

# Broadening Participation through Authentic, Collaborative Engagement with Computing for the Greater Good

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## Outcome R1 - Retention and Diversity

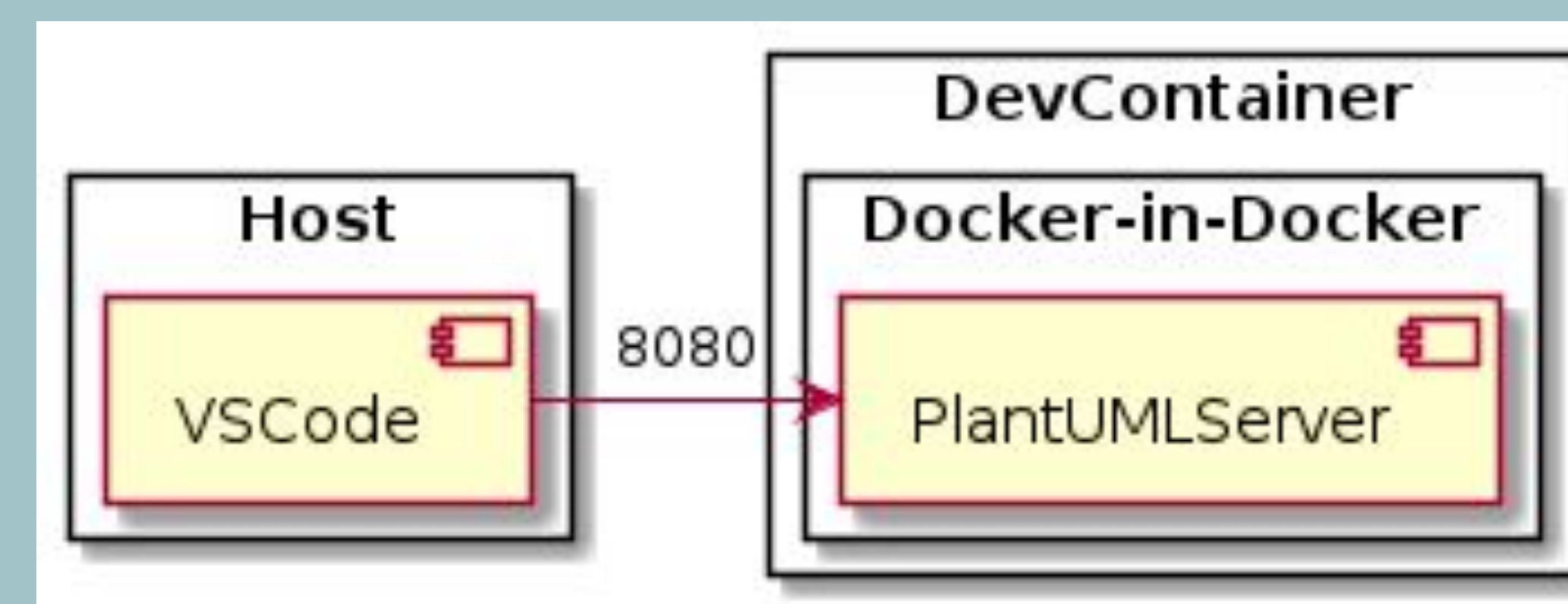
- Initial research into the motivation of “doing good” indicates that women and underrepresented groups are more strongly motivated by the humanitarian nature of projects.
- Survey:
  - Four institutions: a community college, a small liberal arts college, a private university, and a public state university
  - Participants: students in undergraduate introductory computing courses that included some programming
  - Timeline: 2020-2021 academic year
  - Results: 369 at least partially usable surveys
  - Gender: 103 identifying as Woman, 254 as Man, 7 as Non-Binary, 4 preferred not to disclose and 1 self-described.
  - Race/ethnicity: 2 American Indian or Alaska Native, 57 Asian, 40 Black or African American, 38 Latinx or Hispanic, 182 White, 31 Two or More Race/Ethnicities, 8 Other and 11 Not Disclosed
- Students were asked about their preference for class use of humanitarian vs non-humanitarian computing examples. Two types of questions were used:
  - WYR (Would You Rather) questions - Students were given a choice between two similar applications, one humanitarian and one not, and asked which they would rather write. (e.g., a choice between 2 games, one humanitarian and one not)
  - Motivation to learn questions - students rated how motivating it would be to work on specific applications, some humanitarian and some not
  - General result: All genders preferred humanitarian projects, but women’s preference was stronger

## Research Questions

- R1:** How does HFOSS education affect student learning, engagement, retention, and diversity in computing programs?
- R2:** How does HFOSS education impact role and identity of students?
- R3:** How does HFOSS education impact the role and identity of instructors?
- R4:** Can incremental HFOSS education increase adoption by instructors of computing for the greater good in STEM education?

