COMP 915
Learning Styles and Course Planning

Don Porter

(Portions courtesy Samarjit Chakraborty)

Disclaimers

- I am not an education or psychology expert
- And some of the scholarly consensus has changed since I took a similar course
- Lessons: Stay humble, stay curious

Bold Assertion:
People are different

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  - Big 5/OCEAN (actually scientifically validated):
    Openness: curious vs cautious
    Conscientiousness: organized vs. careless
    Extraversion: outgoing vs. reserved
    Agreeableness: compassionate vs. critical
    Neuroticism: sensitive vs. confident

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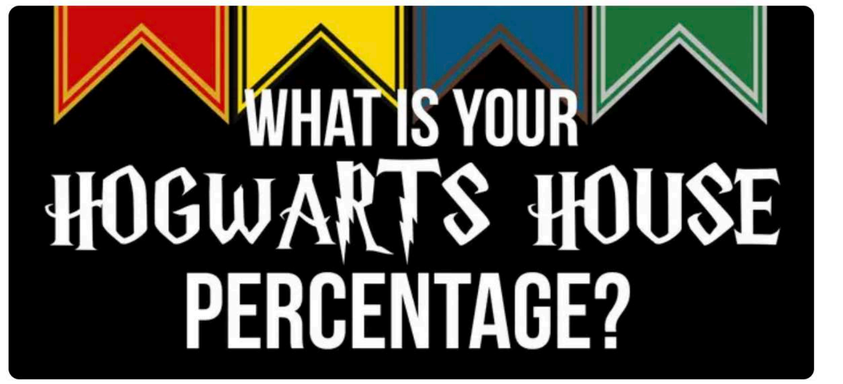


Silly quizzes are obv. Copyright buzzfeed

Lesson 1:

- What worked for you to learn,
  will NOT work for all of your students
- And, it is not the students' shortcoming

