

Alternative CS1

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Executive Summary

- CS1X = Intro sans experience
 - Favorable to female, minority
 - Likely to choose CS
 - Likely to persist to graduation



I don't teach high school

I don't teach high school

- Attendance spotty
- 60 hours lecture + lab
- CS1 \approx CS AP-A
- 200-500 students per class
- One teacher, a dozen TAs



Challenge

- CS enrollment down
- Recruit to and from CS1
 - Required for engineers (from)
 - Elective for rest (to)
- By default, getting self-defined geeks



Differentiated Instruction

- CS1G open to all

CS1E experience
required

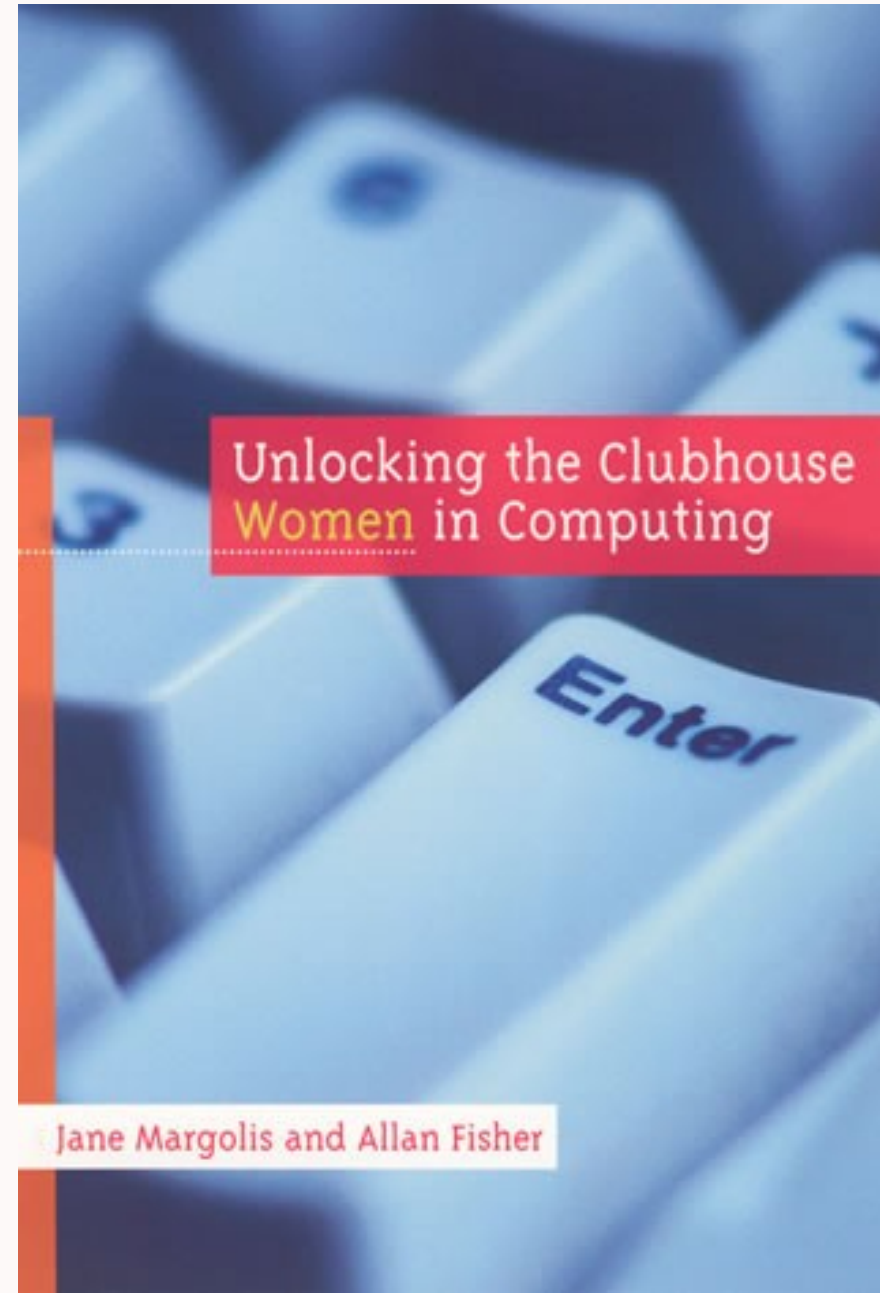
CS1X
inexperience
required



Differentiated Instruction

- CS1G open to all
- CS1E experience required

CS1X
inexperience
required



Differentiated Instruction

- CS1G open to all
- CS1E experience required
- CS1X inexperience required



Results (2002–2011)

- Rise from 7% to 25% female
- Rise from 450 to 1100 students
- CS1X 60% female, 100 students
- CS2: $1G \leq 1E \leq 1X \leq HS$



CS1X Mechanics

- Closed enrollment
 - Privilege, not remedial
- Pledge (next slide)
- Must **not** have prior experience
 - ~~Grandstanding~~
- Integrated lecture+lab



CSIX Pledge

- Sign to be admitted:
 - Attend every class
 - ...and pay attention
 - Ask or answer; be helpful
 - Try to enjoy material
 - Be proselytized



CS1X Practices

