Rethinking CS1

Chrestomathics
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Joanne McGrath Cohoon

www.cs1x.info

NSF BPC-DP Grant 073925
CS1 that attracts and retains diverse students in computing

- Under-represented minorities routinely match demographics
- Women’s percentages rose from 12% to 18%
  - Peer university women’s percentage near 12%
The curious course CS 1

- Intro to programming for all Engr students
- Enrollment more than doubled over last ten years
- Range of experience
- Women and minorities usually least experienced
Multiple pathways

- **CS1G** - open to all
- **CS1E** - open to experienced
- **CS1X** - open to inexperienced
- **CS1C** - computational thinking for A & S
UVA CS1 Enrollments by Gender
UVA CS1 Enrollments by Ethnicity
Despite inexperience, similar yield to general course.
Despite inexperience, similar yield to general course.
Performance on first exam CS 2

More than 90% retention to graduation

• An ABD in CS at Vanderbilt
• Leadership roles
Course designed to promote

Interest
Confidence
Belonging
Identity
IGNITE STUDENTS’ INTEREST

Make computing worthwhile
Study and application of useful things and processes

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<table>
<thead>
<tr>
<th>Application</th>
<th>Mutual Interest</th>
<th>CS Teacher</th>
<th>CS Student</th>
<th>Female Student</th>
<th>Male Student</th>
<th>Female – Male</th>
<th>Male – Teacher</th>
<th>Normalized Student – Teacher</th>
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## Mutual Interest

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### Sudoku
- Connect four
- Language translation
- Personality typing
- Daily Jumble
- Tic-Tac-Toe
Inform and demonstrate

- Flexibility: industry, geography
- Socially relevant
- Work with others
- Job projections
- High salaries
- Satisfied professionals
BUILD STUDENTS’ CONFIDENCE

Successes
- Pedagogy

Encouragement

Peer role models
Active and collaborative learning
Guided discovery
Integrated lab – instructor and TAs always there
Regular acknowledgement
Culture of success
Encouraging pedagogy and examples
Active and collaborative learning
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Encouraging pedagogy and examples
• Active and collaborative learning
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• Encouraging pedagogy and examples
CS 1X – MEANS

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These are my peeps

What happens when hens eat Fruit Loops!
• Active and collaborative learning
• Guided discovery
• Integrated lab – instructor and TAs always there
• Regular acknowledgement
  • Culture of success
• Encouraging pedagogy and examples
Our audience is more than “the guys”
Try on the role of a computing person
Active and collaborative learning
Guided discovery
Integrated lab – instructor and TAs always there
Regular acknowledgement
Culture of success
Encouraging pedagogy and examples

8. How helpful was it working with a partner?
   - Very unhelpful
   - Unhelpful
   - Neutral
   - Helpful
   - Very helpful

9. Should partnering be used in future assignments?
   - Emphatically no
   - No
   - Neutral
   - Yes
   - Emphatically yes

10. Was working with a partner helpful in preparing you for the exam?
CS 1X – MEANS

- Active and collaborative learning
- Guided discovery
- Integrated lab – instructor and TAs always there
- Regular acknowledgement
  - Culture of success
- Encouraging pedagogy and examples
Attractive to under-represented groups
More likely to choose computing
Attraction comparable to demographics
Brought up to comparable levels
More than comparable persistence to graduation
Other contributors and resources

Luther Tychonievich
Mary Lou Soffa

www.cs1x.info

NSF BPC-DP grant 073925
Tapestry 3-day summer workshop geared for HS CS teachers and educators who want expand CS instruction

Workshop components

- Demonstrate effective CS pedagogical practices for all students
- Recruiting strategies
- Provide materials that attendees can use to influence their schools and districts
public class BeanCount {
    public static void main(String[] args) {
        Scanner stdin = new Scanner(System.in);

        System.out.print("Enter jelly bean length (cm): ");
        double a = stdin.nextDouble();
        System.out.print("Enter jelly bean width (cm): ");
        double b = stdin.nextDouble();
        System.out.print("Enter jelly bean height (cm): ");
        double c = stdin.nextDouble();
        System.out.print("Enter jelly bean loading factor (%): ");
        double loading = stdin.nextDouble();
        System.out.print("Enter jar size (mL): ");
        double jar = stdin.nextDouble();

        int count = (int) (jar * loading / (5.0 * Math.PI * a * b * c / 24));
        System.out.println("beans: " + count);
    }
}