Image stolen from The Simpsons, via google images

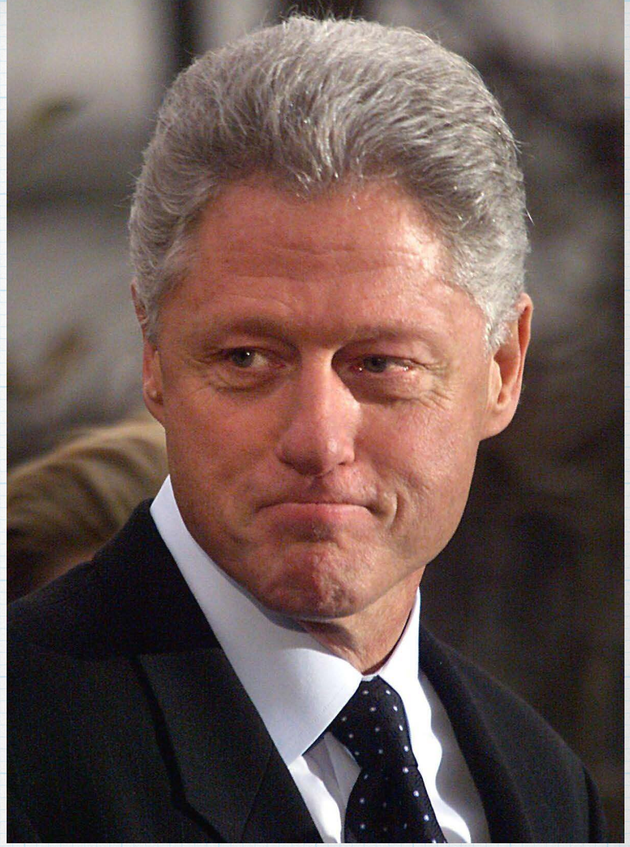
All models are wrong, Some are useful

- My favorite: the Whole Brain Dominance Instrument

	Left	Right
High	Analytical	Visionary
Low	Detail-Oriented	Empathetic

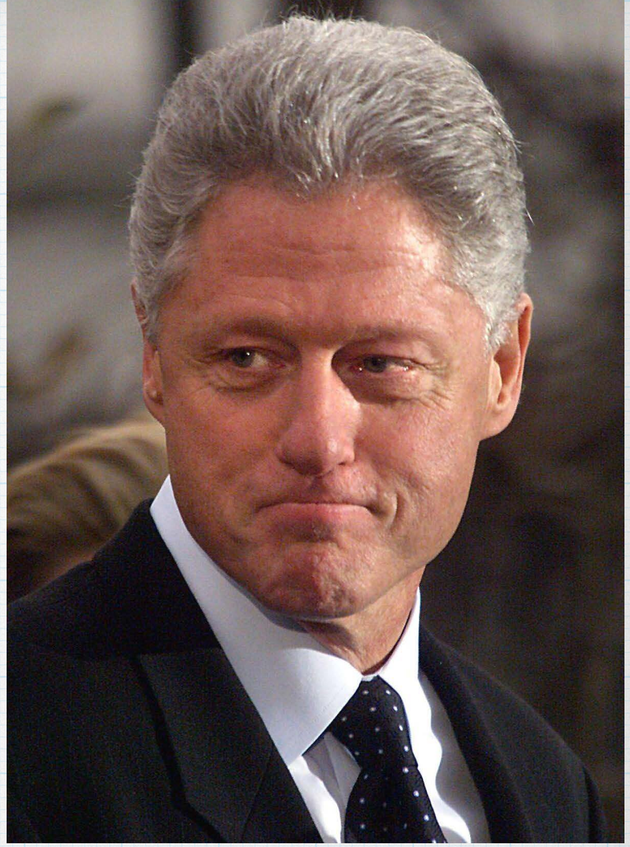
- People have varying degrees of comfort in each area

Example: Bill Clinton



- 42nd President of the United States (1992—2000); spouse of Hillary Clinton
- Only US President from my home state of Arkansas
- Widely considered an exceptional speaker
  - Why?

The formula for a Clinton Speech



1. I feel your pain
2. Here is why you are experiencing your pain
3. I have a vision for a world without your pain
4. And a 12-point plan to accomplish it!

	Left	Right
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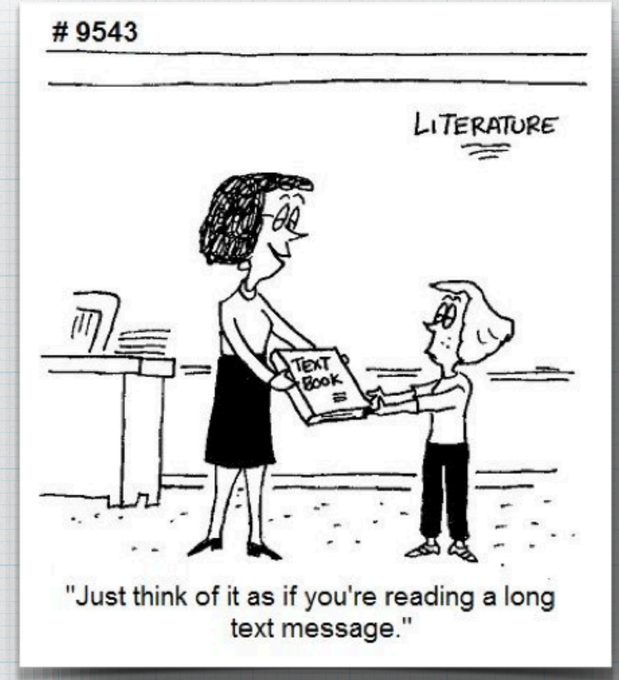
Learning Styles: A Teaching-Specific Model

Preferred Learning Style		*Corresponding Teaching Style*	
sensory / intuitive	perception	concrete / abstract	content
visual / auditory	input	visual / verbal	presentation
inductive / deductive	organization	inductive / deductive	organization
active / reflective	processing	active / passive	student participation
sequential / global	understanding	sequential / global	perspective



- There are multiple dimensions in learning and teaching styles
- To account for all students, what should you do? Accommodate all the 32 styles?

Sensing and Intuitive Learners

Gap between engineering education and what would be effective

- E.g., sensors like data, facts vs intuitors like concepts
- Ideas?

Sensing and Intuitive Learners

Gap between engineering education and what would be effective

- E.g., sensors like data, facts vs intuitors like concepts
- Solution: blend concrete information with abstract concepts

Visual and Auditory Learners

Visual vs Auditory vs Kinesthetic (taste, touch, smell)

- Most college teaching is verbal
- Result - serious learning/teaching style mismatch

Visual + auditory modalities reinforce learning for more students

- Solution: blend figures, graphs, logic/information flow into the text

A Note on Kinesthetic Learning

- My spouse teaches Montessori at the elementary level
  (6—11 yrs old)
- They cover math topics through **algebra**
- Introduced kinesthetically!
  - Then generalize to symbolic manipulation

