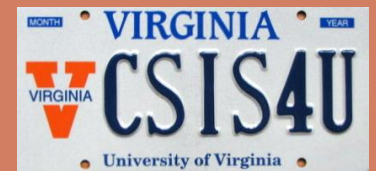


CHRESTOMATHICS  
JIM COHOON  
JOANNE McGRATH COHOON

[WWW.CS1X.INFO](http://WWW.CS1X.INFO)

NSF BPC-DP GRANT 073925

Rethinking  
CS1



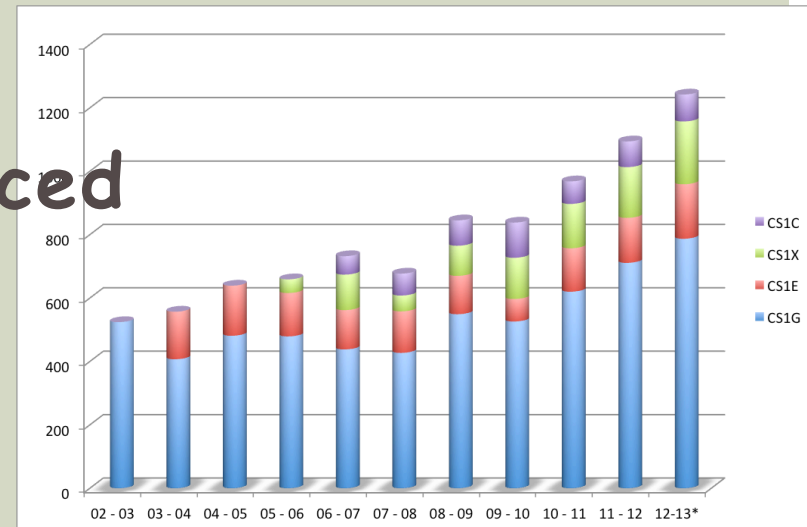
# EXECUTIVE SUMMARY

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

