Look into my eyes
Jim Cohoon

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

Programming seems hard
I've never tried it before
I hope I don't fail

CS is darkness.
If I squint, I still cannot see.
Class will be my light.

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

These things baffle me
Computers are mysteries
Solve this quandary

Computer science
Will teach me how to use the
Devil box this spring

Programs, Java, work.
Combined both inside and out.
In my head lurks doubt.

I will learn Java,
Programming will be so fun.
I prefer mocha.

Befuddled blonde brain
Computer caused confusion
Programming paranoid

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

And in conclusion

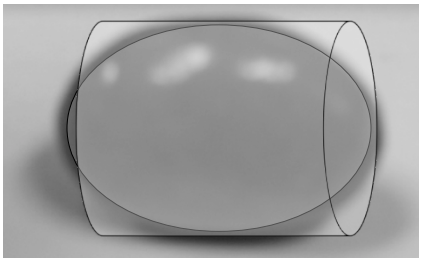
- CS 1X – an introductory CS course targeted for students without prior experience
  - Attractive to under-represented groups
  - More likely to choose computing
  - Attraction comparable to demographics
  - Brought up to comparable levels
  - 100% persistence to graduation

Chrestomathics

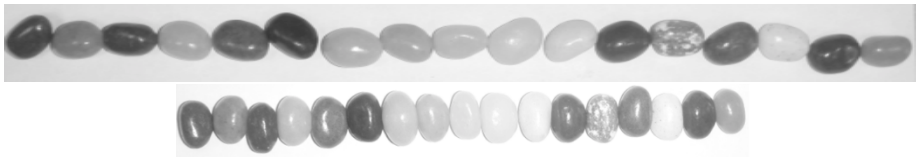
The study and application of useful things and processes

Is the jar full?

Chrestomathics



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



Chrestomathics

$$\frac{d \cdot e}{5 \cdot \pi \cdot a \cdot b \cdot c \,/\, 24}$$

BeanCount.java

```
import java.util.*;

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);

    }
}
```