Writing a poem
For my new computer class
This is an odd start

**Computers are oil
I, however, am water
We do not mix well**

**The unfamiliar -
Anxious anticipation
Of struggling, learning**

**Befuddled blonde brain
Computer caused confusion
Programming paranoid**



**A little afraid
Yet, I'm excited to learn.
The journey awaits**

**Computers work me.
But after this course,
I work computers.**

**Computers scare me,
There's no reasoning with them.
Please teach me your ways.**



The spring brings new life
To an overeager brain
Excited to learn

Computer Science
I could hate you or like you.
Which one will it be?

Although starting weak
With much potential hidden
Strongest in the end



On my computer
I will write me a program
That will change the world



Baby Steps

- Laptops, TAs in lecture/lab
- 72 .java files in 31 assignments
- 164 example programs

cstapestry.wikidot.com/slides



Chrestomathics

- Programming \neq Computer Literacy \neq Computer Science \neq Information Technology \neq Information Systems \neq Computer Engineering \neq Software Engineering \neq Discrete Mathematics \neq Computational Thinking...
- **Chrestomatics (invented word)**
 - study of interesting/useful things/processes
- **From problem to code**



How many in 500ml jar?



How many in 500ml jar?



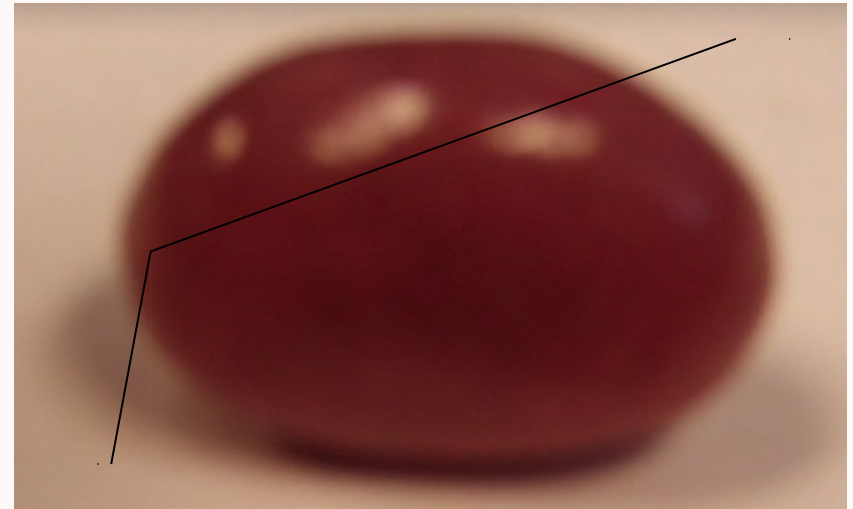
Volume of jar
÷
volume of bean

(round down)

(air pockets?)