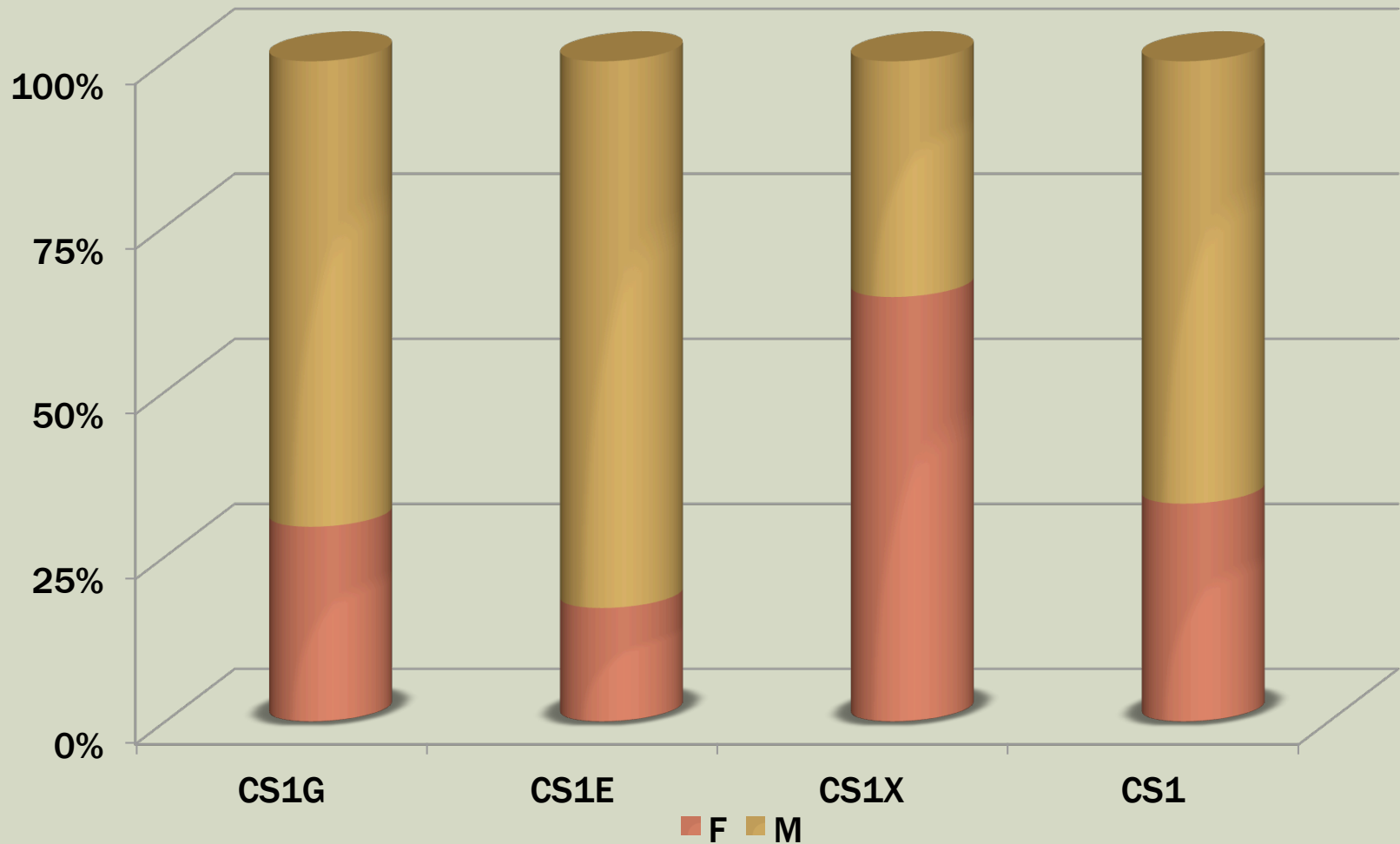


# MULTIPLE PATHWAYS

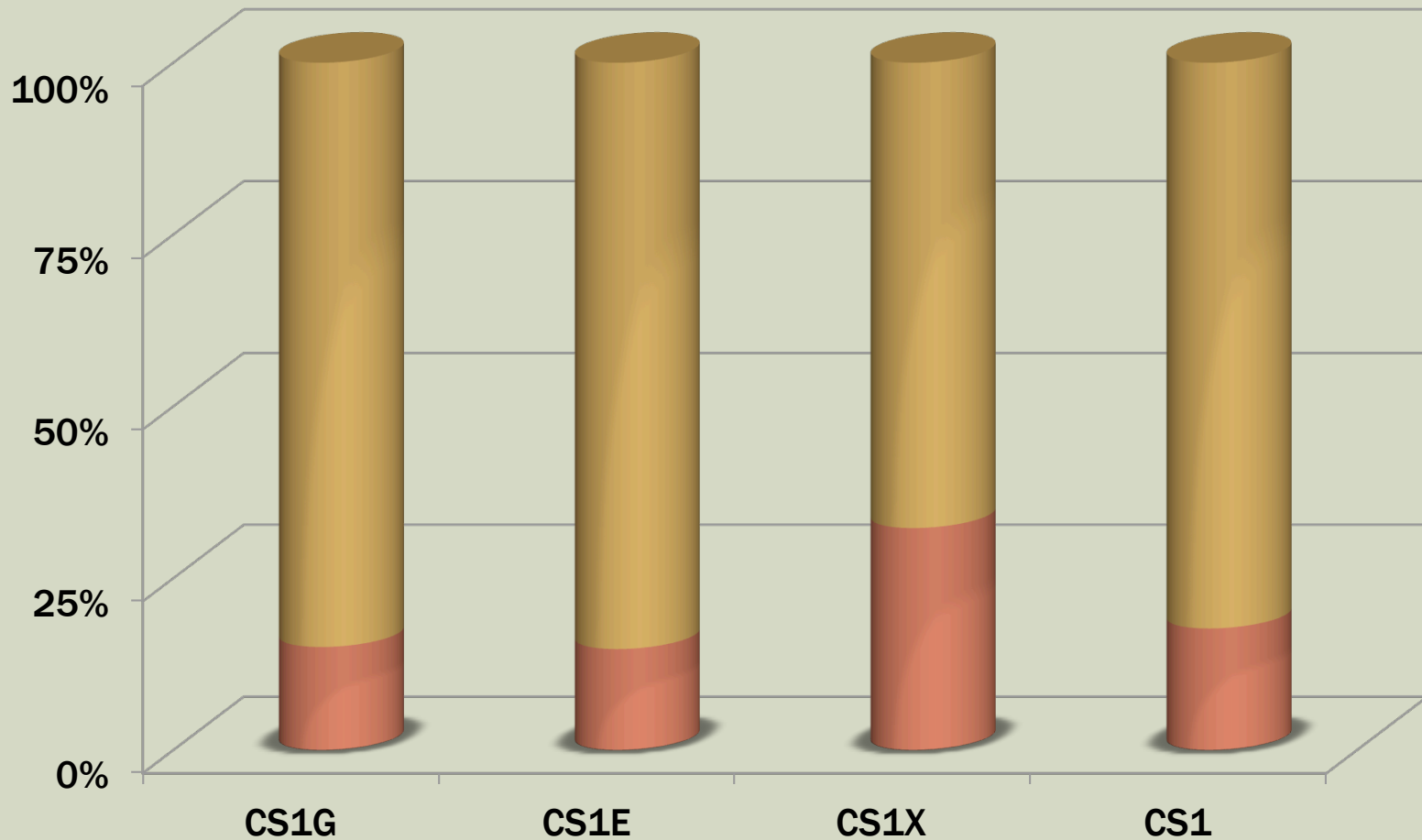
- CS1G - open to all
- CS1E - open to experienced
- CS1X - open to inexperienced
- CS1C - computational thinking for A & S