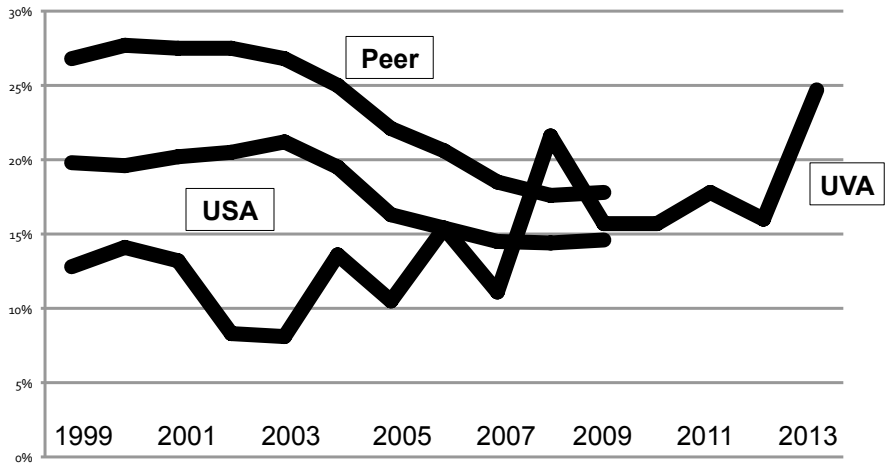
Starting point – do what you want

Want what you do

My current situation

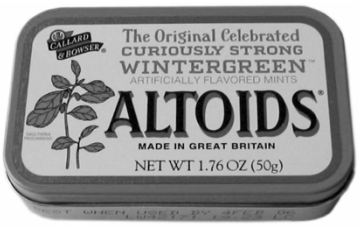
The situation – stormy weather

% of Female Graduates 1999 – 2013

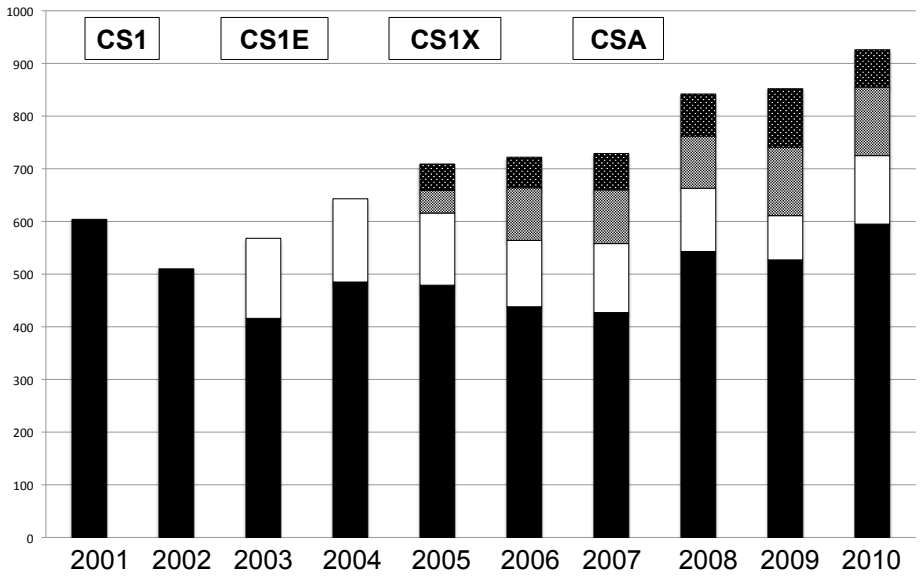


Our situation – the curious course CS 1

- Required course for all 1st year engineering students
  - Introduction to programming
  - First course in a BS computing degree
  - Weekly closed laboratory
- Contrary to national trends course enrollment is increasing – up 25% over the last 7 years
  - Improved CS 1 experience



Ten Years of CS intro enrollments



CS 1 multiple entry points

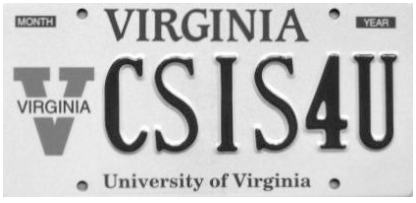
- CS 1
  - Open to all
- CS 1E
  - Open to people with experience

CS 1E

- Specification
  - Provide comparable computing content
  - Common assignments, tests, and grading
  - Open laboratories
- Result
  - Better overall CS 1 environment
  - Contributes to enrollments and helps with diversity
  - By itself not a magic bullet

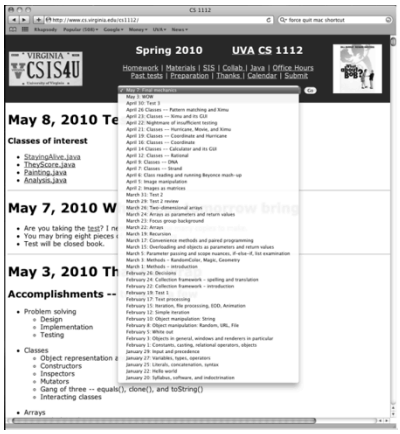
CS 1X – founding principles

- We can do better
- Meet CS1 knowledge and experience goals
- Offer different means and practices to encourage the education, interest, and retention of a diverse community
- Common demographics
  - 50% female
  - 14% African-American
  - 10% Hispanic



CS 1X – means

- Active and collaborative learning
- Guided discovery
- Class culture of success
- Encouraging pedagogy and examples
- Constant recruiting
- Regular acknowledgement
- Integrated lab – instructor and TAs always there



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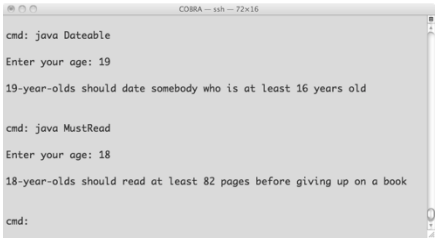

