SEEKING RELEVANCY, BUILDING EXCELLENCE: SERVICE LEARNING IN THE SEECS PROGRAM, AN NSF S-STEM SPONSORED PROJECT

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Outline

- NSF S-STEM Grant Objectives
- Seminar Activities
- Service Learning and Design Projects
  - Boat Ramp
  - “Go Green” Bicycle Generator
  - Sediment Collector
  - Kit Assembly Assist
- Project Development Methods
- Lessons Learned and Future Plans
History of the Scholarship

- NSF, Directorate of Undergraduate Education
  - Scholarships in Science, Technology, Engineering and Mathematics (S-STEM)

- Applied in November 2007

- Grant of $600,000 awarded in July 2008

- 11 graduates of the program, to date

- 20 current SEECS scholars (five seniors, six juniors, nine sophomores) and ten offers to 2012 freshmen
Goals

- Increase enrollment of academically talented, financially disadvantaged students
- Assist students through graduation
  - Scholarships
  - Academic Support
- Foster professional development
Objectives

#1
• Support 20 students
• Per year

#2
• Build referral network

#3
• Offer program of student service support

#4
• Enable professional development
• Target 90% retention
• Target graduate studies or employment
Seminar Activities

- Each semester of the seminar includes three components
  - **Design**
    - 50% of the semester meeting time
    - Two class-cohorts working together
  - **Professional** development
  - **Personal** development
## Seminar: Semester Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Type</th>
<th>Class-Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction / Lecture</td>
<td>All scholars</td>
</tr>
<tr>
<td>2</td>
<td>Workshop Pers. Dev.</td>
<td>Individual academic levels</td>
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<tr>
<td>3</td>
<td>Social</td>
<td>All scholars</td>
</tr>
<tr>
<td>4</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
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<tr>
<td>5</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
</tr>
<tr>
<td>6</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
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<tr>
<td>7</td>
<td>Speaker</td>
<td>All scholars</td>
</tr>
<tr>
<td>8</td>
<td>Fall Break</td>
<td></td>
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<tr>
<td>9</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
</tr>
<tr>
<td>10</td>
<td>Workshop Prof. Dev.</td>
<td>Individual academic levels</td>
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<tr>
<td>11</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
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<tr>
<td>12</td>
<td>Seminar / Social</td>
<td>All scholars</td>
</tr>
<tr>
<td>13</td>
<td>Design</td>
<td>Freshmen and Seniors / Sophomores and Juniors</td>
</tr>
<tr>
<td>14</td>
<td>Thanksgiving</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Design</td>
<td>All scholars</td>
</tr>
<tr>
<td>16</td>
<td>Dinner Pers. Dev.</td>
<td>All scholars</td>
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</tbody>
</table>
# Two-Year Design Sequence

<table>
<thead>
<tr>
<th>First Year (Conceptual Design; Seniors mentor Freshman)</th>
<th>Second Year (Embodiment Phase; Juniors mentor Sophomores)</th>
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</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>Defining a Project</td>
<td>Analysis of Design Alternatives</td>
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<tr>
<td>Design Perspectives</td>
<td>Develop Models</td>
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<tr>
<td>Understanding Constraints</td>
<td>Test Models</td>
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<tr>
<td>Proposing Design Alternatives</td>
<td>Selection of Design Concept</td>
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<tr>
<td>Measuring Risks and Success</td>
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<tr>
<td>Design Perspectives</td>
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<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Expectations Change Management</td>
<td>Development of Design Solution</td>
</tr>
<tr>
<td>Freshman Design Projection</td>
<td>Testing in-situ</td>
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<tr>
<td></td>
<td>Implementation of Design Solution</td>
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<tr>
<td></td>
<td>Evaluation of Design Solution</td>
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</tbody>
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Design Projects

- Bayfront Maritime Center Boat Ramp
- Go Green Bicycle-Powered Electric Generator
- Stream Sediment Collector for Sea Grant Pennsylvania
- Kit Assembly Assistant for Barber Center
## Correlating Selected Projects and Engineering Majors

