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Undergraduate Research and Teaching at Oak Lake Field Station

Lan Xu

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Undergraduate Research and Teaching at Oak Lake Field Station

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South Dakota State University
Why Field-Based Education Matter?

“There is simply no substitute for actually experiencing nature, to see, small, and listen to the integrated pattern that nature offers an open mind.”

Ecologist Paul Dayton

Dayton 2011
Problems

• Loss of field studies in biology education\(^1\)

• The decline in field biology skills in the UK has reached crisis point \(^2\)

• Impending extinction of natural history \(^3\)

• Critical to the biological sciences \(^4\)–\(^6\):
  - Behavior, Ecology, Evolution, Systematics, Conservation Sciences

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\(^1\) Leopold 2013
\(^2\) Warren 2015
\(^3\) Wilcove & Eister 2000
\(^4\) Eisner 1982
\(^5\) Wilson 1982
\(^6\) Fleischner 2005
Importance and Benefits

• Why are the field-based educational experiences important to advancing biological knowledge?

• What challenge threaten opportunities for students to engage in field-based educational experiences?

• How can we enhance field-based pedagogies in biology/natural sciences?
Importance and Benefits

• Learning that occurs in a field setting is a powerful experience that

  ➢ promotes development of new generations of creative scientists

  ➢ enhances environmental literacy

  ➢ Instills social responsibility in our citizens

1 Fleischner et al. 2017
Challenges to Teach in the Field

- Suitable availability field sites
  - Diversity
  - Facility
  - Safety
- Feasibility
  - Distance
  - Transportation
  - Timing
  - Financial
Why Oak Lake Field Station?

• A gem on the Prairie – Providing unique teaching and learning environments
  – Diverse habitats/ecosystems: from aquatic to terrestrial
  – Diverse organisms: microbes, invertebrates, vertebrates, plants to animals, and more
  – Diverse managements: grazing, fire, and interseedling
  – Diverse resource, baseline-inventory, GIS, weather station, herbarium, and etc.
Why Oak Lake Field Station?

• Facility
  – Classroom with Internet
  – Fully equipped lab
  – Ground and lake
  – Dormitory
  – Dinner hall

• Safety
  – Gate and security
  – Safe learning environment
  – Designated caretaker
Undergraduate Teaching at Oak Lake Field Station

- Field Ecology Course (NRM 311L)
- Plant Ecology (BOT 419L)
NRM 311 Field Ecology Course Objectives

- Develop a familiarity with common field and lab equipment
- Use scientific method to investigate ecological questions
- Perform basic analyses on ecological data
- Learn how to record and manage scientific data
- Apply the principles of scientific writing to communicate study results
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 25</td>
<td>Aquatic Sampling (Lake Monitoring)</td>
</tr>
<tr>
<td>Sept. 1</td>
<td>Vegetation Sampling</td>
</tr>
<tr>
<td>Sept. 8</td>
<td>Photosynthesis &amp; Respiration</td>
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<tr>
<td>Sept. 22</td>
<td>Population Dynamics</td>
</tr>
<tr>
<td>Sept. 29</td>
<td>Community Analysis</td>
</tr>
<tr>
<td>Oct. 1</td>
<td>Decomposition</td>
</tr>
</tbody>
</table>
Collecting green ash litter

Mixing and Drawing Litter

Weighing out 5.00 g FW for each bag

Placing litter into bags

Bag labeling and soldering bags shut

Attaching bags to rope

Tying stakes on to stakes

Recording weights and bag numbers

Generating and entering data to excel

Preparing flags for site marking

Placing time zero bags in oven

Oven temperature =60°C for 72hrs

Decomposition Lab – Exp. Setup

South Dakota State University
Department of Natural Resource Management
<table>
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**Decomposition Lab – Exp. Setup**

[Image of individuals performing tasks]

*South Dakota State University*
Department of Natural Resource Management
Decomposition Lab – Data Collection & Analysis

Leaf Litter Decomposition Rate

- Green Ash - Aquatic
- Green Ash - Terrestrial
- Maple - Aquatic
- Maple - Terrestrial

Avg. % Mass Remaining

Time (Days)

Leaf mass lost

94% mass loss

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Undergraduate Research at OLFS – Seed Bank

- Effects of different management practices on soil seed bank composition in Northern Great Plains
Undergraduate Research at OLFS – Bud Bank

- Persistence of smooth bromegrass belowground bud bank in response to mowing strategies
- Univ. Sioux Fall
Undergraduate Research at OLFS – Bud Bank

• Persistence of smooth bromegrass belowground bud bank in response to mowing strategies
• Presented at national conferences, e.g. SRM, ESA (Student Travel Award)
• SD DOT

Nicole Boone
Undergraduate Research at OLFS – Bud Bank

• Persistence of smooth bromegrass belowground bud bank in response to mowing strategies
• Presented at local, regional and national conferences, e.g. SRM
Undergraduate Research at OLFS – Bud Bank

• Persistence of smooth bromegrass belowground bud bank in response to mowing strategies- rhizome
• Presented at local, regional, & national conferences
• Won Schultz-Werth award
  – IOWA DNR
Impacts on Student Learning

• In general, the students took both field ecology lab and lecture, performed better than the students took the lecture only.

• Engagement
• Critical Thinking
• Retain the knowledge
• Hands-on ability
• Practical problem solving
• Logical and independent thinking
• Team, collaboration, and interpersonal skills
Acknowledgements

• Field Ecology & Plant Ecology Students
• UGTAs and GTAs
• Undergraduate Researchers
• College of ABS or College AFES
• Dept. of NRM
• Dr. Dudash
• Oak Lake Field Station
• Dr. Troelstrup
Happy 30th Anniversary
Questions?

THANK YOU!