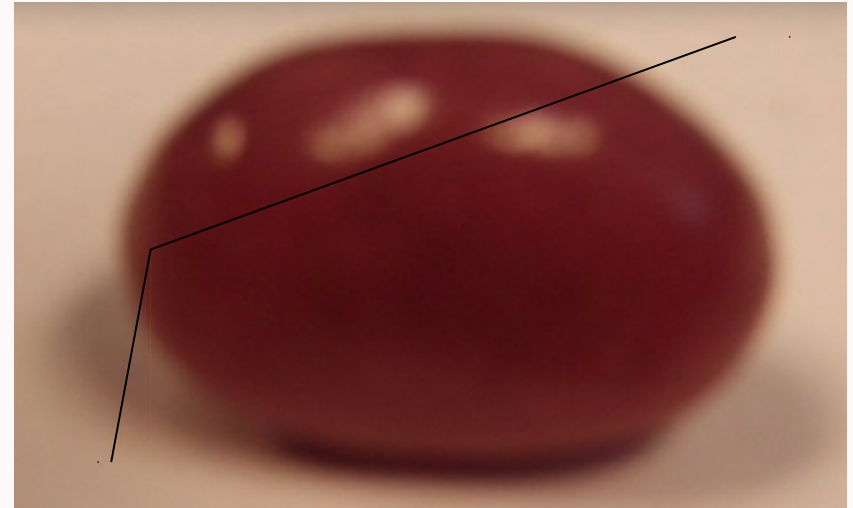
Volume of bean



$$5 \cdot \pi \cdot l \cdot w^2 \div 24$$



Volume of bean



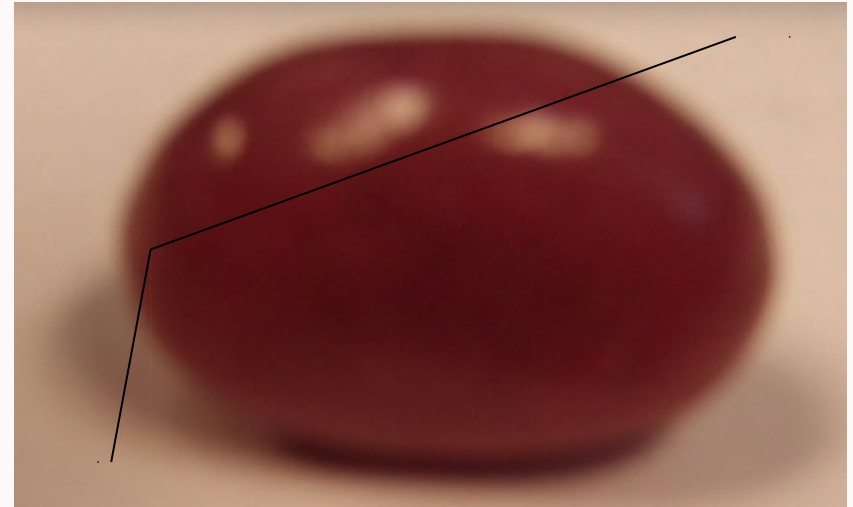
$$5 \cdot \pi \cdot 1 \cdot w^2 \div 24$$