<table>
<thead>
<tr>
<th></th>
<th>Boat Ramp</th>
<th>Go Green Bicycle Generator</th>
<th>Sediment Collector</th>
<th>Kit Assembly Assist</th>
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</thead>
<tbody>
<tr>
<td>Computer Science</td>
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<tr>
<td>Electrical Engineering</td>
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<tr>
<td>Environmental Engineering</td>
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<tr>
<td>Information Systems</td>
<td></td>
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<tr>
<td>Mechanical Engineering</td>
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<tr>
<td>Software Engineering</td>
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Boat Launch Ramp

- **Stakeholder**: Bayfront Center for Maritime Studies
  - *Completed in Academic Year 2009-2010*
Bicycle Powered Generator

- **Stakeholder:**
  Service Learning Office, Gannon University
  - Completed in Academic Years 2009-2011
**Sediment Collection Device**

- **Stakeholder:** Sea Grant Pennsylvania

- **Started Fall 2010**
  - **Construction Completion:** April 2012

**Goal:** Build a device to capture sediment

- **Collect** sediment for analysis (2 liters)
- Device must endure different environments
Sediment Collection Device: Status

- Two designs were prototyped and tested
Sediment Collection Device: Status

- Designs were consolidated and collector built
- Deployment during early fall due to fishing season
Stakeholder: Barber National Institute

Started Fall 2011

To be completed in Academic Year 2012-2013

Intellectually / physically challenged adults

Vocational assembly work

Goal: Device to assist in proper assembly of parts kits

Audio/video cues and mechanisms providing guidance

Parts kits can be “complex” and

Quality assurance is a must, but

Assemblers typically not able to read, count
Relationship Building and Maintenance: Building

- Relationships with non-profit organizations are required as a source of design projects.
- Gannon University Office of Service Learning is used to provide referrals of potential non-profit partners.
- SEECS PI’s contact non-profits to schedule a tour and meeting to discuss SEECS and specific needs of the non-profit and thereby assess whether a partnership is feasible.
Relationship Building and Maintenance: Maintenance

The following are necessary for maintenance of relationships between SEECS and non-profit partners:

- **Clearly stated expectations from DAY ONE**
  - Stakeholders must understand the timeline of delivery and have realistically achievable goals

- **Constant communication with stakeholders**
  - Co-PIs act as the liaison between the students and the non-profit
  - Communications are needed to clarify requirements, obtain additional information, and provide progress summaries

- **Visit to sites**
  - Co-PIs visit the site to provide the initial evaluation of the project
  - Once a project has been selected and during the conceptualization phase, students tour the site, and return as-needed
Project Selection – Original Plan

- Freshmen – fall semester
  - Brainstorm project ideas
  - Meet potential community partners and understand needs
  - Choose project

- Used for 2009-2011 project
Project Selection – Revision #1

- Must shorten time allotted to project definition
- Potential partners visited by co-PIs during summer
- Three potential projects presented to freshmen
- Used for 2010-2012 project
Project Selection – Revision #2

- Project selection still took significant time
- Desire to spend more time on design
- Project for 2011-2013 chosen by co-PIs and presented as the project
- Will use this method for 2012-2014 project
Scholar Coaching through Design

YEAR ONE: Stakeholder and Problem Appreciation

YEAR TWO: Solution Design and Build

Sophomores

Juniors
Scholar Coaching through Design

Freshmen

Sophomores

Seniors

Juniors
Lessons Learned

- Annual survey of SEECS Scholars shows:
  - Overall satisfaction with seminar
  - Better appreciation of aspects of engineering design
  - Improved awareness of interdisciplinary interactions within engineering field

- Maintaining good stakeholder relationships is critical

- Financial support is crucial
Future Plans

- A model for an Engineering Honors program emphasizing experiential learning
- Seek outside sponsorship for scholarships
Acknowledgement

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Questions