Massive Open Online Labs?
Microelectronics at Home
The challenge

• Significant growth of ECE program over past 5 years

• Limited laboratory space and equipment

How to continue to provide high-quality instruction to many students?
The opportunity

- Open-source hardware and software
- Low-cost components and equipment

NI myDAQ
Pilot study

• 14-person summer microelectronics course

• Half worked in lab, half worked remotely

• Remote work performed with NI myDAQ

• Students provided with high-quality instructional videos

• Findings published in conference proceedings of the American Society for Engineering Education
Pilot study

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Are students comfortable building circuits?

<table>
<thead>
<tr>
<th></th>
<th>Very comfortable</th>
<th>Somewhat comfortable</th>
<th>Somewhat uncomfortable</th>
<th>Very uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>With instructions</td>
<td>64%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Without instructions</td>
<td>0%</td>
<td>64%</td>
<td>18%</td>
<td>18%</td>
</tr>
</tbody>
</table>
# Student feedback on lab experience

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>myDAQ lab took longer</td>
<td>55%</td>
<td>18%</td>
<td>18%</td>
<td>9%</td>
<td>0%</td>
</tr>
<tr>
<td>Liked doing lab outside of class</td>
<td>0%</td>
<td>18%</td>
<td>45%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>Knew how to get help</td>
<td>18%</td>
<td>45%</td>
<td>0%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>Disadvantage not to have TA</td>
<td>36%</td>
<td>55%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Successes

- High-quality instructional videos
- myDAQ hardware platform and accompanying software
- Laboratory documentation
Recommendations

• Anticipate hardware failure—test all components thoroughly before lab

• Provide TA assistance—videoconference where students can show their circuits

• Encourage lab meetings—get students to troubleshoot collaboratively