START

Make a horizontal diagram including the following answers (you have 10 minutes):

Ask yourself

1.What are the most important things I do before I start a car?
   - ❖Think about 5, but don't write less than 3.
2.What do I need to remember to do just right before turning on a car?
   - ❖Write the most important 2
3.When I finally turn on the car, what is the first thing I do just before I start driving?
   - ❖describe it using 2 or 3 words phrase

Possible Answer Key:

If the car needs to be started
   insert key **and**
   sit **and**
   buckle seat belt **and**
   check mirrors **and**
   then start the car

If I am just about to start the car
   put hands on the steering wheel **and**
   press the breaks **and**
   insert key/push start button
   then the car will start

If I am about to drive
pay attention **and**
look over shoulder **and**
left light on **and**
then drive

MIDDLE

Make a vertical diagram including the following answers (you have 10 minutes):

1. My car is on and I'm ready to go. What is the most important decision I make just before starting to drive?
2. While driving, what do I usually do?
   - write answer using action and non-action verbs
   - think about 6-8, but do not write more than 5
3. How long does it take me to decide where to park? How do I decide it?
   - think about 2-4 parameters, but write only the most important one.

Possible Answer Key:
1- If I am about to drive
look over the sides to make sure no one is coming **and**
turn on the go signal **and**
release the breaks **and**
press the accelerator
then drive

2- If I am driving for some time I
look around **and**
pay attention **and**
feel happy **and**
sing **and**
listen to music/radio **and**
then keep driving until destination

3- If I want to park
then it takes me 2-3 minutes. I look for the closest spot.

FINISH

Make a horizontal diagram including the following answers (you have 10 minutes):

1. I just parked my car. What do I automatically do?
   - Think about 3-4 actions, but write the 2 most important ones.
2. Beside those unconscious actions, which are the conscious actions I do after I turn off the car?
   - think about a few of them, but just write the least and most important ones.
3. Once I'm ready to leave the car, what are the most important things I can never forget?
   - think about 3-4, but just write 1.

Possible Answer Key

1-If I park my car
I turn it off
then I take my keys.

2-If I turn off my car
Then I look in the mirror

If I park my car
then I take my key and my bag

3- If I leave the car
then I lock it

Kennia Delafe

Cognitive Simulation
-a bridge to the mind-

IDE 712
Professor: Rob S Pusch, Ph.D

What comes to your mind when you hear the term Cognitive Simulation?
a brief history of its origins:
- were originated during the information processing revolution by Newell and Simon (1972)
- Computers were first used to represent the way humans processed information
- so it has been a connection between psychology and computer science
- early steps of CS were based on artificial intelligence languages developed to represent objects and ideas consistent with human functioning
- Cognitive Simulations are runnable computer programs that represent models of human cognitive activities
- Those computer programs output explicit representations of mental processes and knowledge structures

Cognitive Simulation

Main purpose:

* reify mental constructs

* demonstrate theories and models of human mental functioning in a computer program

* transform unclear ideas into specific and accurate theories (Kieras, 1990)

* provide theoretical facts about human mental functioning (Kieras, 1990) to explore and validate psychological theories (Neches, 1982)

* provide a way for testing theories using algorithms

When it should be used

❖ to express and better understand some theoretical ideas

❖ to explain events in details

❖ to clarify what humans might be doing or thinking while completing a task

❖ to design experiments to explore new phenomena

❖ to conduct cognitive task analysis (CTA) for problem solving activities

(Kieras 1985)

-specially effective for fault diagnosis and problem solving in accident situations.
-CTA reveal the knowledge and reasoning required to successfully respond to a task demand
- CTA provides a tool for understanding the extent to which the environment supports the diagnostic confronted by the problem solver

How it is used

❖ Semantic network frame-based systems:

    ❖ human memory structures represented by concept maps or conceptual graphs

        ❖ represent memory structures as network of ideas

            ❖ represent the organization of ideas in a content domain

❖ Production Rule Systems:

    ❖ facts and rule in the form: IF (condition) THEN (action)

        ❖ represent cognitive skills in a computer program

    ❖ higher level task models through the use of control models

- production rule knowledge base are the most common now
- it requires the designer to identify the goals, decisions, or outcomes of the knowledge base
- example: When I am driving
IF I see the yellow light AND
closed to the interception
THEN I continue driving
Obviously, it is more complicated in real live due other facts such as roads conditions, others drivers behaviors, and more

