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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- Hence: Many, many personality tests/types
  Most fun and no real scientific grounding

- 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

- Myers-Briggs (e.g., INTJ)
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Lesson 1:

- What worked for you to learn, will NOT work for all of your students
- And, it is not the students’ shortcoming
All models are wrong, Some are useful

- My favorite: the Whole Brain Dominance Instrument

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- 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!

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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 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

“In an increasingly complex world, sometimes old questions require new answers.”
So how will you incorporate all the 32 styles?

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?
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

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!