## Outcome R4 - Increase HFOSS Adoption By Using HFOSS Kits

- Open source projects are large, complex, and evolving
  - Difficult to reuse assignments with a live project
- Development of an HFOSS kit:
  - Lightweight containers isolate the HFOSS application and its dependencies
  - Provides a consistent development environment across students and faculty for a course, assignment, or a project
  - Repeatable across terms
- An HFOSS kit contains:
  - A container with an operational copy of an HFOSS project
  - Learning activities
  - An instructor guide
- Provide students an authentic computing context
  - More controlled than having students work directly with a live open source project



## Outcome R4

### Increase HFOSS Adoption via Instructor-Led Projects

- Instructor-Led HFOSS projects
  - Address a humanitarian need for real clients
  - Actively being developed and used
  - Used in courses across a variety of educational institutions.
- Projects have considerable scale and complexity
  - Designed and managed with the intent to support multi-institutional student and faculty participation

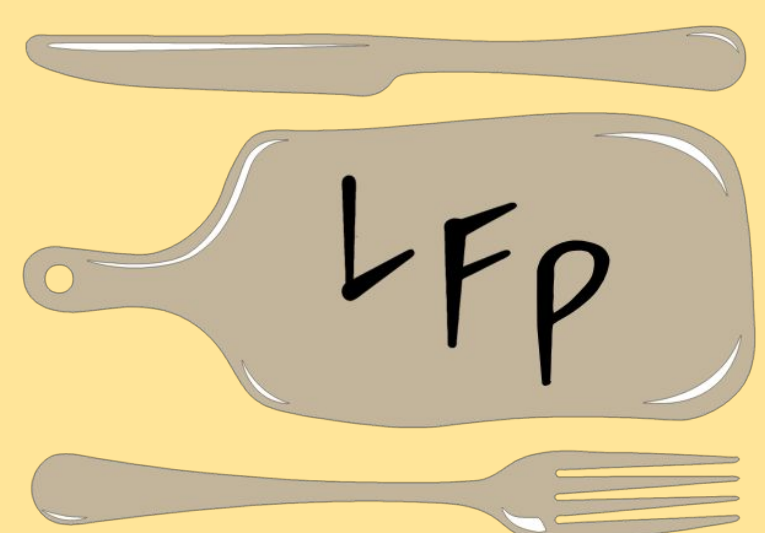
### Farm Data 2

- Support for the operation and certification requirements of small organic farming operations
- Project integrated into all four years of the curriculum
- Contact: Grant Braught, braught@dickinson.edu
- Site: <https://github.com/DickinsonCollege/FarmData2/>



### LibreFoodPantry

- A community building free and open source software for food pantries
  - Three institutions
  - Four different courses
- Contact: Karl Wurst, kwurst@worchester.edu
- Site: <https://librefoodpantry.org/>



### OpenEnergyDashboard

- Web-based application to display energy information in a web browser
  - Designed to be portable so that it can be used at many organizations
  - Eight institutions
- Contact: Steve Huss-Lederman, huss@beloit.edu
- Site: <https://openenergydashboard.github.io/>



**Table 1: Results of one-tailed, two-sample t-tests and Cohen’s d to determine if women prefer humanitarian applications significantly more than men do and the effect size.**

Test Type	Would You Rather	Motivation to learn prog (hum)	Motivation to learn prog. (non-hum)
T-Test	t(357) = 6.93, p<.001	t(346) = 3.80, p<.001	t(346) = 4.72, p<.001
Cohen’s d	.6998 for a medium to large effect	.4293 for med. effect	.5418 for med. effect



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