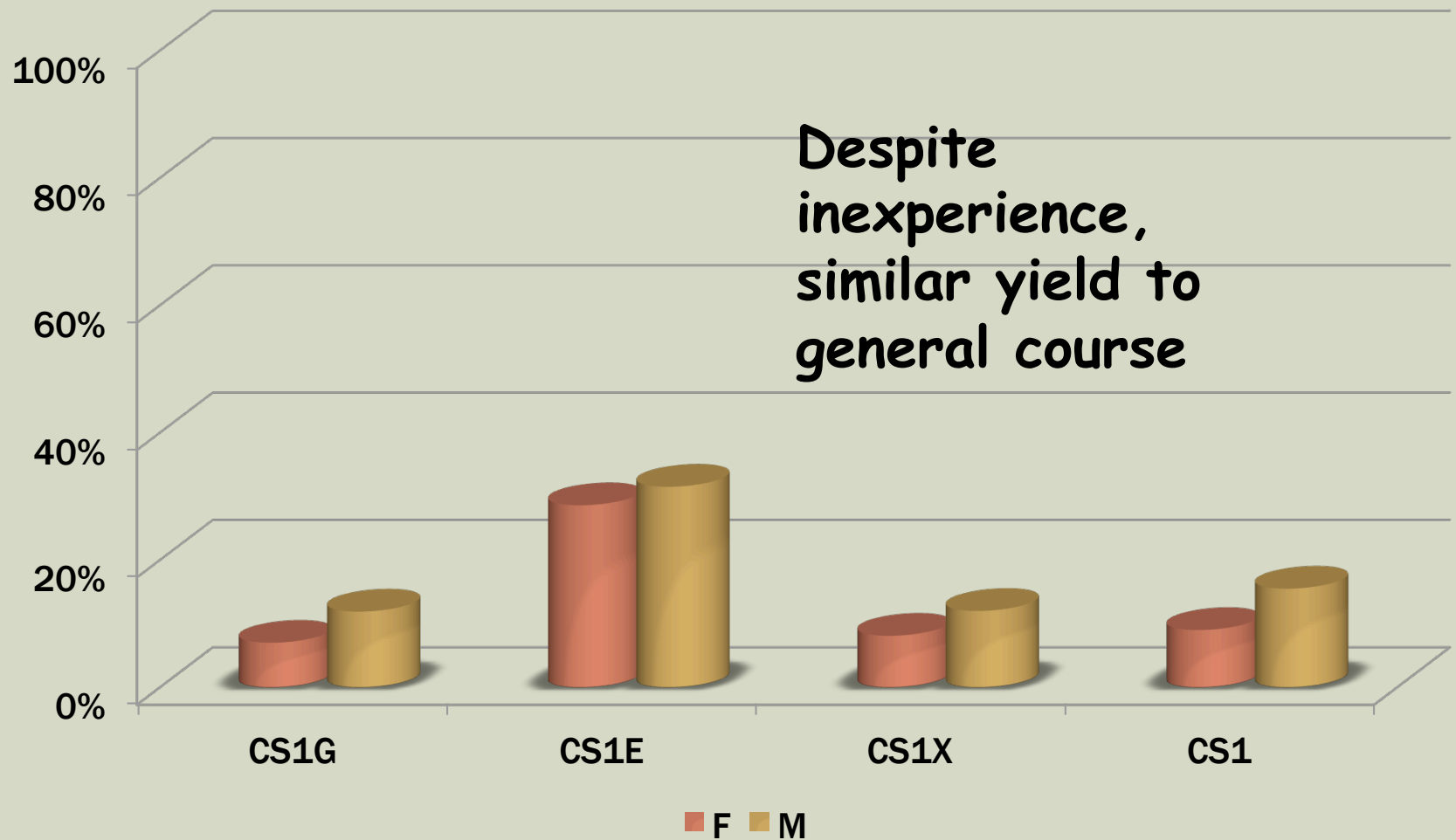
# UVA CS1 ENROLLMENTS BY GENDER



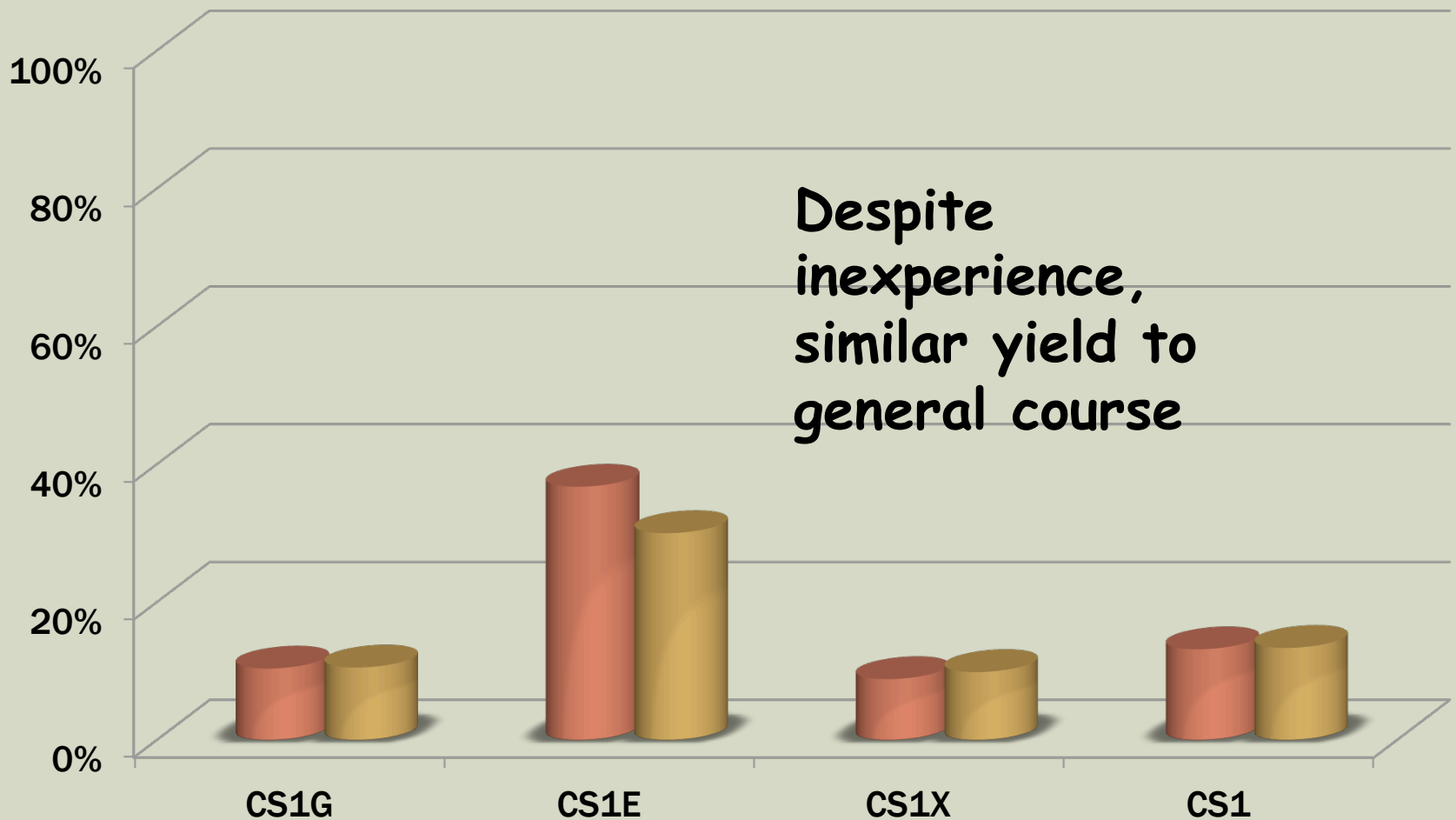
# UVA CS1 ENROLLMENTS BY ETHNICITY



# UVA COMPUTING MAJOR YIELD BY GENDER



# UVA COMPUTING MAJOR YIELD BY ETHNICITY



# CS1X ACHIEVEMENT & PERSISTENCE

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  
Identify



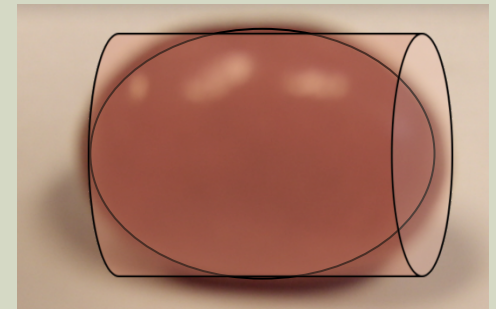
# IGNITE STUDENTS' INTEREST

**Make computing worthwhile**



# CS1X – CHRESTOMATHICS

## Study and application of useful things and processes

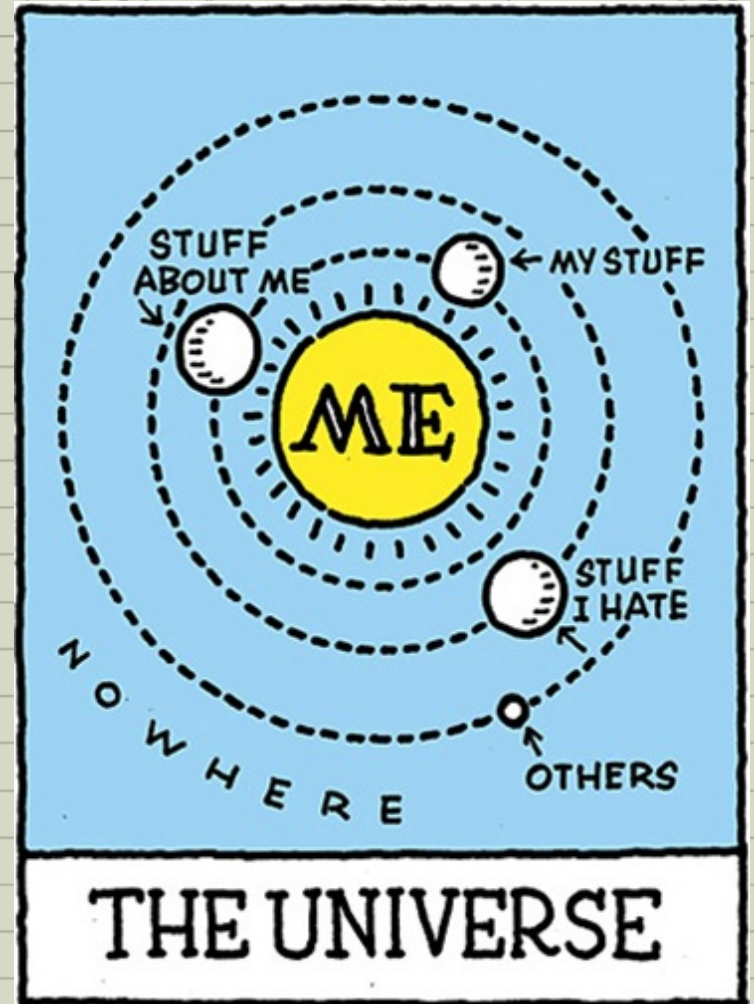


$$5 \cdot \pi \cdot a \cdot b \cdot c / 24$$



Table 8: Likert-Scale Ratings of CS1 Example Applications

MUTUAL INTEREST		CS Teacher	CS Student	Female Student	Male Student	Female – Male	Normalized Student – Teacher
Instant messaging		5.36	5.39	5.38	5.43	-0.05	0.47
Music player		5.30	5.39	5.29	5.71	-0.42	0.53