Air pockets



30.2% air



$$5 \cdot \pi \cdot 1 \cdot w^2 \div 24$$



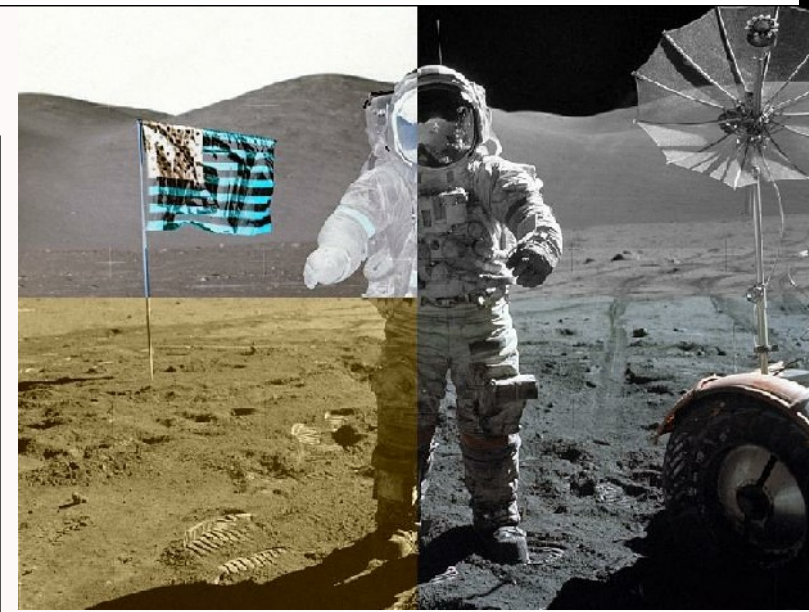
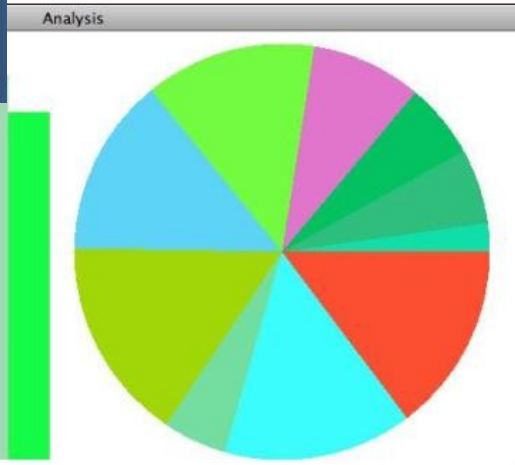
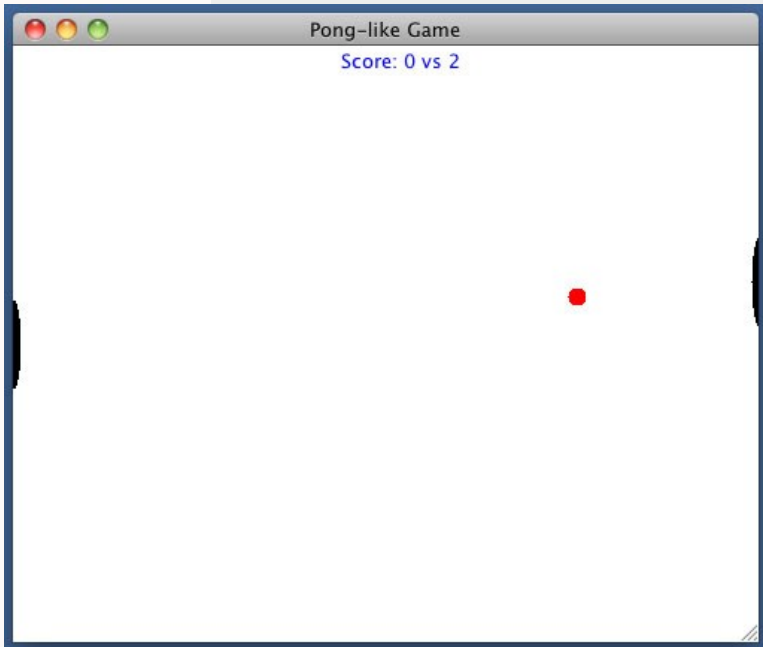
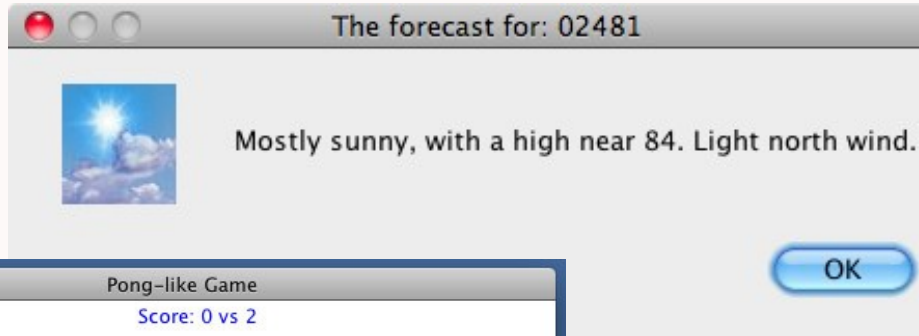
Other Examples

