CSE599: Teaching Methods in Computer Science

CSE 1202
Prof. Mia Minnes
minnes@eng.ucsd.edu
http://cseweb.ucsd.edu/~minnes/cse599/
Feedback
Expect Today…

• Techniques for active learning

• Practicum:
  - Today and Week 8: Role play student/TA
  - Week 7 and Week 9: no class meetings
  - Week 10: Elevator pitch competition
    • Details to come Week 8
Learning Goals: CSE 599

3. Develop, describe, and implement a discussion section activity to support student-centric learning.
4. Describe at least 3 ways to “find out what students don’t know” (e.g., for guiding discussion section or lecture planning).
5. Describe a specific lecture/discussion activity or homework assignment for a computing course that engages students in metacognitive assessment.
7. Put to practice at least 2 techniques for engaging students in discussion section.
10. Provide examples of formative and summative assessments in a specific
Why do we lecture?

GREAT Innovations:
The printing press, The web
You don’t have to trust the monk!
How instructors see lecture ...

“I skate to where the puck is going to be, not where it has been.”
– Wayne Gretzky
How students see lecture ...
How do students react to lecture?

Measures alterations in emotional, cognitive, and attention.

Active Learning

First Exposure: With resources and Feedback
Lecture

Read Hard Stuff
Textbook

See if You Know Hard Stuff
Homework

Show Knowledge Mastery
Exam

Learn Hard Stuff: With teacher and discussion
Lecture

Practice Knowledge Mastery
Lab/homework

Show Knowledge Mastery
Exam

First Exposure: With resources and Feedback
Homework
Active Learning

Motivation:
- Greater opportunity for expert feedback.
- Research on how people learn:
  - Everyone constructs their own understanding.
  - To learn, you must actively work with a problem.
Active Learning

Multiple approaches here:
1. Think-Pair-Share (TPS)
2. Problem Based Learning (PBL)
3. Process Oriented Guided Inquiry Learning (POGIL)
4. Peer Instruction (PI)
5. Others
Peer Instruction

• Before class: students prepare
• In-class: students answer and discuss 4-6 questions.
• In-class: instructor dynamically adjusts class based on student understanding.

Not just about asking questions in class or having students talk.
Peer Instruction

• Before class: students prepare

• In-class: students answer and discuss 4-6 questions.
  - Students individually consider & respond to a m.c. question.
  - Students discuss same question in groups, then respond again.
  - Instructor guides students in class-wide discussion.

• In-class: instructor dynamically adjusts class based on student understanding.

Not just about asking questions in class or having students talk.

public class Nim {
    private int[] board;
    public Nim() {
        int[] board = new int[4];
        board[0] = 7;
        board[1] = 5;
        board[2] = 3;
        board[3] = 1;
    }
    public static void main ( String[] args ) {
        Nim game1 = new Nim();
        Nim game2 = new Nim();
        game1.board[2] = 100;
        game1 = game2;
        System.out.println( game1.board[2] );
    }
}

Is there an error in this code?
A. Yes
B. No

What's wrong with this question / answer set?
public class Nim {
    private int[] board;
    public Nim() {
        int[] board = new int[4];
        board[0] = 7;
        board[1] = 5;
        board[2] = 3;
        board[3] = 1;
    }
    public static void main ( String[] args ) {
        Nim game1 = new Nim();
        Nim game2 = new Nim();
        game1.board[2] = 100;
        game1 = game2;
        System.out.println( game1.board[2] );
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        board[3] = 1;
    }
    public static void main ( String[] args ) {
        Nim game1 = new Nim();
        Nim game2 = new Nim();
        game1.board[2] = 100;
        game1 = game2;
        System.out.println( game1.board[2] );
    }
}
What questions to ask?

• Questions that highlight a common misconception
  - So you don't have to guess what students know / don't know.

• Questions that build connections
  - Ask sequence of questions where insight from earlier ones must be used later.

• Terminology check (only use rarely - don't often lead to good discussion)
  - Drive home the point that these terms matter.

• Questions that spur complex synthesis / analysis
  - Require nuanced analysis that challenges students. Use sparingly but can spur great connections between different topics in the course.
If you don't have clickers

- Low-tech versions.
- Worksheets
- Small group activities.

MethodTest Worksheet
Think like a compiler. Act like a runtime environment.

```java
class Super {
    public void meth(Super other) {
        System.out.println("#1 - in Super.meth(Super)");
    }
}

class Sub extends Super {
    public void meth(Super other) {
        System.out.println("#2 - in Sub.meth(Super)");
    }
    public void meth(Sub other) {
        System.out.println("#3 - in Sub.meth(Sub)");
    }
}

public class MethodTest {
    public static void main(String[] args) {
        Super sup = new Super();
        Sub sub = new Sub();
        Super sup_ref_sub = new Sub();
        sup.meth(sup);
        sup.meth(sup_ref_sub);
        sup.meth(sub);
        System.out.println();
        sup_ref_sub.meth(sup);
        sup_ref_sub.meth(sup_ref_sub);
        sup_ref_sub.meth(sub);
        System.out.println();
        sub.meth(sup);
        sub.meth(sup_ref_sub);
        sub.meth(sub);
    }
}
```

What is printed when MethodTest is run?
And more importantly ... **WHY**?

Hint 1: What is the only thing the compiler knows at compile time to emit the call instruction?

Hint 2: What is known at run time? And the run time must perform the call instruction as specified by the compiler.
Practicum

• You will role-play working with different students in a one-on-one situation (e.g. office hours, or in the lab).

• Today, 4 of you will take the role of TA and 4 will act as students. Each pair will role-play for 5 minutes while the rest of the team observes, then another pair will take over, etc. Make sure to keep a close eye on the timing.

1. Which strategies worked effectively with each "student personality".

2. Which strategies did not work effectively with each "student personality".

3. What strategies can you use as a TA to quickly determine what your student needs (they won't tell you ahead of time what personality / role they're playing or feeling!)