



Language Structure, Development and Thinking

How much harder would it be to communicate without language?

Communication Activity

- Need two volunteers from the class
 - One will need to leave the class for a minute

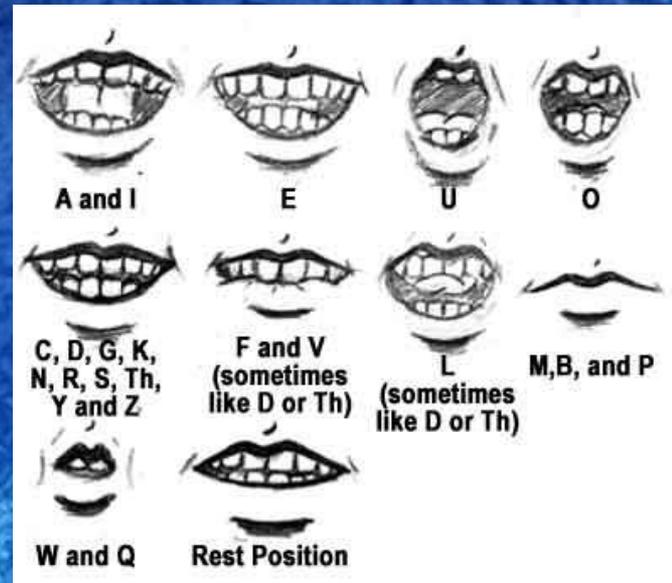


First Building Block of Language

Phonemes

- The smallest distinctive sound unit

- To say bat, we utter the phonemes b, a, and t
- to say that, we utter the phonemes th, a, and t
- about 40 phonemes in the English language
- We have trouble pronouncing phonemes of other languages



How many phonemes does platypus have?

Second Building Block of Language

Morphemes

- The smallest unit that carries meaning; may be a word or part of a word (such as a prefix)
 - Post – means “after”
 - Less – means without
 - How many morphemes are in “bats”?
 - How many morphemes are in “biped”?
 - How many morphemes are in “pneumonoultramicroscopicsilicovolcanoconiosis”?

pneumonoultramicroscopicsilicovolcanoconiosis

'lung,respiration'

'beyond'

'small'

'look,see'

'flint,silicon'

'volcanic'

'dust'

'ADJECTIVE'

'NOUN [condition,result]'

'a lung condition caused by very small-looking particles of volcanic silicon dust'

Third Building Block of Language

Grammar

A system of rules that enables us to communicate with and understand others

Semantics

- The set of rules by which we derive meaning from morphemes, words, and sentences in a given language; also the study of meaning
- Example: adding “-ed” to the end of a word means it happened in the past

Syntax

- The rules for combining words into grammatically sensible sentences in a given language
- Example: all adjectives come before nouns, so we say “white house” not “house white”

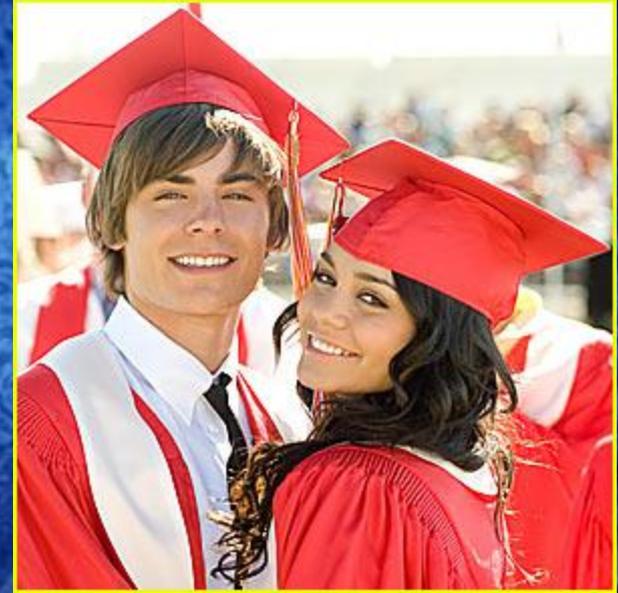


Language Facts

- 40 phonemes can combine to create more than 100,000 morphemes
- 100,000 morphemes can combine to produce 616,500 words
- 616,500 words can combine to create a relative infinite amount of sentences
- Language is complexity built out of simplicity

Language Development

- The average high school graduate knows about 60,000 words
- This breaks down into:
 - 3,500 words per year
 - 10 words per day
- Where do we learn language?
 - Infants under 4 years first start learning by reading lips and discriminating speech sounds (*ah* from wide open lips, *ee* from a mouth with corners pulled back). Their ability to comprehend speech matures before their ability to produce words.



