Thinking and problem solving

AP Psychology
Cognition

• **Cognition** – *the mental activities associated with thinking, knowing, remembering, and communicating*
  • “thinking”
  • Cognitive psychologists study and emphasize how we form concepts, solve problems, make decisions, and form judgements
  • Ex: Piaget and his cognitive development stages
Schemas

• A mental concept or grouping of similar objects, events, ideas, or people.
  • Hierarchies – further dividing concepts into smaller groups

MMC – even though all of the towers looked different, you all have a schema for what a building should consist of – a base, pillars to create height and support the top, etc
Prototypes

• A mental image or best example of a schema or category.

The further we move away from prototypes, boundaries of schemas become fuzzier.
• People whose heart attack symptoms (shortness of breath, exhaustion, dull weight in chest) don’t match their prototype of a heart attack (sharp chest pain) may not seek help.

MMC – everyone’s structures looked somewhat similar as you all shared a common prototype for what a freestanding structure should look like.
PROBLEM SOLVING

To solve problems, we must use COGNITION!
Algorithm

- A methodical, logical rule or procedure that guarantees a solution for a particular problem
- EX: recipes, formulas
- Pros: always correct
- Cons: time consuming

Triangle

Perimeter $p = a + b + c$

Area $A = \frac{bh}{2}$ or $A = \frac{1}{2}bh$
Trial and Error/Guess and check

- Trying a number of different problem solving solutions and ruling out those that don’t work
- Pros: good if there are a limited number of solutions
- Cons: time-consuming, some failure is probable, not guaranteed to find a solution
Heuristic

- A simple thinking strategy that often allows us to make judgements and solve problems quickly
- Based largely on what has been successful in the past for solving that particular problem
- EX: rule of thumb, common sense, educated guess
- Pros: quick, efficient
- Cons: error-prone

MMC: when pressed for time, you used heuristics to design the tower and most of you were unsuccessful 😞
Insight

• A sudden and often novel realization of the solution to a problem
• Pros: often novel/original
• Cons: usually follows trial and error or other failures

MMC: You probably experienced a moment of sudden insight – an Aha moment – when constructing your marshmallow structure.
• Make 4 equilateral triangles from these 6 matches.
Obstacles to Problem Solving

• **Fixation** - *Inability to see a problem from a new perspective*

• **Mental set** - *a tendency to approach a problem in a particular way*
  - often a way that has been successful in the past
  - Predisposes how we think
  - Ex: couldn’t think in 3 dimensions

MMC: You probably fixated on a certain solving method, even if it was unsuccessful.
Metacognition

- **Thinking about thinking**
  - Ex: reflecting on best study habits
  - Ex: How have I solved this similar problem before?

MMC: You probably used metacognition before building your tower, asking, “Have I solved a similar problem before?” etc

Reflecting on what went right and wrong in the constructing of our marshmallow buildings, we can practice metacognition
MAKING DECISIONS & FORMING JUDGEMENTS

Cognitive Phenomena
Framing

- The way an issue is posed
  - How an issue is framed can significantly affect decisions and judgments
  - Those who understand the powers of framing questions can use framing to influence a particular viewpoint.

"aid to the needy"

“welfare”

Find x.

Here it is X 0
Using/Misusing Heuristics

Representativeness Heuristic

• Judging the likelihood of things in terms of how well they seem to represent or match particular prototypes

• Ex: trucker vs professor

Availability Heuristic

• estimating the likelihood of events based on their availability in memory; if events come readily in mind, then we presume such events are common

• Ex: 9/11 and flying
Do We Fear the Right Things?

• Why do we fear a less likely terrorist attack more than a more likely car accident?
  • We fear what our ancestral history has prepared us to fear.
  • We fear what we cannot control.
  • We fear what is immediate.
  • We fear what is most readily available in memory (availability heuristic).
Confirmation Bias

• *a tendency to search for information that confirms one’s preconceptions*
Belief Perseverance

• *Clinging to one’s initial conceptions even after being presented with contradictory information.*
  • Contradictory info often makes people even more defensive of prior beliefs.

“I don’t care if she is a tape dispenser. I love her.”
Overconfidence

- the tendency to be more confident than correct
- to overestimate the accuracy of one’s beliefs and judgments

MMC: It sounded easy at first, right?
How can you hold both ropes at the same time?
Functional Fixedness

• the tendency to think of things only in terms of their usual functions
## Convergent vs. Divergent Thinking

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<th>Convergent Thinking</th>
<th>Divergent Thinking</th>
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<tr>
<td>• Thinking limited to available facts and working towards 1 correct solution</td>
<td>• Thinking that attempts to generate multiple solutions to a problem</td>
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<td>• Great for clear, concise problems.</td>
<td>• Needed for real-world applications of problem-solving practices</td>
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MMC: The kindergarteners in the Marshmallow Challenge displayed divergent thinking and the openness to failure. As we age, traditional schooling diminishes this ability and we focus more on convergent thinking.
Intuition and Problem Solving

• Even though intuition is not always reliable, it allows us to make quick decisions and judgments that are born of experience and beliefs.

• Smart thinkers should welcome intuition, but realize its limitations to overcome overconfidence, and biased and illogical thinking.

• Crash Course - Cognition