Photo manipulation	Encryption	4.90	5.29	5.26	5.66	-0.40	0.66
Card games	Instant messaging	5.73	5.12	5.15	5.66	-0.54	0.66
Medical diagnosis	Password security	5.95	5.14	5.21	5.66	-0.45	0.66
Music library organizer	Engineering	4.54	5.04	4.97	5.66	-0.69	0.66
Battleship game	Card games	5.39	5.02	4.85	5.66	-0.81	0.66
Connect four	Virus protection	5.33	4.92	4.85	5.66	-0.74	0.66
Mad Libs	Fractals	5.09	4.98	5.06	5.66	-0.60	0.66
Sudoku	Predator-prey	5.21	4.78	4.74	5.66	-0.88	0.66
Password security	Smart appliances	5.52	4.67	4.65	5.66	-1.01	0.66
Travel planner	Music player	5.21	4.96	4.62	5.66	-0.94	0.66
Video player	Connect four	5.17	5.06	5.24	5.66	-0.42	0.66
Language translation	Daily jumble	4.73	4.81	4.61	5.66	-1.05	0.66
Engineering applications	Medical diagnosis	4.90	4.65	4.59	5.66	-1.07	0.66
Tic-tac-toe	Photo manipulation	5.26	4.63	4.65	5.66	-1.03	0.66