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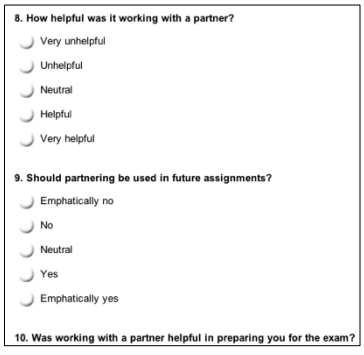

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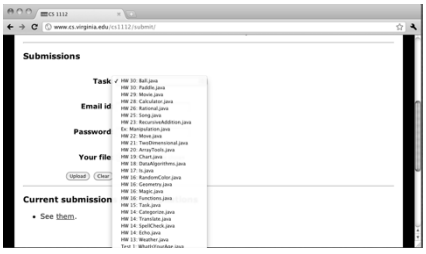

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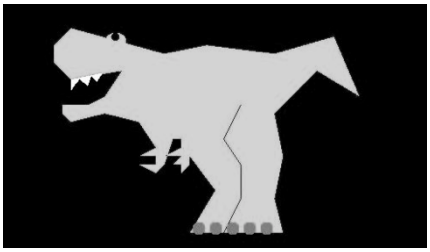

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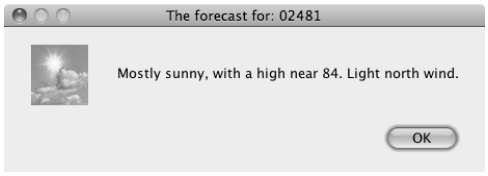

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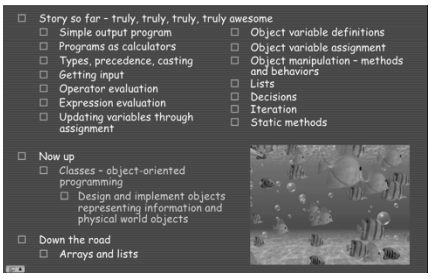

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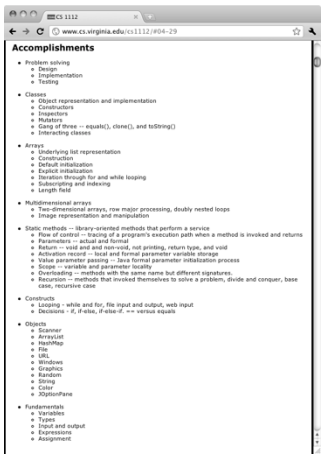

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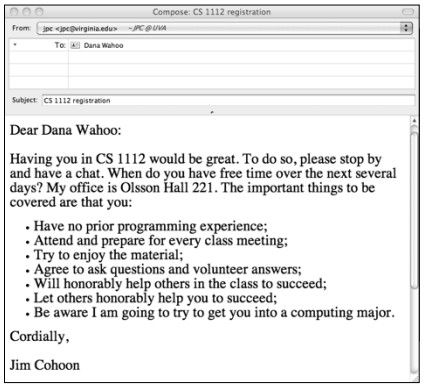

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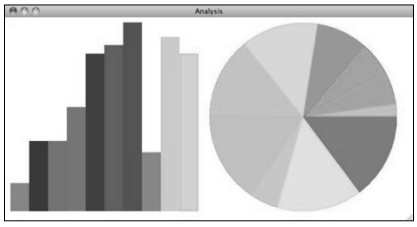

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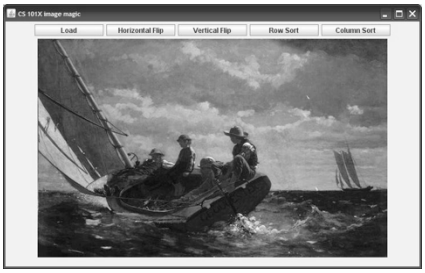