Photo stolen from Maitland Montessori School Website

Inductive vs Deductive Learners

Induction - observations to laws/theory

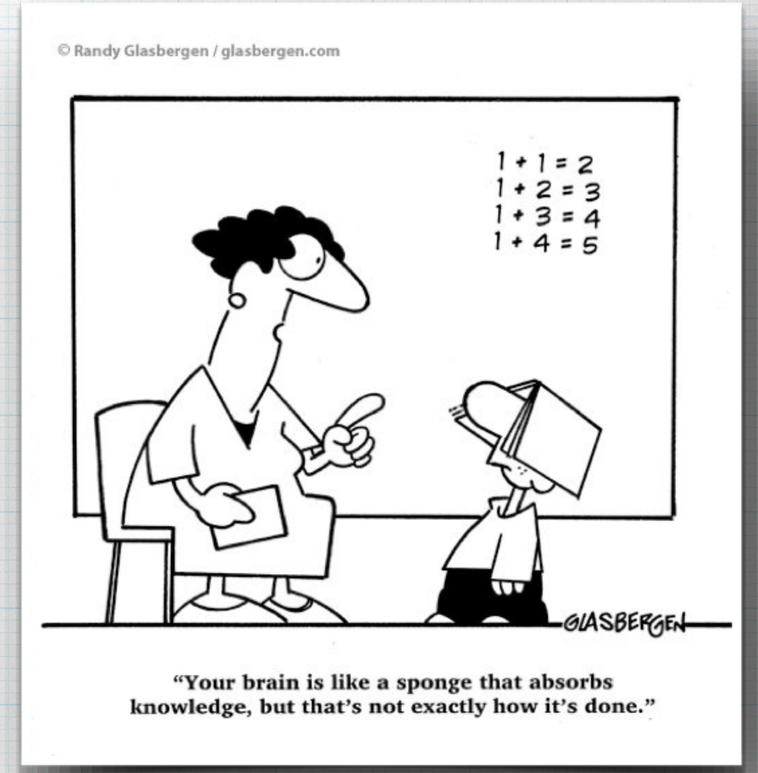
E.g., Scientific method rooted in inductive reasoning

Deduction - theory to consequences

E.g., Mathematical proofs rooted in deductive reasoning

CS is a rare field where we get some of both!

Engineering education - “fundamentals” for sophomores
“applications” later (if ever)



- Research says that inductive teaching better promotes effective learning
- Solution: First induction, then deduction. Let the students deduce the rules

Active vs Reflective Learners

Active - doing something with the information

Reflective - examine information introspectively

Effective teaching strategy:

- Interleave lectures with pauses for thought and discussions & problem solving
- Emphasize both -
  fundamental understanding (reflective) & problem solving (active)

Sequential vs Global Learners

- Sequential learners can work with material they understood partially/superficially
- Global learners require a fuller picture

Standard curriculum follows sequential flow

- Instructors should pay special attention to help global learners
- How? Provide more context, relate to previous courses, assign creativity exercises, encourage alternative solutions

Challenge in COMP 530: No sequential path through an OS

So how will you incorporate all the 32 styles?

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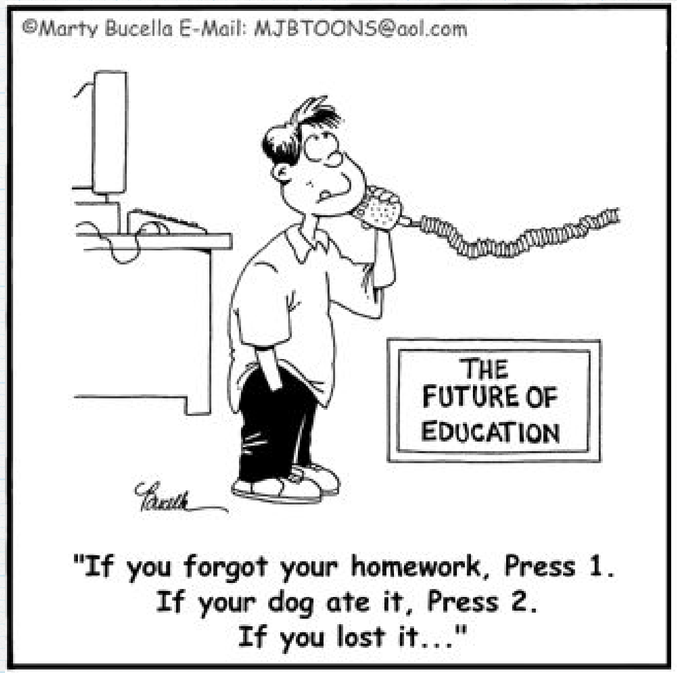


You probably can’t all the time

- But covering a few strategies (poles of each dimension) should help a very large section of students
- Experiment and evolve …

