

Words
me think

Thoughts and Language

Try to have a thought without words

- Before you rush in and say it is possible, let's try to define words.

Darn near impossible to get a perfect definition of what is thought.

In fact, try to give an example of one thing, anything that is not a word

Concept vs. example

If sensations are the raw materials of thoughts, language is the blue print of how the raw materials are put together.

George Kelly – thought people are natural thinkers but the process of thinking is corrupted/influence by environment

The defining characteristic of humanity is the ability to use language

- Some animals can 'communicate'
- Washoe learned approximately 350 words of ASL
 - Could then teach other chimps
 - Create new word combinations that had never been taught

➤ **Nim Chimpsky** 25-125 signs

1. But in a limited way – no grammar, rules
2. Only on things they can see
3. We use language to guide thoughts –
 - do dogs think then bark
 - or do dogs bark to help think



Talking yourself through a problem is a good thing!

Language is comparatively new – only about 2 million years old
4000 human language grouped into 50 families

Culture, not just brain development, affects how we think. English speakers think of time horizontally. Mandarin speakers think of time vertically.

LANGUAGE = system of communicating

1. **symbols** = words ♥ ↑ † ⊕ ●
 2. **grammar** = rules for using such words
-if words are thoughts than grammar helps us form thoughts
An average H.S. senior has a vocabulary of 50,000 words can create a near infinite amount of sentence all from the raw propositions of about 45 English sounds
 3. **phoneme** is the smallest unit of sound
 4. **Phonological rules** = certain languages have certain sounds
 5. **Morpheme** is the smallest unit of Meaning
 1. dog, doggy
 2. pre, post, ing
 6. **words** – made up of one or more **morpheme**
 7. **syntax** = grammatical rules regarding usage of words – (where)
 - A. Fatal accidents deter careful drivers.
 - B. Snow sudden floods melting of causes.
- Semantics** – general knowledge (what a word means)
- A. Fatal accidents deter careful coffee cups.
- it is grammatically correct but not semantically correct

“Don’t give up just because things look bad”
 “It ain’t over till it’s over” ————— Same thing

Surface structure – 1 level of meaning

Deep Structure – what the mind is thinking

“The shooting of the teacher was terrible”

Was that a
 Staff basketball game or school tragedy?

When can babies think? Is it when they can use language?

1 year old – 10 words

5 years old – 10,000 words

Passive mastery –

Active mastery –

All babies can distinguish between all possible human sounds but as the baby grows up in one language he loses his ability to hear sounds that are not of his language.



Babies

- Learn nouns about their world first
- **Cooing** – 2 months old - vowel sounds
- **Babbling** - 6 months old add consonant
- **Holophrases** – one word phrases -
 - Holophrases
- **Telegraphic speech** – “juice spill” only use words that have meaning
 - Memorize exact patterns of words
 - You ran

Limited STM Capacity?

Thoughts and Language

- 4-5 year-olds misapply grammar
-you runned = **overgeneralization**

Deaf babies

- Babble later than hearing babies
- Babble sounds they have never heard
NATIVISM!!!!
- Will babble with their hands if they are taught sign language

How language happens

Behavioralist (nurture) Skinner, reward, punishment and shaping

Problems:

1. children seem to learn things that have not been reinforced
2. parents generally teach content – not grammar
3. Conditioning cannot explain overgeneralization

Observational Bandura babies learn by watching and listening

Modeling

Child: "Mommy fix"

Adult: "Okay Mommy **will fix the truck**"

Child: "It broke"

Adult: "Yes, **it broke**"

Child: "Truck broke."

Adult "Yes, **let's see if we can fix it**"

Nativist (nature) NOAM CHOMSKY – Language Acquisition Device (LAD)

Humans have an instinctive ability to learn language
 a *psycho*-linguist – Chomsky would find this pun funny because he studied thoughts behind the language- was **he** psycho or is that his title?

Critical period(s) – when children should learn language

After that there is difficulty learning language

Early childhood & Puberty seems to be important times

Problem: it only says that language develops, not the process of it

Interactionalist (both) – deaf children who are not taught sign language make up their own. Which means they have a nativist urge that follows “normal” language time lines and are shaped by interaction with other deaf children.

Aphasia – inability to process language due to brain damage

Broca’s aphasia – problems with speech

Wernicke’s aphasia – problems with understanding

Localization vs. distributed processes?

Genetic dysphasia – born with an inability to learn grammar – still can convey meaning & normal intelligence–Yoda?

McGurk Effect – when audio and visual of a person talking doesn’t match, a third sound is perceived.

Understanding speech

↓↓↓**Top-down processing**↓↓↓ – in a conversation people generally know what is being said so they can understand each other only because they know the context of the conversation

1. we hear pauses in sentences – **sensation**
2. many **pauses** occur in the middle of words - not between them – we **perceive** what we think should happen

Bottom-Up processing – how computers process information collect and process every datum and form meaning from it.

Imagine trying to teach a computer to understand this:

A: You goin' to the gym today to work out?

B: Well I am flabby, but only if I can hook a ride with Jim. It's a long way?

A: I'm afraid I heard his transmission conked out, and it's at the shop.

B: Oh [pause], then I guess it won't work out.

Non verbal cues: body language subjective
gestures lip-reading emotion tone
Culture

Bilingual children who are raised in **bilingual** environment during the critical phase often learn both well and score better on cognitive tasks.

