Implementing Course Based Undergraduate Research Experiences (CUREs) across an Environmental Studies Curriculum

Alanna L. Lecher* & Cassandra Korte
Natural and Applied Sciences, Lynn University, Boca Raton, FL, *alecher@lynn.edu

1. Introduction

- Course Based Undergraduate Research Experiences (CUREs) are highly impactful methods of improving student achievement and retention (Bangera & Brownell, 2014).
- Lynn University placed CUREs throughout the Environmental Studies Major curriculum
  - At the lower division level CUREs are laboratory experiences guided by faculty in which students gather data for faculty research projects
  - At the upper division level, students design and execute social and natural science research projects that increase in length from 3 weeks to a full semester
  - Skills are taught throughout the curriculum. These skills are required to ensure success in designing a research project

2. Skill-Building Across the Curriculum

<table>
<thead>
<tr>
<th>Class</th>
<th>Literature Review</th>
<th>Scientific Method Training</th>
<th>Formal Research Project Proposal</th>
<th>Collect Data</th>
<th>Plot and Analyze Data</th>
<th>Computer Skills (Excel, GIS, etc.)</th>
<th>Field/Lab/Survey Techniques</th>
<th>Scientific Writing</th>
<th>Full Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV 130: Human Environment Interactions</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 130: Chemistry 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 110: Biology 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSL 100: Scientific Literacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI 200: Research Methods in Social Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSL 200: Scientific Literacy</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DQR 200: Statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ENV 250: Environmental Risk and Public Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENV 330: Wildlife Conservation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENV 340: Environmental Statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POL 385: Global Environmental Policy &amp; Justice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENV 420: Geographic Information Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENV 450: Capstone in Environmental Studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: How CURE-essential skills are developed over the curriculum, culminating in student-designed final projects

3. Lower-Division CUREs

- Freshman: Artifact Cleaning and Analysis
  - ENV 130, the first semester class
  - Students clean and sort artifacts from the summer archeology dig led by faculty
  - Students discuss how differing abundances of artifacts during different time periods are indicative of social or environmental change

- Sophomore: Bacterial Tolerance Studies
  - ENV 250, second year spring class
  - Students perform a halotolerance or other tolerance study of bacteria collected from the environment as part of a faculty research project
  - Data are used to interpret abundances of bacteria found in the environment

- Junior: Authentic Data Analysis
  - ENV 340, second semester spring class
  - Students access various international and governmental databases on which to perform statistical analyses
  - In the final project students collect data on their own or from a database to test a hypothesis

- Senior: Capstone Research Project
  - ENV 450, final semester before graduating
  - Students spend 3 weeks designing a research project in natural or social sciences, 8 weeks executing the project, and the remaining time creating a final report and presentation
  - Workshop style class sessions work to further a student’s progress on their own research

4. Upper-Division CUREs

- Sophomore: Bacterial Tolerance Studies
  - ENV 250, second year spring class
  - Students perform a halotolerance or other tolerance study of bacteria collected from the environment as part of a faculty research project
  - Data are used to interpret abundances of bacteria found in the environment

- Junior: Authentic Data Analysis
  - ENV 340, second semester spring class
  - Students access various international and governmental databases on which to perform statistical analyses
  - In the final project students collect data on their own or from a database to test a hypothesis

- Senior: Capstone Research Project
  - ENV 450, final semester before graduating
  - Students spend 3 weeks designing a research project in natural or social sciences, 8 weeks executing the project, and the remaining time creating a final report and presentation
  - Workshop style class sessions work to further a student’s progress on their own research