Stages of Language Development

Babbling Stage

- First occurs around 4 months of age
- The infant spontaneously utters various sounds at first unrelated to the household language
 - NOT an imitation of adult speech
 - Contains dialect from all over the world
 - Deaf infants will babble audibly but also with hands
 - Babbling begins to resemble household language at around 10 months
 - Phoneme sounds outside the infant's native tongue begin to disappear

Stages of Language Development

One-Word Stage

- First occurs around 12 months of age
- The child speaks mostly in single words
- “Doggy” may mean “look at the dog out there!”



Stages of Language Development

Two-Word Stage

- First occurs around 24 months of age
- The child speaks mostly two-word statements
- Characterized by telegraphic speech: child speaks like a telegram (“go car”)



Stages of Language Development

TABLE 10.2

SUMMARY OF LANGUAGE DEVELOPMENT

Month (approximate)	Stage
4	Babbles many speech sounds.
10	Babbling resembles household language.
12	One-word stage.
24	Two-word, telegraphic speech.
24+	Language develops rapidly into complete sentences.

fi yuo cna raed tihs, yuo hvae a sgtrane mnid too. Cna yuo raed tihs? Olny 55 plepoe out of 100 can.

i cdnuolt blveiee taht I cluod aulacly uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the ltteres in a wrod are, the olny iproamtnt tihng is taht the frsit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it whotuit a pboerlm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Azanmig huh? yaeh and I awlyas tghuhot slpeling was ipmorantt! if you can raed tihs forwrad it.

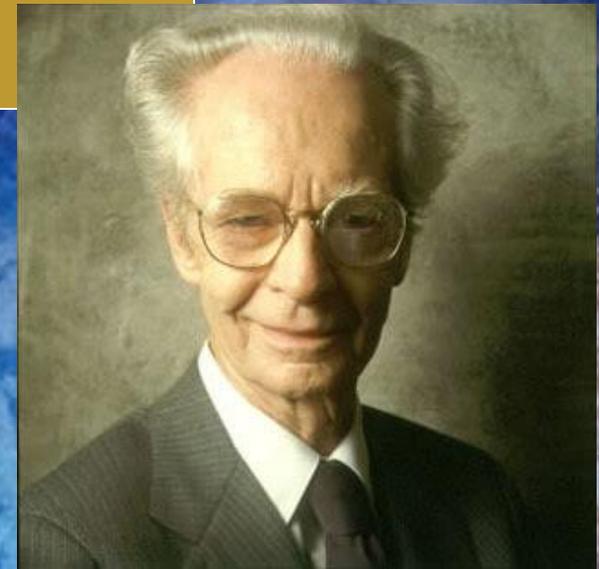
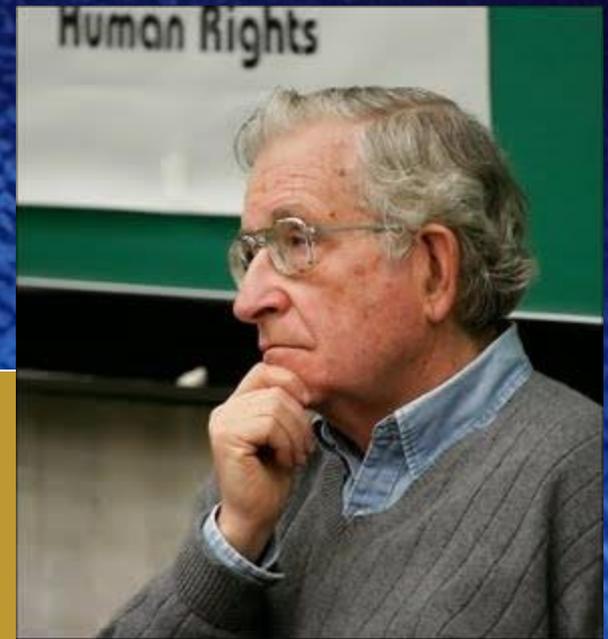
Explaining Language Development