Thinking

– creating and manipulating mental representations

Meta cognition – thinking about thinking - introspection

Meta analysis – analysis of previous research

psychometrics

Mental chronometry – measuring time of mental events

1. Reaction time
2. Stimulus-response compatibility
3. Expectancy
4. Speed accuracy tradeoff

Concept – category of objects, events, ideas with common properties

1. artificial concept – clearly defined - square
2. Prototype concept – that which everyone understands but might not be accurate – an operationalized definition
3. Based on the idea of exemplar share characteristics – BIRD



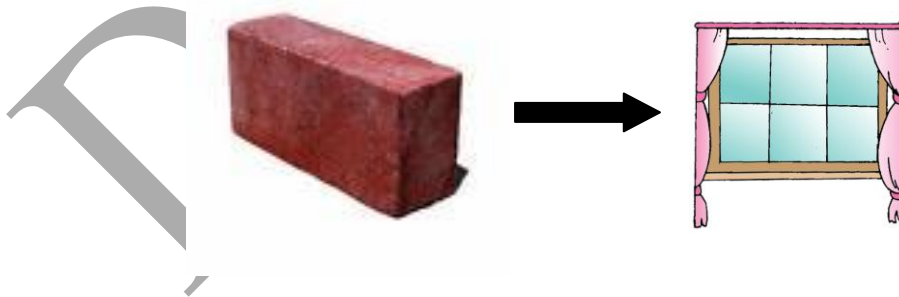
There is increasing evidence that animals can form mental categories and group abstract things.

Proposition – smallest units of knowledge that can stand by themselves

(**m**orpheme) = **m**eaning

Informal Reasoning

- How humans usually think
- Not logical
- Faster, efficient, than true logical thinking and can lead to errors
 - We are slower than computers so we use shortcuts,
 - That is the magic of human thought!!!
- top down processing, Example, how do you know that is a chair?
- inductive reasoning *finding specifics after you find a general idea*
- heuristics “error prone and simple thinking strategies”
 - short cut
- cognitive bias
- schema - stereotype
 - Script – what should occur in a situation?
 - If you are walking on sidewalk and seeing a person lying on sidewalk - you assume it is not a heart attack
- Mental Models – how things work – we have mental model of a brick and a window



Biases – problems with thinking logically. Many textbooks, professors, and other sources warn against biased thinking. Is that right? Fair? How are humans supposed to think?

1. _____ I knew it all along
2. _____ put things in a category that may or may not fit properly
3. _____ small detail that throws off the big picture
4. _____ thinking of the first thing that comes along
5. _____ only listen to what you agree with
6. _____ Take credit for success but not for failure

Fundamental Attribution Error

7. _____ remember things the way they are supposed to be (schema)
8. _____ believing you hold the same thoughts as you did when you were young

Formal Reasoning

logical - following specific rules

Bottom – Up

Algorithm – formula for getting the correct answer each time

“step by step”

$$2 + \underline{\quad} = 10$$

Syllogisms

- A. Inference if $A=B$ and $B=C$ then $A=C$
- B. In a math class or when following the scientific method

Deductive – Sherlock Holmes

Diagnosis – medical
 auto repair
 trouble shooting

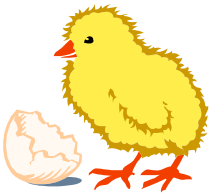
STRATEGIES – LAB SITUATION

1. Decomposition – divide into smaller parts

2. Work backward – if you were to climb a mountain, what equipment would you need at the top?

3. Analogies – problems are often similar to each other or do smart people just think they are and work on past experience

3. Incubation – for big problems let your subconscious work on it for a while - psychodynamic link to unconscious



OBSTACLES TO PROBLEM SOLVING

1. Multiple Hypothesis - Many reasons for problem which one should be tested first? - Availability Heuristic

2. Stress

- Yerkes Dodson Law

Can be fixed in therapy • Ruminative thinking – going back to memories that are stressful

- Catastrophizing – over emphasizing the negative consequences

3. Mental set – following an old system because it worked before

- Functional fixedness – **is there another way to use a hammer?**
- Opposite of Creative thinking

1. Divergent thinking = brainstorming

2. Convergent thinking

4. Confirmation bias – humans want to confirm hypothesis rather than refute even in the face of contrary evidence

What is more important in car? **ATTRIBUTES**

Safety

Speed

Looks

Reliability

Cost

Roominess

1. Working memory does not allow us to hold a lot.
2. People focus on 1 thing – usually that which is most important to them
3. A BMW is better than a Ford- why do people choose Fords?



Probabilities

Framing effect (priming) people will make a choice based on how the question is worded

- 1) "Would you like to go out tonight?"
- 2) "What time do you want to go out tonight?"

Statistic play a big part in this: whether the statistics lead them to think of gain vs. cost

- People buy lottery tickets but not insurance
- People are really confident in their ability to predict outcomes
- People overestimate rare & good possibilities
- People underestimate common & bad possibilities
 - Human decision making is really flawed - but it can't be too bad if we've come this far on the other hand...



Embodied Cognition – the idea that sensations from our body **prime** us to think a certain way

- Perception affects thoughts
- Thoughts affect perception
 - Immoral things are dirty
 - Important things are heavy
 - Good things are higher

Artificial Intelligence

DO COMPUTERS THINK?

Information processing system

1. receives information
2. represent info with symbols
3. manipulates those symbols



Computers are getting better

- not only are they improving exponentially,
- the exponent is increasing exponentially
- once we can make a computer that can design a better computer than itself it will be the last invention we need to make.

-Brain imaging is getting so good, can we start to reverse engineer parts of the brain?

-imitating human thought?

- **Very** difficult to teach computers short-cuts in thought
Rather, computers think of **all** solutions (even dumb ones) really fast
- In any human task, we do it in less than 100 steps, or synaptic connections. A computer always uses millions of steps.

- Or coming up with a unique way that is suitable for computers?

Expert systems solve a problem in a very limited field

Thoughts and Language

- very difficult to make a computer a good general problem solver
- so much of our knowledge is assumed

Neural networks model – not just processing things in serial with speed but rather making decisions about what to think about.

Dr. Swope