Review 1

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Topics Covered

- Informatics and Data Science

Problem Solving with Thinking	Problem Solving with Computer Science
Computational Thinking	Variables
Design Thinking	Conditionals (Selection)
Creative Thinking	Loops (Repetition)
Statistical Thinking	Arrays
	Standard I/O, File I/O

Thinking: Computational Thinking

- Fundamental to problem solving
- Decomposition
- Abstraction
- Generalization
- Pattern Recognition
- Algorithmic Thinking
- Evaluation

Thinking: Computational Thinking

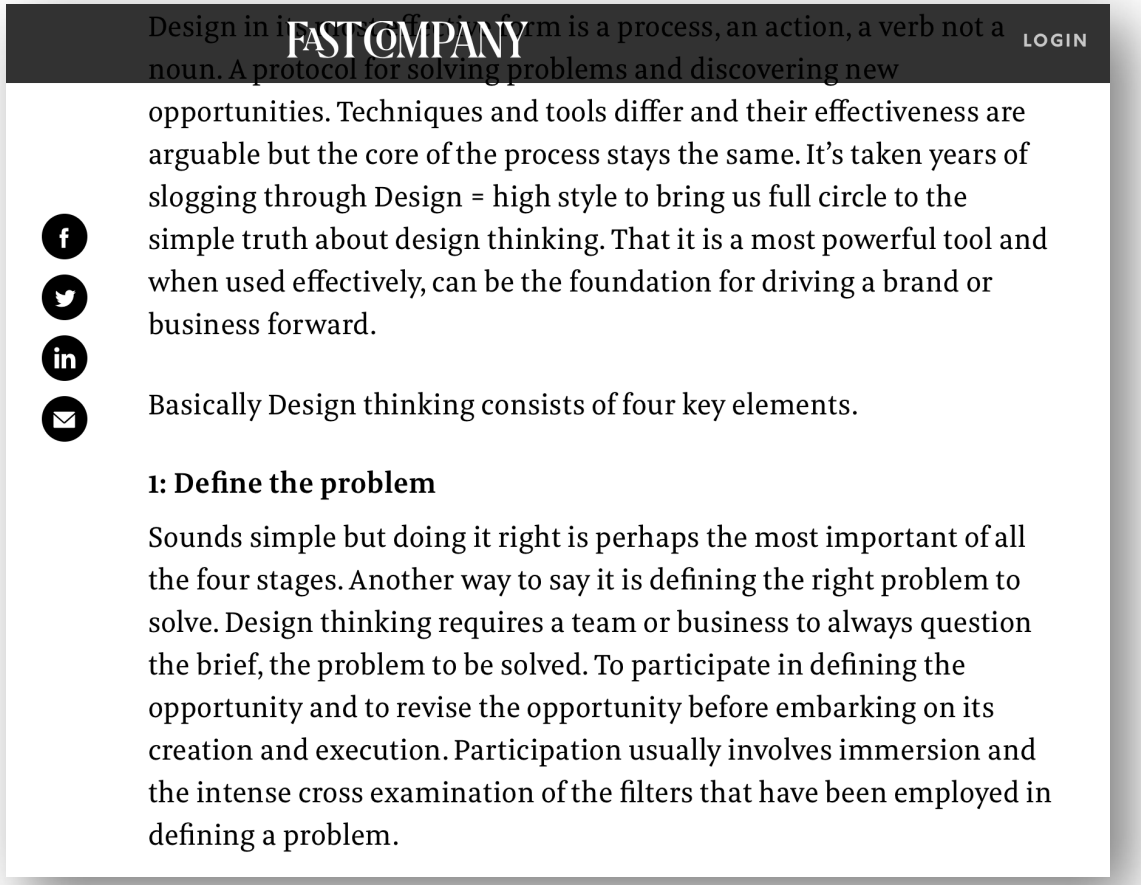
- Fundamental to problem solving
- What are the six skills that we discussed?
- Will you be able to apply them?
- Will you be able to recognize them in action?

What is Computational Thinking?