- Noam Chomsky's theory of Inborn Universal Grammar

-VS-

- B.F. Skinner's theory of Operant Learning

- Nature vs. Nurture
- Biological Predisposition vs. Association and Reinforcement



Whorf's Linguistic Relativity Hypothesis

- Otherwise known as linguistic determinism
- The idea that language determines the way we think
- The Hopi tribe has no past tense in their language, so Whorf says they rarely think of the past.



Linguistic Determinism Examples

- Some cultures have no past tense for verbs... how does this affect their ability to think about the past?

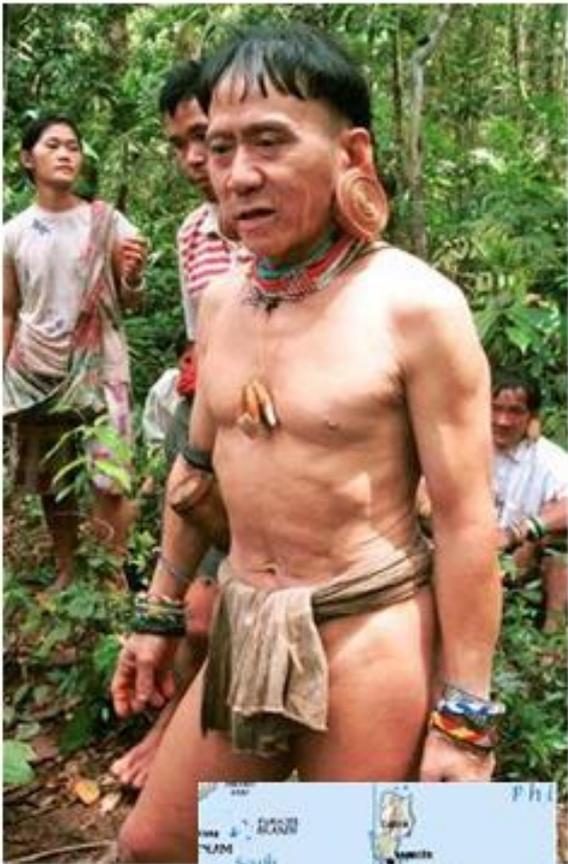


- English vs. Japanese
 - Individuality vs. collectivist



The Penan people, who live in Borneo, have one word for *he* and one word for *she* in their language. However, they have six words for *we*.

What might the number of words that the Penan have for the term *we* indicate about their culture and society?

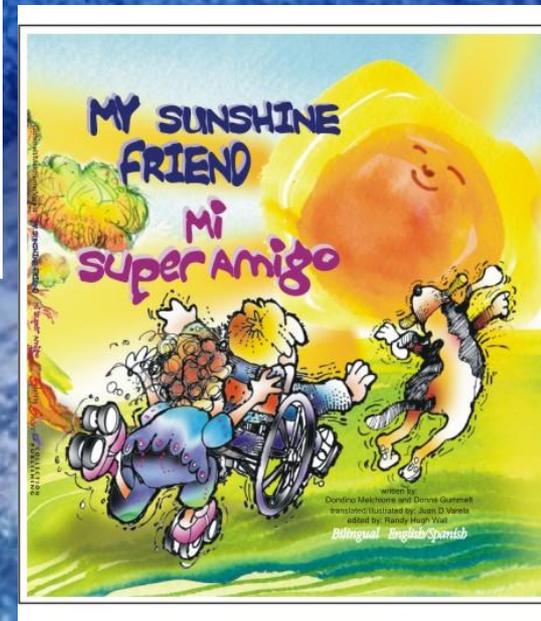


Linguistic Determinism Examples

- “Girls’ night out” vs. “Ladies’ night out”
 - Sportsmanship vs. sportspersonship,
fireman/firewoman vs. firefighter, stewardess
vs. flight attendant



- Bilingual children have a more accurate sense of self... why?