Heart monitor	Science applications	5.36	4.59	4.50	5.66	-1.06	0.66
Business applications	Routing	5.04	4.58	4.54	5.66	-1.08	0.66
Photo n...		5.04	5.08	5.32	5.66	-0.64	0.66
Exercise training zone		4.19	4.54	4.56	5.66	-1.10	0.66
Personality typing		4.68	4.61	4.71	5.66	-0.95	0.66
Photo viewer		4.77	4.73	4.88	5.66	-0.88	0.66
Smart appliances		4.73	4.40	4.29	5.66	-1.37	0.66
Virus protection		4.90	4.52	4.24	5.66	-1.42	0.66
Body mass index		4.73	4.61	4.76	4.21	0.55	0.32



# MUTUAL INTEREST

5.71	Encryption
5.50	Instant messaging
5.50	Password security
5.39	Engineering
5.38	Card games
5.33	Virus protection
5.21	Fractals
5.21	Predator-prey
5.21	Smart appliances
5.17	Music player
5.17	Connect four
5.04	Daily jumble
5.04	Medical diagnosis
5.04	Photo manipulation
5.04	Science applications
5.00	Routing

Sudoku  
Connect four  
Language translation  
Personality typing  
Daily Jumble  
Tic-Tac-Toe

[illegible]