- A way of thinking for *logically* and *methodically* solving problems
  - E.g., *purposeful*, *describable*, *replicable*
- Includes *skills* such as
  - Decomposition
  - Pattern Recognition
  - Abstraction
  - Generalization
  - Algorithm Design
  - Evaluation

Thinking: Design Thinking

- What are the four key steps?
- Will you be able to apply them?
- Will you be able to recognize them in action?



From: https://www.fastcompany.com/919258/design-thinking-what

Thinking: Creative Thinking

- Makes practicing computational thinking more effective
  - Computational thinking makes practicing creative thinking more efficient
- What are the four competencies that we discussed?
- Will you be able to apply them?
- Will you be able to recognize them?

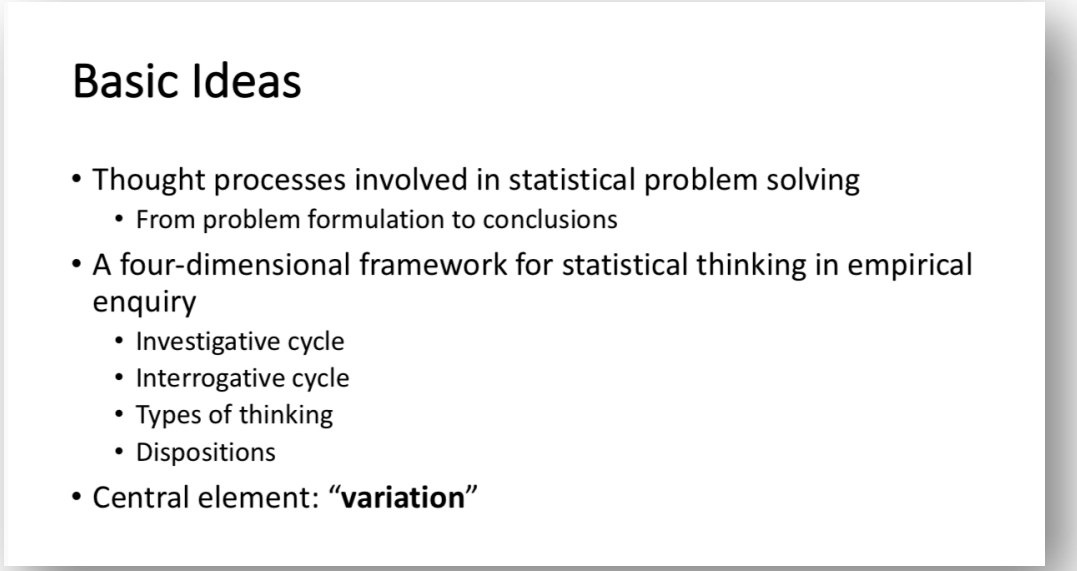
CREATIVE THINKING

Epstein's Generativity Theory breaks creative thinking down to four core competencies

- ***Capturing*** **novelty**
- ***Challenging*** **established thinking and behavior patterns**
- ***Broadening*** **one's knowledge beyond one's discipline**
- ***Surrounding*** **oneself with new social and environmental stimuli**

Thinking: Statistical Thinking

- What are the three types of analytics?
  - What are they for?
- What are the three main groups of descriptive statistics?
  - Will you be able to apply them?
  - Will you be able to interpret the results?
- What is correlation? How to use it to investigate/interrogate?



CS: Variables

- Memory location to hold a value that can change during the execution of a program
- The assignment operator
- int, float, char, Boolean, string, array, etc.

CS: Conditionals (Selection)

- If
- If-Elif
- Nested If
- How to design your if blocks, elif blocks
- How to use compound conditionals
- Flowchart
- Step-by-Step Tracing

CS: Loops (Repetition)

- For loops vs. While loops
  - When to use which?
  - Example of a count-controlled & sentinel-controlled loop?
- Nested loops
- Flowchart
- Step-by-Step Tracing

CS: Arrays

- Data structure that has multiple values as elements
  - An array of numbers
  - An array of strings
  - …
- The power of Loops + Arrays
- 0-indexing
- Built-in methods/functions associated with an array
- How to go through each element of an array?
- How to access elements in a 2-D array?

CS: Standard I/O, File I/O

- Standard I/O: for screen
  - input(), print()
- File I/O: program reading in files as inputs, and writing out files as outputs
- What are the benefits of File I/O?
- CSV, texts