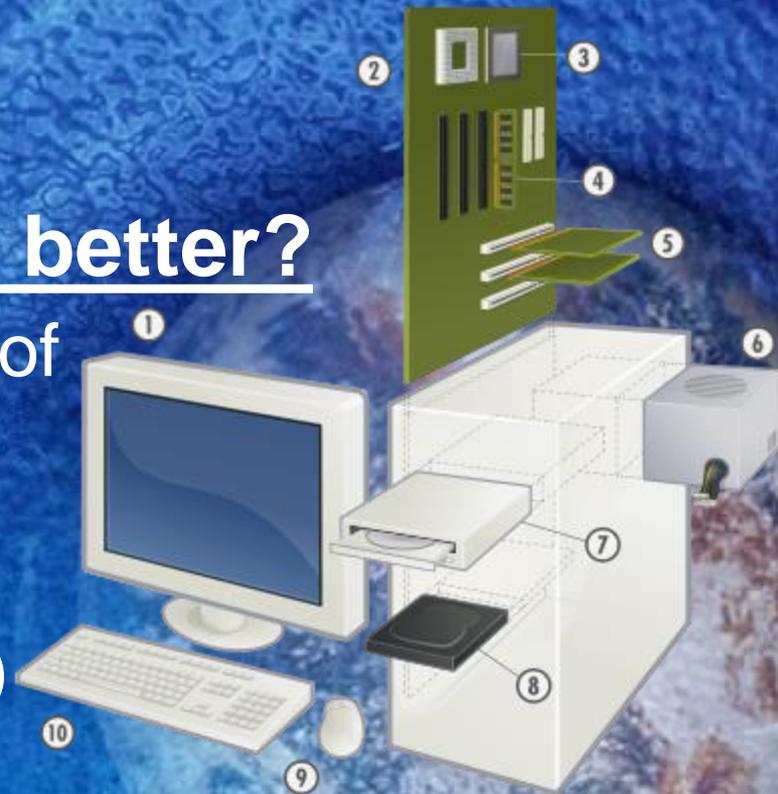


Artificial Intelligence

- The science of designing computer systems to perform operations that mimic human thinking

- What can computers do better?

- Manipulate huge amounts of data, retrieving detailed information from memory, making decisions using specified rules (algorithms)



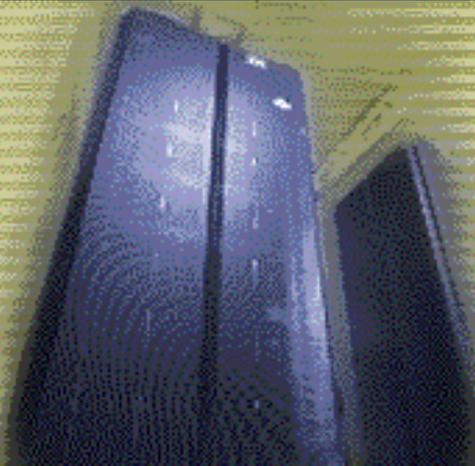
Artificial Intelligence

- What are computers worse at?
 - Computers cannot fear, desires, have beliefs or other subjective mental states
 - Computers do everything one at a time (serially) whereas humans brains do many things at once



Artificial Intelligence

- 1996 and 1997 Chess Match
- Deep Blue vs. Garry Kasparov



Deep Blue

This 1.4 ton
8-year-old sure
plays a mean
game of chess



Garry Kasparov

The best player
in the world
shows no signs
of slowing down

- 3.5-2.5 (1997)

4-2 (1996)

Animal Thinking and Language

- Do animals think? Yes.
 - Chimps display insight when they learn to use new tools, cats and dogs can be trained by operant conditioning (rewards) to learn to do certain behaviors

