A SoTL Project on Instruction in Debugging Computer Programs

Michael C. Loui

Joint work with Ryan Chmiel, M.S. student in ECE

April 21, 2006
How can we improve students’ program debugging skills?

- Debugging (trouble-shooting) is a time-consuming aspect of software development.
- Testing reveals only presence of defects; debugging requires diagnosis.
- Few computer science curricula include explicit instruction in debugging methods.
Others have previously studied instruction in debugging

- Gugerty & Olsen (1986): Debugging skill is correlated with program comprehension
- Benander et al. (2000): Implementing a recursive algorithm produces fewer bugs than implementing an iterative algorithm for the same problem
- Lee & Wu (1999): Students who practiced debugging loops wrote better programs
In Spring 2003, we introduced debugging exercises in ECE 291

- Optional debugging exercises before programming assignments #2, #3, #4
- Of 116 students in the course, 27 participated in the debugging exercises, 89 did not
- No significant difference in aptitude between groups: average first exam scores were
  - 70.7% for Treatment group (N = 27)
  - 72.0% for Control group (N = 89)
Students who did the exercises spent less time debugging

Percentage of Time Debugging

<table>
<thead>
<tr>
<th>Programming Assignment</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>42%</td>
<td>43%</td>
</tr>
<tr>
<td>#2</td>
<td>38%</td>
<td>52%</td>
</tr>
<tr>
<td>#3</td>
<td>35%</td>
<td>43%</td>
</tr>
<tr>
<td>#4</td>
<td>36%</td>
<td>49%</td>
</tr>
</tbody>
</table>
We published our work