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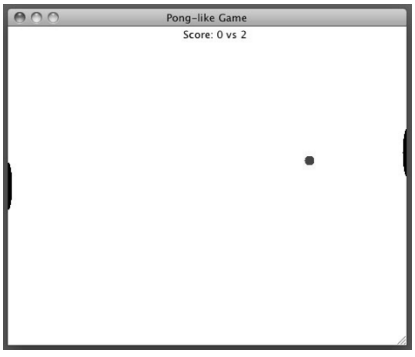

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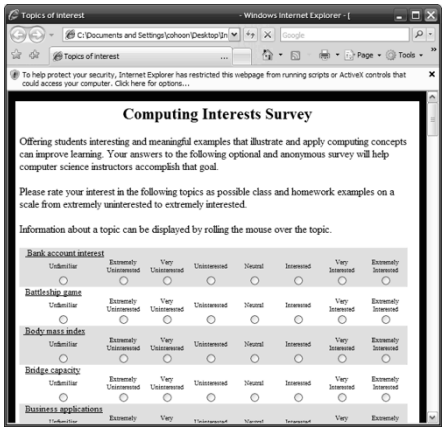
Examples

- Major class examples based on survey of class interest
  - 7-unit Likert scale
- Looking for other schools to participate
- Average rating varied from 5.4 down to 3.3 – interested to uninterested



Examples

- Major class
  - 7-unit Lik
- Looking for
  to participa
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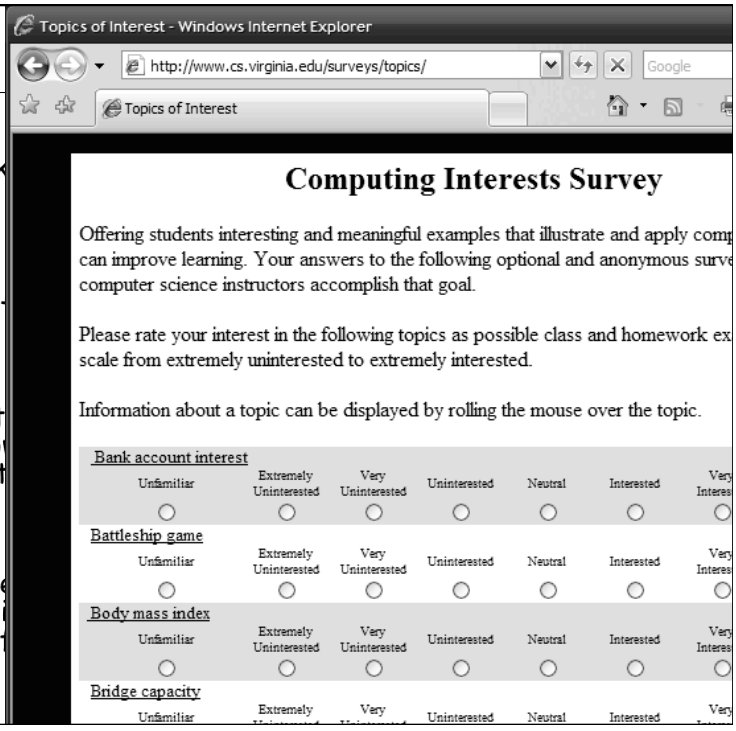
  interested t
- Student inte
  topic with si
  genders diff