How to produce it

Process of constructing Cognitive Simulations

1. identification of an appropriate problem

2. limit and define the problem domain

3. specify solutions, goals, conclusions, or behaviors

4. specify attributes or factors and attribute/factor values

5. develop solution matrix

6. generate and sequence rules

7. evaluate the simulation

1. identification of and appropriate problem
    1. evaluate problems in terms of: demand or importance, payoff, available expertise, complexity, problem domain, definable process.
2. limit and define the problem domain
    1. identify important components, define relationship, eliminate unnecessary elements
3. specify solutions, goals, conclusions, or behaviors
    1. generate all possible solutions, identify the most probable solution
4. specify attributes or factors and attribute/factor values
    1. identify factor in decision making, spare critical from trivial attributes, identify and assign attribute values
5. develop solution matrix
    1. tribute values along the top, rows represent unique conditions, solution/goal in the last column, most likely goals for inclusion at the bottom
6. generate and sequence rules
    1. rules for each row, start with IF + condition that are compared with situations or desires, combine conditions using AND/OR/NOT, sequence rules, position most likely result first
7. evaluate the simulation
    1. does the simulation display apparently realist behaviors?
    2. can you explain how the computer model works on therms of the theory?
    3. if working with a well-developed phenomenon, does the model precisely address the data?

| Advantages	Disadvantages
❖ reveal consequences of different cognitive mechanisms	❖ represent only one form of knowledge; skill performance depends on multiple representations
❖ process is more meaningful and realistic	
❖ theoretical models are found deficient	❖ building CS requires formal operational reasoning

Advantages:

1. building a runnable computer program forces the analyst to describe cognitive mechanisms in detail….
2. when modeling reflective behavior, CS relays on personal activity as well as theoretical making the process…
3. when reuniting personal knowledge bases to theoretical descriptions, learners find that ….

Application of Cognitive Simulations

- to support research, not specifically directed to task analysis

- identify the cognitive activities in fault management under dynamic conditions in nuclear power plants

What do we know about what we know?

What we know about our own learning

What we **do not** know we know
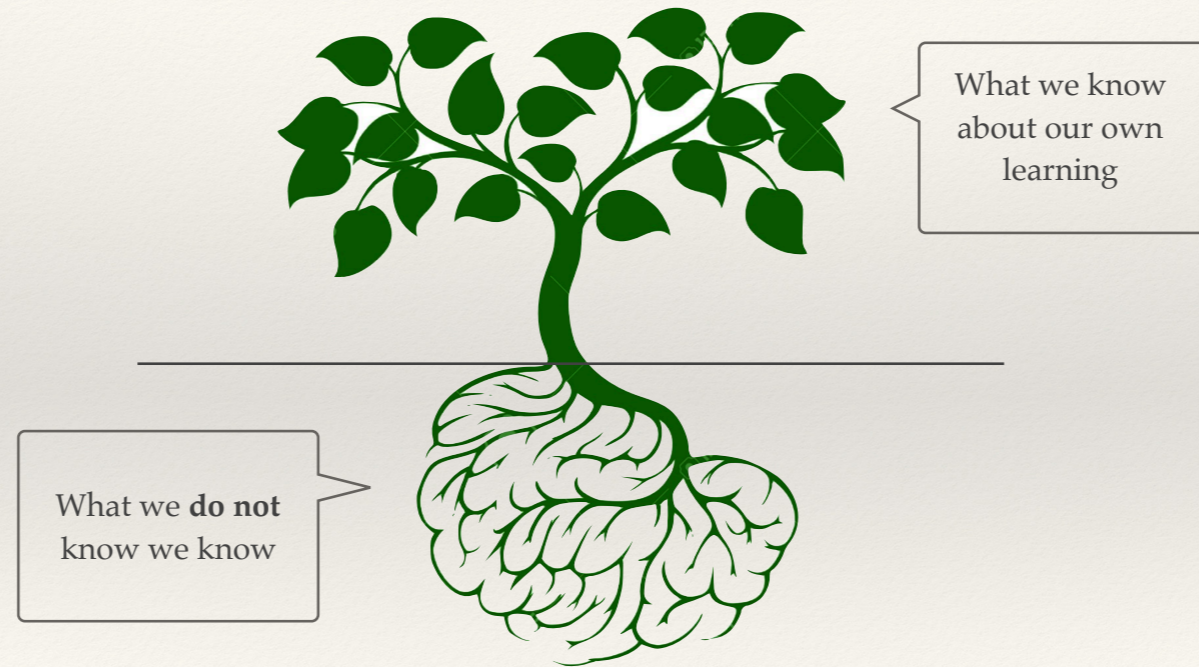
Picture retrieve from: https://jp.123rf.com/stock-photo/tree_of_knowledge.html?sti=n9n01w3y5sp0c1rplt|

Novices make mistakes because of lack of knowledge or incorrect knowledge

Experts can only describe 30% of what they know

Going back to the beginning exercise

Final question: How long have you been driving?

observe in the way novice and expert drivers translate the pre-scribed goals into own operative goals

observe in which way novice/expert mental modes or personal theories are used to represent their performance requirements and work context

Cognitive resources (relevant knowledge/skills) novice/experts use to accomplish the tasks they deem important