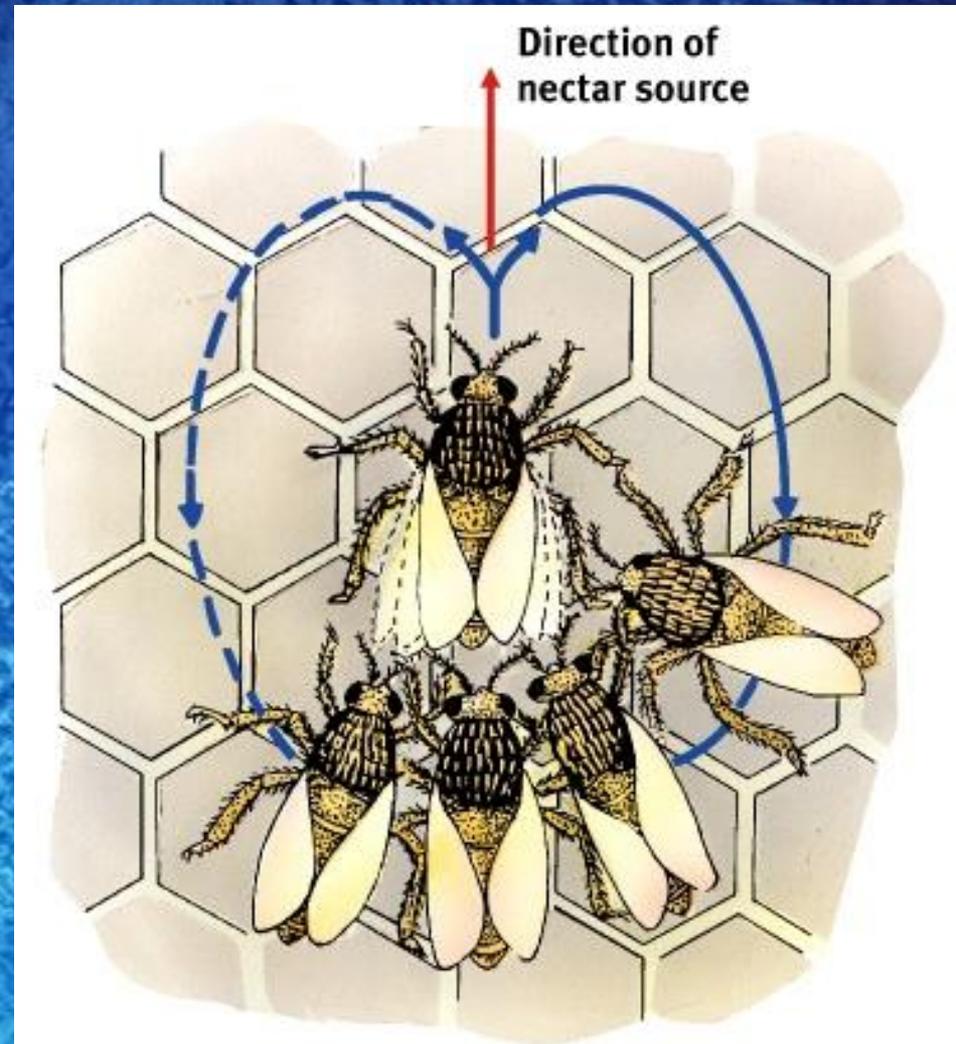


Animal Thinking and Language

- Can animals become culturally diverse?
Yes.
 - One group of chimps slurp ants directly from the stick, another group plucks them off individually
 - One uses stone hammers, other uses wooden
- What would be the equivalent mental age of a human for the MOST advanced cognitive animals?
 - 2 years old

Animal Thinking and Language

- Do animals exhibit language? Yes.
 - Monkeys have different alarm cries for different predators; barks for leopards, cough for eagles, chattering for snakes
 - Honeybees do dances that inform other bees of the direction and distance of food
 - Apes learn limited sign language (2-year old vocabularies and sentences)



Animal Thinking and Language

- Can apes really talk?
Debatable.
 - Gain limited vocabulary with great difficulty; hardly like children learn words
 - Lack any form of syntax (order of words)
 - May just be that apes learn certain arm movements mean certain rewards



Apes and Signing



"Koko-Love"



"Baby"



"Gorilla"



"Good"