# MESSAGES THAT SPARK INTEREST

## Inform and demonstrate

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



# BUILD STUDENTS' CONFIDENCE

Successes

- Pedagogy

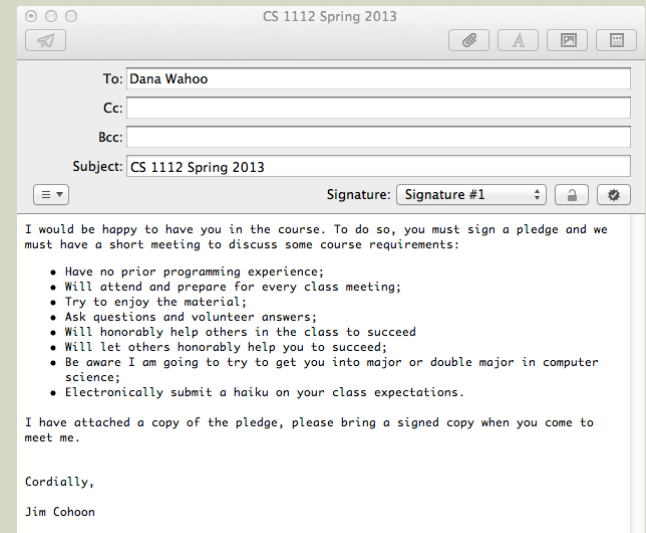
Encouragement

Peer role models



# 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



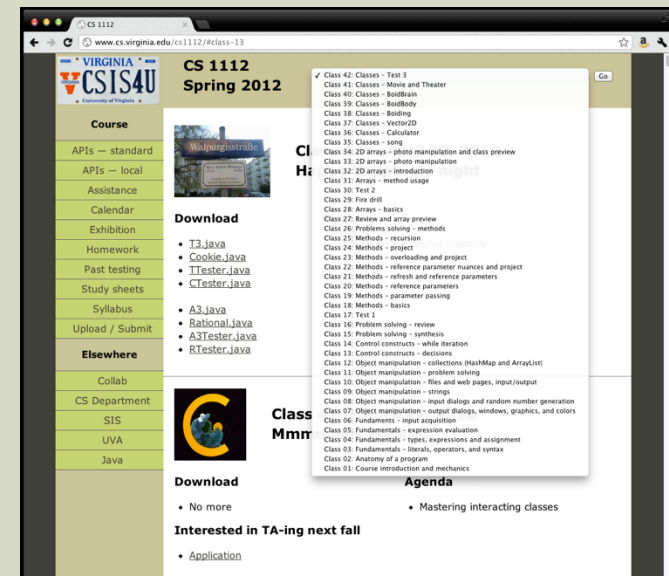
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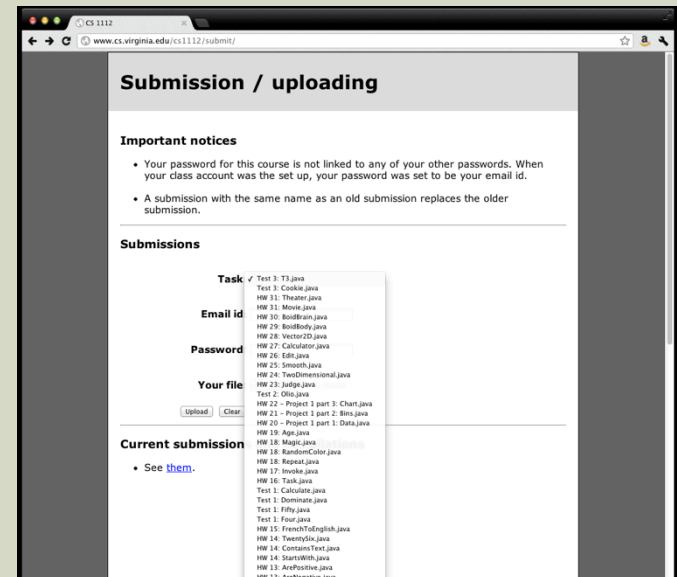
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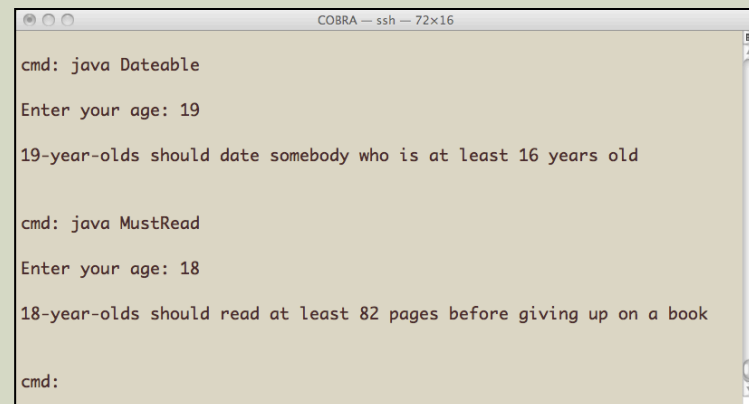
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A terminal window titled "COBRA — ssh — 72x16" showing the execution of two Java programs. The first program, "Dateable", prompts