Learning Activities for Secondary and Post-Secondary CS Courses

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Gender Statistics—Taulbee

Women
1999–2000

- **B.S.** in C.S. & C.E.—19%
  highest since 1993–94 (low 15%, 1997–98)

- **M.S.** in C.S. & C.E.—26%
  same as 1998–99 (low 19%, 1993–94)

- **Ph.D.** in C.S. & C.E.—15%
  down from 16% 1993–94 (low 12%, 1995–96)
Gender Statistics—Taulbee

Women
1999–2000

- **Assistant** Professors—**21%**
  highest since 1993–94 (low **16%**, 1997–99)

- **Associate** Professors—**13%**
  highest since 1993–94 (low **10%**, 1993–97)

- **Full** Professors—**8%**
  same as 1998–99 (low **5%**, 1993–94)
Ethnicity Statistics—Taulbee

1998–99

• **B.S. in C.S. & C.E.**

  - Hispanic: **4%** low: **2%** 1995–97
  - American Indian: **0.2%** low: **0.1%** 1995–96

• **M.S. in C.S. & C.E.**

  - African American: **1%** low: **1%** 1994–99
  - American Indian: **0.2%** low: **0.07%** 1994–95
Ethnicity Statistics—Taulbee, Continued

- **Ph.D. in C.S. & C.E.**

  - African American: 2%  low: 1% 1993–98
  - Hispanic: 2%  low: 0.6% 1997–98
  - American Indian: 0.1%  low: 0% 1993–94, 1996–97
Some Factors Leading to Under-representation

- feeling *isolated*, “different”
- low *self-esteem*
- *harassment*, discrimination
- general lack of *sensitivity* to relevant issues
- lack of *role* models
- *discouragement*, both personal and societal
Recruitment and Retention of Women...Report of a Workshop, CRA

Recommendation 11: Actively counter negative stereotypes... of computer science and engineering

Some of the common misperceptions include...

...All computer scientists work 24–7–365
If we want a different outcome, we’re going to have to do things differently. We’re making too little progress doing more of the same thing.

—John White, Dean of Engineering, Georgia Institute of Technology

“Women in Engineering and Science: Does Anyone Care?”

*Bridging the Gender Gap in Engineering and Science: The Challenge of Institutional Transformation, CMU, 1995*
If you always do what you always did, you will always get what you always got.

—Jackie “Moms” Mabley
Quoted in Acts of Faith, I. Vanzant, 1993
And the Survey Sez...

It is obvious there is a problem...

We asked several of our classes what they thought were characteristics of effective teachers

“Think of the teacher who has had the most positive impact on your life…”
No Surprises

- **Cared** about students
- Excited, creative, **enthusiastic** about teaching/subject area
- Took **time** to listen / help
- Made learning **fun**, enjoyable
- Was “**real**” and told it how it really was
- Able to present material in **many ways** so material was clear
Showing Our Students We Care

Themes & Activities

• Languages and Environments
• Acting Out
• Toys and Props
• Writing Across the Curriculum
• Humor and Student-oriented Examples
• Mentoring and Concern for Students
Languages and Environments

Logo

- simple—minimum syntax details
- graphical, colorful
- encourages experimentation
- interactive
- useful to show properties of recursion
Languages and Environments

ISETL & Maple

- powerful mathematics tools
- used in discrete math, numerical analysis
- first-hand experience—engages the students
- exploration of concepts and methods
**Acting Out**

**Active learning** is preferable to **passive** memorization

- Execution of control structures:
  - Selection (if)
  - Pre-test, post-test, and fixed iteration

- Sorting, using strings, sticks, whatever is handy

- Bounded buffer problem

- Synchronization problems from concurrency
Toys and Props

Demonstration Models

- recursion: counting candy pieces in a box or jar
- separate chaining method of hashing: egg carton and pieces of yarn, with large, numbered beads
- deck of playing cards – various sort algorithms
- interlocking children’s blocks – recursive mergesort
- small, numbered boxes with marbles – induction
Writing Across the Curriculum

Have students:

- write descriptive stories
- keep journals
  - give them a weekly question to answer
  - have them describe (in their own words) and give examples for current material
Humor and Student-oriented Examples

Bad humor is better than no humor at all!

New Examples:

- Groundhog Day (the movie)
- Viagra in the Waters (the song)
- Shoe- and boot-boxes as int and float storage
- Good parenting skills (AND) vs not-so-good (OR)
Mentoring and Concern for Students

SUGAR

- candy prizes for finding errors / omissions
- jar of candy for recursion
- Tootsie Pops for tired students
Mentoring and Concern for Students

Small Things with a Big Impact

- Ask a student how they’re doing
- Use 24+ point fonts for slides
- Make handouts of slides or post on web
- Post digital picture of your students (locally)
- Encourage questions
- Answer questions as simply as possible
• Encourage students to draw pictures

• Don’t get burned out yourself

Remember to Smile!
Conclusion

• listen and pay attention to students

• communicate your own enthusiasm

• make time to give extra help

• hold all students to high expectations and be clear about them

• don’t be afraid to experiment with new activities in your classes