Teacher interest top 15

Table 8: Likert-Scale Ratings of CS1 Example Applications

Application	High School Student	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	4.90	5.29	5.26	5.36	–0.10	**0.83**
Card games	5.73	5.12	5.15	5.07	0.08	–0.17
Medical diagnosis	3.93	3.93	3.21	5.00	0.21	**1.63**
Music library organizer	4.61	4.97	4.97	5.29	–0.32	0.94
Battleship game	5.00	4.85	4.85	5.43	–0.58	0.46
Connect four	5.33	4.85	4.85	5.14	–0.29	0.03
Mad Lib	4.52	4.52	4.73	5.21	–0.42	
Sudoku	5.09	4.85	5.06	4.79	0.27	0.33
Password security	5.52	4.74	4.74	4.93	–0.19	–0.30
Travel routing	4.81	4.65	4.65	4.71	–0.06	0.75
Video player	5.05	4.96	4.62	5.79	**–1.17**	0.35
Language translation	5.10	5.24	5.24	4.62	**0.62**	0.77
Engineering applications	4.29	4.61	4.61	5.29	–0.68	0.35
Tic-tac-toe	5.26	4.59	4.59	4.79	–0.20	–0.17
Heart monitor	4.81	4.65	4.65	4.54	0.11	**1.17**
Business applications	4.50	4.50	4.50	4.79	–0.29	0.17
Photo mosaics	5.32	5.32	5.32	4.50	**0.82**	0.80
Exercise training zone	4.59	4.56	4.56	4.46	0.10	0.79
Personality typing	4.38	4.36	4.36	4.36	0.35	0.37
Photo viewer	4.88	4.36	4.36	4.36	**0.52**	0.40
Smart appliances	4.29	4.29	4.29	4.64	–0.35	0.11
Virus protection	4.90	4.52	4.24	5.21	–0.97	0.06
Body mass index	4.73	4.61	4.76	4.21	0.55	0.32
Food dispenser	4.00	4.10	4.12	4.07	0.05	0.54
Science applications	4.71	4.21	4.00	4.71	–0.71	–0.06

5.73 Card games
5.52 Password security
5.52 Encryption
5.36 Instant messaging
5.33 Connect four
5.30 Music player
5.26 Tic-tac-toe
5.10 Spamming
5.09 Sudoku
5.09 Daily jumble
5.05 Video player
5.00 Calculator
5.00 Battleship game
4.90 Virus protection
4.90 Photo manipulation

Teacher interest top 15

5.73 Card games
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Teacher interest top 15 and number 28

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4.90 Photo manipulation

4.54 Music library organizer

Student interest – female and male

Sudoku	5.77	*Card games*	5.44
Instant messaging	5.69	*Connect four*	5.32
Language translation	5.45	*Instant messaging*	5.22
Personality typing	5.43	Password security	5.03
Connect four	5.38	Tic-tac-toe	4.96
Daily Jumble	5.31	Encryption	4.95
Photo manipulation	5.22	Music library	4.86
Card games	5.11	Engineering	4.82
Medical diagnosis	5.11	Sudoku	4.78
Music library	5.10	Business	4.77
Tic-tac-toe	5.01	Photo manipulation	4.73

Take away and give away

Binary Typewriter	Robotics
Career tracking	Master mind
Amusement Park rides	Stock Picker
Numbers - Prime, Mersenne, etc.	Energy use reduction
Turing test related	Texting prohibitor while driving
Linked list random pairing	Bus routing
Home food inventory	Music file organization
Scribbler w/fluke	3-D stuff
Arcade games	GIS for hikers
Grade calculator	SAT Game
Calorie calculator	Amusement Park rides
Artificial Intelligence	Finding 'dollar' words

Take away and give away

Othello	Stanford's Nifty Assignments
Interval analysis	Shoots & Ladders
Enigma encryption	Hangman
Art of Computer Science	Periodic table
Tracert detection	Monopoly
Fake-header sleuthing	Garal's Tires
Concordance creator	Pacman
Color calculator	Match game
Minesweeper	Robotics
Conway's Game of life	RFID tracking
Games	Homeland security
Random Writer	
Animation	

Take away and give away

- Designed to encourage education, interest, and retention of a diverse community
- Starts with preregistration
  - Students must meet with me – we make promises to each other

- Along the way
  - Recognition and encouragement of accomplishments -- mentoring
  - Routine discussion of options, advantages, and rewards of computing careers
  - Introduce CS

Take away and give away

- CS 1X a course targeted for students without prior experience using
  - Guided discovery with active learning
  - Integrated computer availability
  - Motivating examples with broad appeal
  - Routine discussions of options advantages, and rewards of computing careers
  - Establishment of a cohesive, ongoing culture

Produced

- Significant additional interest in computing among the students
- Attracted other students to take the course

Take away and give away

- How do you maintain a positive class environment?
- What would you like to change in your intro to CS course?
- What about your course should others adopt?
- What should you change, but will not?