for an age and outputs a message about dating. The second program, "MustRead", prompts for an age and outputs a message about reading. The terminal shows the command prompt "cmd:" followed by the program name, the input "19" and "18", and the resulting output messages.

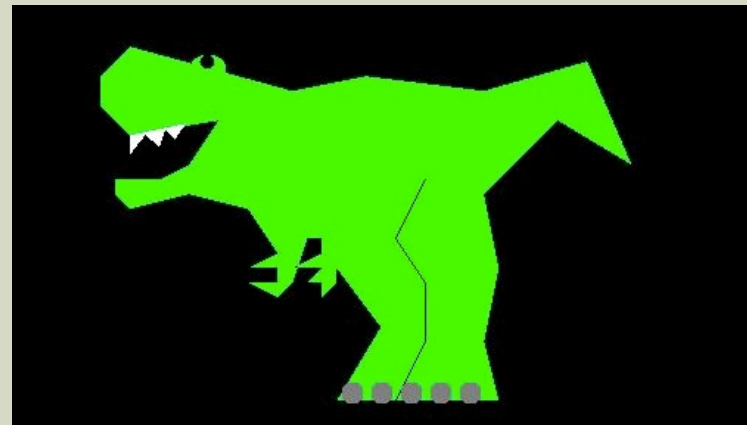
```
cmd: java Dateable
Enter your age: 19
19-year-olds should date somebody who is at least 16 years old

cmd: java MustRead
Enter your age: 18
18-year-olds should read at least 82 pages before giving up on a book

cmd:
```

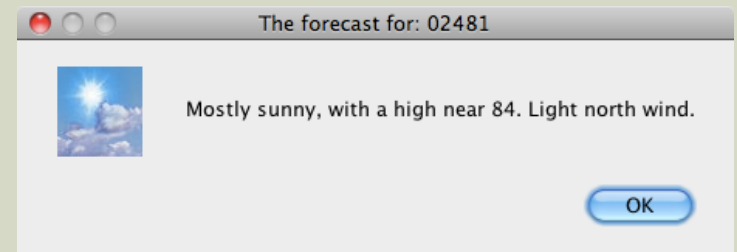
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# PROMOTE BELONGING

These are my peeps



What happens when hens eat Fruit Loops!

