these data to contextualize policy alternatives, and
- Present results to state legislators
This class

- Semester-long
- In person
- Undergraduate class
- Course readings, in class activities, presentations, lectures
- Experiential and service learning via multiple cleanups and reflection
The class

- Conduct 4 beach cleanups in Connecticut (February-April 2016)
- Weigh, measure, catalog debris found
- Create a Tumblr
- Present results to state legislature
Bluff Point State Park and Coastal Reserve

February 6, 2016

Clean Up Sites

- Bluff Point State Park and Coastal Reserve
- February 6, 2016
Clean Up Sites

- Hammonasset Beach
- February 7, 2016
Hammonasset Beach
Clean Up Sites

* Meig’s Point, Hammonasset
  * February 7, 2016
  * April 2, 2016
Meig’s Point Hammonasset
Meig’s Point Hammonasset
Meig’s Point Hammonasset
What we found

* 1,622 individual pieces

- Plastic 76%
- Metal 5%
- Wood 1%
- Glass 3%
- Mixed Materials 3%
- Sports equipment 1%
- Rubber pieces 5%
- Paper 2%
- Clothes and shoes 3%
- Asphalt and brick 0.2%
The five most frequently found items:

- Smoking related items 129 (8.0%)
- Plastic food wrappers and bottles 132 (8.1%)
- Plastic cup pieces 135 (8.3%)
- Film plastic 176 (10.9%)
- Hard Plastic 326 (20.1%)
Informing policy

- We found remnants of municipal waste
- Not fishing gear (recreational or commercial)
- Not manufacturing
- Not from the shipping industry
Presenting results
Lessons Learned

- Benefits of active learning
- Time consuming
- Management
- Winter collections versus nesting seasons
- Connecting with policy makers
- Not advocating for one policy
Measuring the impact

- Measure student knowledge, environmental attitudes, and behaviors
- Compare with a traditional laboratory-based environmental studies course
## Results

Pre-post scores and analysis for test and control subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUCT120, a traditional lab-based environmental course (the control) (n=26)</th>
<th>POL/HON, a marine debris experiential and service-learning course (the test) (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test Mean SD</td>
<td>Post-test Mean SD</td>
</tr>
<tr>
<td>Knowledge of marine debris</td>
<td>7.4 ± 1.1</td>
<td>7.6 ± 1.3</td>
</tr>
<tr>
<td>Environmental attitudes</td>
<td>56.1 ± 6.77</td>
<td>59.7 ± 9.35</td>
</tr>
<tr>
<td>Environmental behaviors</td>
<td>58.7 ± 11.5</td>
<td>65.6 ± 13.9</td>
</tr>
</tbody>
</table>

*Statistically significant
## Results

Pre-post scores and analysis for test and control subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUCT120, a traditional lab-based environmental course (the control) (n=26)</th>
<th>POL/HON, a marine debris experiential and service-learning course (the test) (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test <em>Mean</em> SD, Post-test <em>Mean</em> SD, Point change <em>p</em>-value</td>
<td>Pre-test <em>Mean</em> SD, Post-test <em>Mean</em> SD, Point change <em>p</em>-value</td>
</tr>
<tr>
<td>Knowledge of marine debris</td>
<td>7.4 ± 1.1, 7.6 ± 1.3, +0.2 ± 0.211</td>
<td>7.6 ± 1.4, 8.5 ± 0.8, +0.9 ± 0.0023*</td>
</tr>
<tr>
<td>Environmental attitudes</td>
<td>56.1 ± 6.77, 59.7 ± 9.35, +3.6 ± 0.0078*</td>
<td>57.3 ± 7.86 (n=23), 58.9 ± 8.91 (n=23), +1.6 ± 0.08</td>
</tr>
<tr>
<td>Environmental behaviors</td>
<td>58.7 ± 11.5, 65.6 ± 13.9, +6.9 ± 0.0021*</td>
<td>63.2 ± 19.0, 77.2 ± 18.1, +14.0 ± 0.00001*</td>
</tr>
</tbody>
</table>

*Statistically significant
# Results

Pre-post scores and analysis for test and control subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUCT120, a traditional lab-based environmental course (the control) (n=26)</th>
<th>POL/HON, a marine debris experiential and service-learning course (the test) (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test Mean SD</td>
<td>Post-test Mean SD</td>
</tr>
<tr>
<td>Knowledge of marine debris</td>
<td>7.4  1.1</td>
<td>7.6  1.3</td>
</tr>
<tr>
<td></td>
<td>p=0.211</td>
<td></td>
</tr>
<tr>
<td>Environmental attitudes</td>
<td>56.1  6.77</td>
<td>59.7  9.35</td>
</tr>
<tr>
<td></td>
<td>p=0.0078*</td>
<td></td>
</tr>
<tr>
<td>Environmental behaviors</td>
<td>58.7  11.5</td>
<td>65.6  13.9</td>
</tr>
<tr>
<td></td>
<td>p=0.0021*</td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant
Weaknesses

* Relatively small sample sizes

* A short term observation

* Bias toward the perceived “preferred” answer?

* Courses are not all taught by the same professor
Conclusions

- Meeting the gold standard of laboratory class
- Interesting questions about the way experiential work may influence (depress?) attitudes
- Open source, replicable model expansion
• Fulbright
• South Asia, Southeast Asia
• Indonesia, India
• Thiruvananthapuram, India
• 6 months
• University of Kerala, Kariavattom campus
• Teach 2-week modules in two courses
• Replicate Uhart project
• Teacher training workshop
Shankumugam Beach
Thank you!
kowens@hartford.edu