([link](#))

- Datable.java (05),
FrenchToEnglish.java (15),
Chart.java (22)
- Final projects: IM, Flocking,
Pong, Photo manipulator



Showoffable



Pair Programming

- Driver + Navigator
- Requires supervision
- Learn better faster
- Social (like real world)



Positive Reinforcement

- “Look what you’ve learned”
- “You can do it”
- “You should major in CS”
- Share job prospects, good news
- Avoid any suggestion of false stereotypes



Inclusion

- Personal contact with instructor
- Personal comments on grading
- TAs correct instructor
- Lots of group work
- Lots of help and helping



Interaction

- When given a number,
 - Stand up
 - If the number ≤ 1 , return 1
 - Otherwise
 - Give someone sitting number – 1
 - Give someone sitting number – 2
 - Return the sum of the results
 - Sit down



Recruitment

- Recruit every time possible
 - During campus visits
 - In bookstore (lurk)
 - On way to/from class
- “You should take this class”
- “You will do great”



What is interesting?

- Survey of interest
- 7-point Likert

Topics of interest - Windows Internet Explorer - [

C:\Documents and Settings\cohoon\Desktop\In Google

Topics of interest

To help protect your security, Internet Explorer has restricted this webpage from running scripts or ActiveX controls that could access your computer. Click here for options...

Computing Interests Survey

Offering students interesting and meaningful examples that illustrate and apply computing concepts can improve learning. Your answers to the following optional and anonymous survey will help computer science instructors accomplish that goal.

Please rate your interest in the following topics as possible class and homework examples on a scale from extremely uninterested to extremely interested.

Information about a topic can be displayed by rolling the mouse over the topic.

	Unfamiliar	Extremely Uninterested	Very Uninterested	Uninterested	Neutral	Interested	Very Interested	Extremely Interested
<u>Bank account interest</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<u>Battleship game</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<u>Body mass index</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<u>Bridge capacity</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<u>Business applications</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



- 5.59 Encryption
- 5.43 Card games
- 5.34 Instant messaging
- 5.30 Password security
- 5.29 Virus protection
- 5.17 Smart appliance
- 5.14 Photo manipulation
- 5.10 Transportation routing
- 5.08 Music player
- 5.07 Language translation
- 5.07 Engineering apps
- 5.05 Fractals
- 5.00 Science apps



Encryption

Card games

Instant messaging

Password security

Virus protection

Smart appliance

Photo manipulation

Transportation routing

Music player

Language translation

Engineering apps

Fractals

Science apps



Encryption

Card games

Instant messaging

Password security

Virus protection

Smart appliance

Photo manipulation

Transportation routing

Music player

Language translation

Engineering apps

Fractals

Science apps

Sudoku

Connect four

Personality typing

Daily Jumble

Tic-tac-toe

Medical diagnosis

Both liked

Males liked

Females liked

Females and class liked



Share

- Examples you use

Share

- How you make a positive environment

Share

- Examples you use
- How to make a positive environment
- What will you change?
- What should others copy from you?
- What should you change, but will not?



Summary

- CS1X: privilege, baby steps, interesting examples, reinforcement, sociability
- Female- and minority-friendly
- Attracts all students