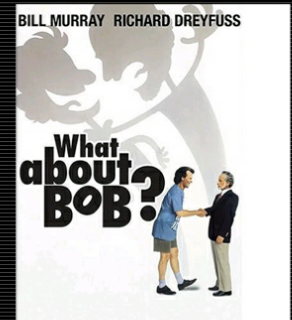


# CS 1X – MEANS


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## The *awesome* story so far

- Story so far - truly awesome
  - Computing systems and problem solving
  - Variables
  - Types
  - Input and output
  - Expressions
  - Assignments
  - Objects
  - Pop up windows
  - Decisions
  - Iteration
  - Files
  - URLs



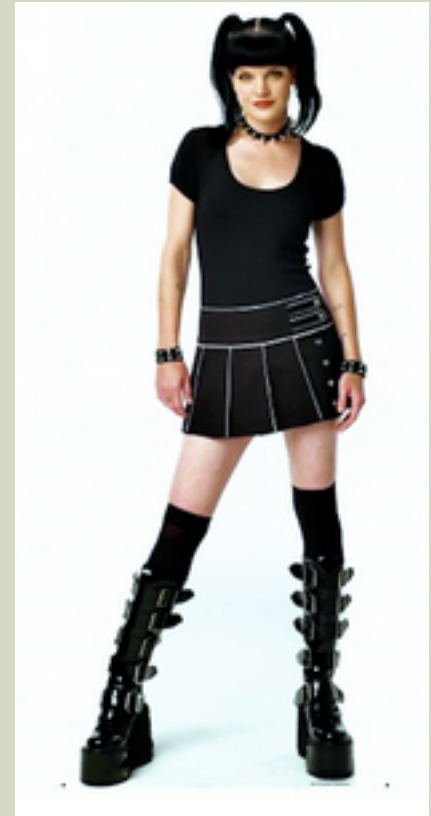
# INCLUSIVE LANGUAGE



Our audience is more than  
"the guys"

# IDENTITY

Try on the role of a  
computing person



# CS 1X – MEANS

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8. How helpful was it working with a partner?

- ☐ Very unhelpful
- ☐ Unhelpful
- ☐ Neutral
- ☐ Helpful
- ☐ Very helpful

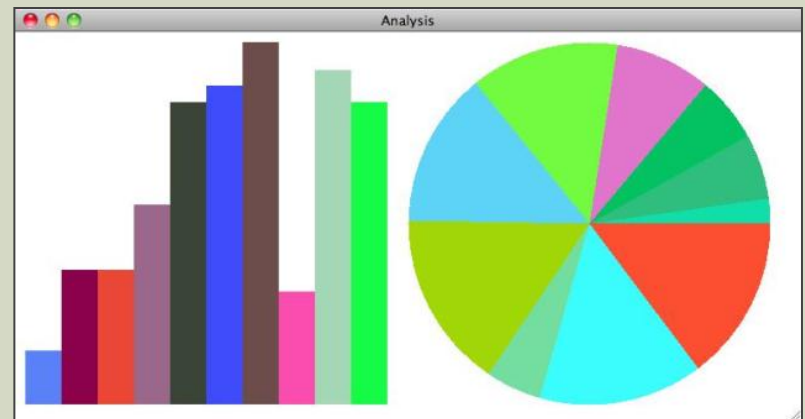
9. Should partnering be used in future assignments?

- ☐ Emphatically no
- ☐ No
- ☐ Neutral
- ☐ Yes
- ☐ Emphatically yes

10. Was working with a partner helpful in preparing you for the exam?

# CS 1X – MEANS

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# CS1X – [WWW.CS1X.INFO](http://WWW.CS1X.INFO)

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](http://www.cs1x.info)

NSF BPC-DP grant 073925

# TAG PROJECT – TAPESTRY FOR ALL

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

# BEANCOUNT.JAVA

```
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 * Math.PI * a * b * c / 24 ) );  
        System.out.println("beans: " + count);  
    }  
}
```

