EFFECTIVE TEACHING TACTICS

Cynthia Lee, Stanford University
Susan Rodger, Duke University

CRA-W.org
@CRAWWomen

bit.ly/cra-teaching-2018
What does CRA-W do?
Individual & Group Research Mentoring

**Undergrads:** Undergraduate Research Experiences
**Undergrads:** Distinguished Lecture series/role models
**Grad Cohort:** Group mentoring of graduate students
**Grad Students:** Discipline Specific Research workshops
**Academics/PhD Researchers:** Group mentoring for early and mid career @ CMW, Grace Hopper, and Tapia

2400+ students & PhDs a year

Stay in touch: CRA-W.org, @CRAWomen, Facebook: CRA-W, LinkedIn: CRA-Women
CRA-W Events at Grace Hopper

Visit the CRA-W Booth in the EXPO to learn more (#2050)

Attend another CRA-W Session Thursday (2 more) or Friday (1)

Visit a CRA-W Table at the Student Opportunity Lab on Friday (Undergrads)

Stay in touch: CRA-W.org, @CRAWomen, Facebook: CRA-W, Linked-in: CRA-Women
Here is a slide for the first day…
Classroom rule:

NO SITTING IN THE LAST FOUR ROWS!

Come join the rest of us!

_get students closer to you_
Quick Poll: Who’s in the room?

Current instructors?
   Average class size?

TAs?

Students who plan to teach someday?

High school teachers?
Susan Rodger

Intro #1: The Technical Me...

- NCSU - BS Math & CS
- Purdue - PhD
- Rensselaer - Assist Professor
- Duke - Professor of the Practice
- Research: Visualization, animation, CS education

Intro #2: Non-Technical Me

- Married
- Kids: Two boys (grown)
- 3 cats, over 200 fish
- Other fun: swimming, running, write Wikipedia pages, baking
Cynthia Lee

Intro #1: The Technical Me...
- Lecturer at Stanford
- PhD in high-performance computing at UCSD
- Peer Instruction enthusiast

Intro #2: Non-Technical Me
- Rock climbing
- “Like a cat lady, but for chickens”
- Cooking (not the pet chickens)
Brainstorm: 3 verbs for what students are doing in this photo
Think - Pair - Share

Collaborative Learning Strategy

- First answer question individually
- Partner with peer to develop answer
- Share answer with class

Advantages:
- Increases classroom participation
- Higher confidence in reporting ideas to class
- More productive classroom discussions
Adding active learning to your classroom:  
A spectrum from tiny tweaks to significant overhaul

Got workshop new idea fatigue?  
Don’t beat yourself up!  
Choose the amount of change you’re ready to make:

- Minor tweaks
- Significant overhaul
- More traditional
- Pervasive active learning

- Every little bit helps! The more active learning, the more students benefit.
Ways to Select students to answer questions

Problem – same students always eager
How do you get other students to participate?

  Randomly call on them (card for each student)
  Keep track of who has spoken already
  Work in groups – call on group
  Assigned groups – call on group numbers
Read the book

Read before coming to class
Ready to work in class

Reality
Run out of time to read, not prepared

Bring on – Reading quizzes
Online (Sakai, Blackboard, etc)
Turn off when class starts
Have an engaging book....

Runescape (Brad Miller)

Here is the program in activecode. Note that the function definition is the same as it was before. All that has changed is the details of how the squaring is done. This is a great example of "black box" design. We can change out the details inside of the box and still use the function exactly as we did before.

```python
1 def square(x):
2     runningtotal = 0
3     for counter in range(x):
4         runningtotal = runningtotal + x
5     return runningtotal
6
toSquare = 10
7 squareResult = square(toSquare)
8 print("The result of", toSquare, "squared is", squareResult)
```

ActiveCode: 1 (sq_accum1)
Pair Programming

Students work on problem with one computer in pairs

- “Driver” and “navigator” - rotate often
- Shown to improve student learning outcomes and retention
Interactive Lecture Notes and Handouts

Create two versions of lecture notes
Slides with missing parts
Release complete slides later
Instant Feedback in Lecture

