Encouraging CS Students to Compute for Social Good Through Collaborative, Community-Engaged Projects

Monisha Pulimood, Diane Bates, Kim Pearson
The College of New Jersey
February 27, 2019
Computing for the Social Good in CS Ed, 20019
The CABECT Model

Collaborative Project

CS Course

Non-CS Course

Community Partner

Deeper Student Engagement
# Courses for this Study

<table>
<thead>
<tr>
<th>Semester</th>
<th>Computer Science</th>
<th>Journalism/IMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2013</td>
<td>Software Engineering</td>
<td>Blogging and Social Media</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>Database Systems</td>
<td>Health and Environmental Journalism</td>
</tr>
<tr>
<td></td>
<td>Software Engineering</td>
<td>News Games</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>Software Engineering</td>
<td>Future of the News</td>
</tr>
<tr>
<td>Fall 2014</td>
<td>Software Engineering</td>
<td>Health and Environmental Journalism</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>98</td>
</tr>
<tr>
<td>N in Fall 2013/Spring 2014</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td>N (Complete for CSG)</td>
<td>42</td>
<td>14</td>
</tr>
<tr>
<td>Percent Complete (for CSG)</td>
<td>77.78%</td>
<td>53.85%</td>
</tr>
</tbody>
</table>
The Study

Habitat for Humanity

CS Course (Software Engineering)

Journalism Course

Deeper Student Engagement
Habitat for Humanity, Trenton Area, NJ (HH) acquires properties to build houses. Often these sites are brownfields – underused and likely contaminated sites that must be cleaned up prior to construction.

Computer science students collaborated with journalism students and HH to develop an online system called SOAP (Students Organizing Against Pollution) that would estimate the likelihood of contamination on any given plot of land, prior to expensive environmental testing.
The Pilot Project

- Collaborating class sessions were held in the same timeslot but independently.
- Classes met 4 times during the semester to brainstorm, share progress reports, plan next steps.
- Student outcomes were measured through self-assessments in pre- and post-tests in five paired classes over four semesters.
Social Responsibility: 5 point agreement scales; pretest $\alpha = .886$; post-test $\alpha = .922$

- Adults should give some time for the good of the community;
- People, regardless of whether they've been successful or not, ought to help others;
- Individuals have a responsibility to help solve our social problems;
- It is important to help others even if you don't get paid;
- It is important to help to reduce hunger and poverty in the world;
- It is important to help to make sure all people are treated fairly;
- It is important to help to make the world a better place to live in;
- It is important to help other people;
- It is important to speak up for equality.
Pre and Post Test Items

**Global Efficacy:** 5 point agreement scale
- I feel that I can make a difference in the world.

**Local Efficacy:** 5 point agreement scale; pretest $\alpha = .918$; post-test $\alpha = .768$
- It's not really my problem if my neighbors are in trouble and need help (reverse coded);
- I believe I can make a difference in my community;
- When I see someone being taken advantage of, I want to help them;
- I often think about doing things so that people in the future can have things better;
- When I see someone being treated unfairly, I don't feel sorry for them (reverse coded);
- I feel sorry for people who don't have what I have; It is important to me to contribute to my community and society.
## Mean Changes from Pretest to Post-test

<table>
<thead>
<tr>
<th>Index/Item</th>
<th>Computer Science</th>
<th>Journalism / IMM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Responsibility</td>
<td>+.05</td>
<td>+.07</td>
<td>+.03</td>
</tr>
<tr>
<td>Global Efficacy</td>
<td>-.05</td>
<td>-.29</td>
<td>-.10</td>
</tr>
<tr>
<td>Local Efficacy</td>
<td>+12.81</td>
<td>+5.88</td>
<td>+11.22</td>
</tr>
</tbody>
</table>
Local Efficacy Index, Pre and Post Test Means

- Computer Science: Pre - 13.93, Post - 26.74
- Journalism/Interactive Multimedia: Pre - 20.86, Post - 27.29
Mean Change for Local Efficacy Index Items

1. I feel sorry for people who don't have what I have. 1.04
2. It's not really my problem if my neighbors are in trouble and need help. (Reverse Coded) 1.23
3. I often think about doing things so that people in the future can have things better. 1.52
4. I believe I can make a difference in my community. 1.75
5. It is important to me to contribute to my community and society. 1.77
6. When I see someone being taken advantage of, I want to help them. 1.93
7. When I see someone being treated unfairly, I don't feel sorry for them. (Reverse Coded) 1.98

Mean Change from Pre to Post Test
Change in Local Efficacy Items by Discipline

When I see someone being taken advantage of, I want to help them.
When I see someone being treated unfairly, I don't feel sorry for them. (Reverse Coded)
It is important to me to contribute to my community and society.
I believe I can make a difference in my community.
I often think about doing things so that people in the future can have things better.
It's not really my problem if my neighbors are in trouble and need help. (Reverse Coded)
I feel sorry for people who don't have what I have.

Mean Change from Pretest to Post-Test
Conclusions

- Students develop a deeper sense of personal social responsibility.
  - Community-engaged learning may have limited effect on abstract ideas about social and global responsibility but when CS students participate in these activities, they develop a stronger sense of their own abilities to make positive changes in their communities.

- In addition:
  - Students develop a strong foundation in applying disciplinary knowledge to solve real-world problems.
  - Students develop the ability to recognize and articulate the interconnectedness of different disciplines.
Change in Computational Thinking Items in Computer Science Classes

- I can apply design and implement principles in the development of computer-based systems of varying complexity. 1.44
- I understand the tradeoffs involved in design choices for computer-based systems. 1.36
- I can use abstractions. 1.32
- I can design and implement a computer-based system to meet desired needs. 1.25
- I can apply algorithmic principles and computer science theory in the modeling and design of computer-based systems. 1.24
- I can evaluate a computer-based system to meet desired needs. 1.20
- I can collaborate with others to design and develop computer-based tools and technologies appropriate to careers for which my major prepares me. 1.17
- I can use current computing techniques, skills, and tools necessary in careers for which my major prepares me. 1.12
- I can use algorithms. 1.10
- I can use logical thinking. 1.08
- I can analyze a problem, and then identify and define the computing requirements appropriate to its solution. .95
- I understand the impact of computing on society. .81
- I can apply knowledge of computing appropriate to my major. .77
Social Responsibility Index, Pre and Post Test Means

Mean of Social Responsibility Index

- Computer Science: 38.26
- Journalism/Interactive Multimedia: 38.71

Course Code
Global Efficacy, Pre and Post Test Means

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Mean of Global Efficacy Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>4.14</td>
</tr>
<tr>
<td>JPW/MM</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>4.21</td>
</tr>
</tbody>
</table>