A Manipulative Rich, Design Based Approach to First Year Electrical Engineering Education

Matt Shuman

FIE 2008
Introduction

- Industry demands more innovation and design
- Teaching design effectively is difficult
- Design is facilitated using a
  - Platform for Learning
  - Freshman Mentor Program
Problem

You do not envision a class on innovation; you do not envision a class on lifelong learning. So the question becomes, is there a way to turn the curriculum inside out; to integrate these other abilities so deeply that in fact they go along with the learning of the engineering?
- Leah Jamieson, DesignCon 2007
Platform for Learning

- ABET fundamental requirements
- Includes additional "soft skills"
Freshman Mentor Program

- Mentors 170 students
- Peer-led-labs
- Hierarchical approach
PFL and FMP Synergy

• Freshman Mentors Help by
  - Assisting with lecture
  - Lab operation
  - Developing the PFL
  - Act as a "mortar" to hold the first year together

ECE 111 ECE 112 ECE 271/272
Lecture Lab Lecture Lab Lecture Lab
Platform for Learning
ECE 111
Senior Design
Assessment

• Voluntary survey
• Targets innovation and design
• Two examples:
  – Innovation
    • "I do more than what is required in lab and create new projects with my lab materials."
  – Design
    • "I have a role model who helped me engineer something creative this term."
## Results

<table>
<thead>
<tr>
<th>Question</th>
<th>ECE 111 Pre</th>
<th>ECE 112 Pre</th>
<th>ECE 112 Post</th>
<th>ECE 272 Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>I do more than what is required in lab and create new projects with my lab materials.</td>
<td>42.9</td>
<td>58.6</td>
<td>61.2</td>
<td>52.2</td>
</tr>
<tr>
<td>I have a role model who helped me engineer something creative this term.</td>
<td>22.0</td>
<td>48.7</td>
<td>52.2</td>
<td>80.6</td>
</tr>
<tr>
<td>I have experienced success in doing engineering related activities.</td>
<td>57.3</td>
<td>80.5</td>
<td>81.0</td>
<td>76.2</td>
</tr>
</tbody>
</table>
Conclusion

- Self-efficacy influences retention
- Self-efficacy has 4 components
  - Mastery Experiences
  - Vicarious Experiences
  - Social Persuasion
  - Physiological State
- Synergy of PFL and FMP improves self-efficacy by addressing all 4 forms
- T-Test confirms significance of results
Questions?