Clickers

Google forms

What's printed from the first statement under main numbered # 1? *

- "Go" (92.2%)
- "Go3"
- "Go*3"
- "GoGoGo"
- None
- Nothing is printed

(180 responses)
Instant Feedback in Lecture

What's printed from the second statement under main numbered # 2? *

(180 responses)

- "Go" 43.9%
- "Go5"
- "GoGoGoGoGo"
- None
- "GoGoGoGoGo" and None
- Nothing is printed
Setting up Google Forms

Make it easy for students to get the form

CUSTOM BITLINK

Current: http://bit.ly/1CWexRo

Customize your Bitlink! Extend your brand, build trust, and drive engagement.

bit.ly / 101S15-0205-01
What else have you tried in your classes? What else *could* you do?

*Think - Pair - Share*

Every little bit helps! The research shows the more active learning, the more students benefit.
Peer Instruction: scalable active learning for large (and small) lectures

Lecture consists of a series of modules:

1. Ask a multiple choice question
   a. Students consider and VOTE
Peer Instruction: scalable active learning for large (and small) lectures

Lecture consists of a series of modules:

1. Ask a multiple choice question
   a. Students consider and VOTE
2. Then have students discuss in groups of 3-4
   a. Come to a jury-like consensus
   b. Why is the right answer right?
   c. Why are other responses wrong?
   d. VOTE again
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PeerInstruction4CS.org
Using Animations/Software Tools and Props in Class
Use Engaging and Visual Tools
Example: Python Tutor
www.pythontutor.com

```python
1 scores = [10, 8, 3, 9]
2 list2 = scores
3 list3 = scores[:]
4 scores[2] = 5
```
Active Learning

• CS Unplugged – csunplugged.org
Teaching Automata with JFLAP
Passing Parameters in Class

Pass by reference – throw frisbee

Pass by value – throw copy of frisbee

Pass by const reference – throw “protected” frisbee
Ways to use playing cards:
www.cs.duke.edu/csed/wikipedia

Insertion Sort
Card Class – shuffling, dealing hands
Poker hands – Full house, Flush, etc.
Edible Computer Science
Commit to Try Something New

Share ideas at your table

Enter something you want to try:  

We will email you a reminder next week (and only one reminder).

Slides available: bit.ly/cra-teaching-2018
How to Survive Large Courses

• Cut back on Email
• Use Bulletin Board – like Piazza
  • Students can post anonymously
  • Lots of people can be answer questions
  • You can endorse answers
• Manage with google forms
  • Form if you are sick and need extension
  • Form if you get test accommodations
  • Form to sign up for alternate exam time
  • Form to request a regrade
• Automate Grading of Assignments

Duke: large = 300-350
Teaching Assistants
Undergraduate/Graduate

- Mandatory training session
  - Behavior - Don’t date your students
  - How to help someone
  - What not to do
- Link to Duke site
  www.cs.duke.edu/courses/spring15/compsci101/training/
- Meet weekly with them
  - Make them do X before they help students with X
Assessing Course/Teaching

- Course Evaluation – end of semester
  - These matter to your Dept/University
  - What do the majority say, ignore outliers
- Get feedback earlier – do your own
  - Have anonymous form for feedback and encourage
- Get Someone to sit in and provide feedback
- Determine what you need to improve on
Improving Teaching

- Is there a teaching and learning center?
- Video tape yourself and watch it
- Class boring? Voice monotone?
  - Practice tongue-twisters
  - Take theatre or public speaking course
  - Toastmasters
- Talk too fast? Note to remind to slow down
- Don’t move? Start moving around
  - Get a wireless/laser presenter
Improving Teaching
Attend SIGCSE

- Conference focuses on CS Education
  - Papers, Panels, Workshops, Bofs
  - Attend every year, always get new ideas to try in your courses
- Friendliest and Cheapest Conference
- CRA-W Mentoring Workshop at SIGCSE 2017
- If you can’t attend, check out SIGCSE papers in ACM Digital Library
THANKS

Please rate and review the session in the GHC 18 mobile app

Stay in touch:
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