Finding Science in Education

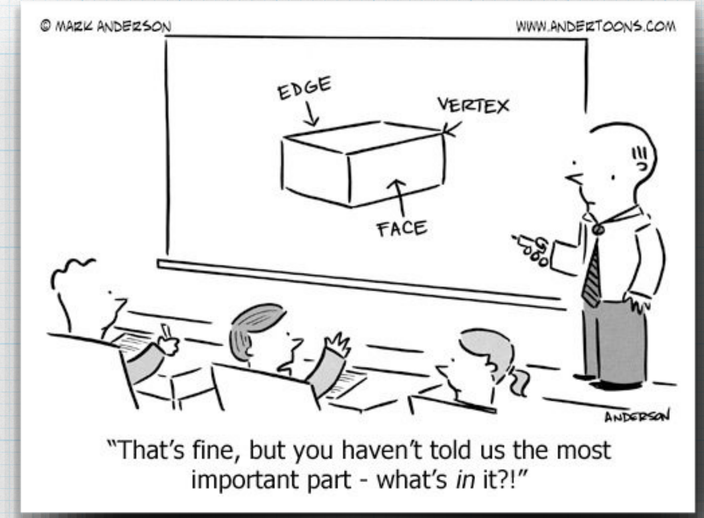
- In OS research, the lag between idea and data is measured in years
- In teaching, the lag between course meeting and assessment can be as short as days, or even minutes!

Disclaimer

- Recent research has somewhat challenged learning styles as the absolute truth
  - Most people learn via most styles, and need all styles
    - Even if they have preferences
- Again, “some models are useful”
- And, these slides will likely need updates in future years, as humans collectively learn more about learning

Course Planning and Evaluation

- What is your first step towards preparing a talk
  or writing a report?



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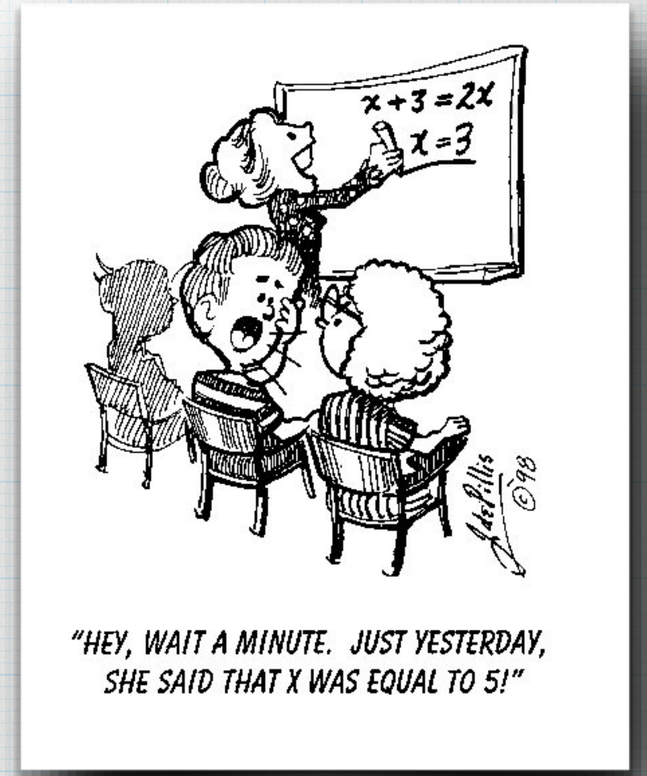
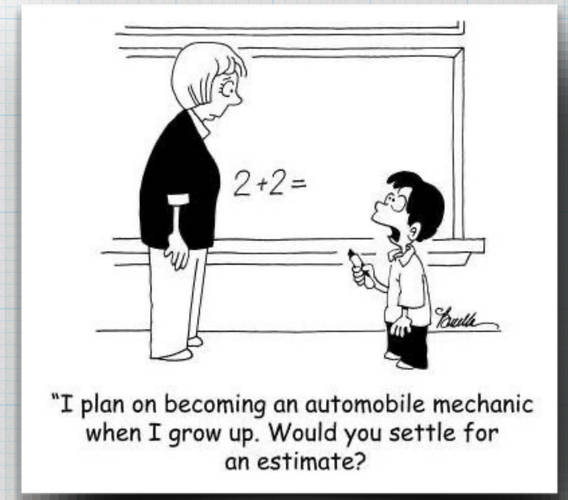
Why are you teaching this?

- A new course
- A talk at a conference



Why are you teaching this?

- Goals tied to outcomes (e.g., what will the students be able to do?)
    - Your goals vs goals of the student (e.g., employment)
- Listing the goals will serve as a basis for designing the course/talk
- Evaluation will be easier - have you achieved those goals?
- Methods of assessment - operational definition of your goals



Bloom’s Taxonomy
(Revised by Anderson and Krathwohl 2001)

Bloom’s Taxonomy
(levels of educational objectives)

- Remember
- Understand - interpret, infer
- Apply
- Analyze - how different components relate to each other
- Evaluate - make judgements based on criteria
- Create

- My test questions:
  - Some simple definition questions
  - Some simple word problems
  - Some challenging problems
  - Some performance analysis
  - Some “what if?” questions

Bloom’s Taxonomy Lessons

- Different learning objectives have different assessment methods
- In courses, students realize different degrees of mastery
  - Good to measure at each level
    - Builds confidence, if nothing else!