

Language and Cognition

Introduction to Cognitive Science

Language and Intelligence

- Language use is often seen as a sign of intelligence
 - Animals that understand commands are seen as smarter
 - We consider ourselves to be so much smarter than other animals often b/c our language use is so much more complex (much greater vocabulary + much more complex grammar) than other animals
- Is there a tight connection between language and intelligence?

Language and Representation

- From a computational and information-processing point of view, a link makes sense:
 - Cognition is information-processing
 - Information-processing needs representations, i.e. a language
- Even more intuitively:
 - Words in our language represent concepts
 - Concepts help us to parse/categorize the world and think about things

Natural Language and 'Higher-Order' Cognition

- However, brains (and hence, presumably, cognition) have been around for a long time, while natural language is a very recent invention.
- But maybe that goes with the 'intelligence' part: language is for 'higher-order' cognition: reasoning, problem-solving, planning, etc.
- Indeed, there is an obvious difference between the language of the brain ('internal'; used to represent) and natural language ('external'; used for communication ... but also to represent)

Situated Cognition and Language

- Situated cognition points to natural language as something that is an artifact that exists in our environment and that we use as a very powerful tool to achieve various higher-order cognitive abilities
- Specialized languages from mathematics, logic, and science allow us to achieve especially powerful cognitive acts of complex problem solving, long-term planning and logical reasoning.

Language, Communication, Culture, Cognition, and Evolution

- Language allowed us to write down thoughts, and not only pass them to others around us, but also to people born long after we are dead.
- Language thus had a big hand in the development of culture which, on their turn, allowed our cognitive abilities to evolve through cultural selection, rather than genetic selection.

Thinking as Speaking: The Whorff Hypothesis

- The linguist Benjamin Whorff hypothesized that language is essential for thinking, i.e. that without language, we couldn't even think at all!
 - Not true, infants can make plenty of inferences
 - But again, maybe it works for 'higher-order' thought
- What is the effect of language on our thinking?
- Does learning a new language teach you new ways of thinking (because, as Situated Cognition would see it, it gives you a new tool?)

Language and Framing

- Language (words, phrases) can really ‘frame’ our judgments and subsequent thinking:
 - ‘freedom fighter’ or ‘terrorist’?
 - ‘janitor’ or ‘custodian’?
 - ‘tax burden’ or ‘tax revenue’?
 - ‘Pro choice’ or ‘Pro life’?

The Kuuk Thaayorre

- The Kuuk Thaayorre, a small aboriginal tribe in northern Australia, have an absolute, rather than relative, way of talking about space.
- So, they would say: “Hey, there is someone to the southeast of you” rather than “Hey, there is someone behind you”.
- This forces them to be much more aware of their absolute location in space, and indeed they outperform people like us in many spatial tasks.
- Moreover, when asked to lay out something in a certain order, the order always goes from east to west (not sure why ... movement of sun?).

Horizontal Languages vs Vertical Languages

- English is written horizontally, Mandarin vertically.
- When English speakers are asked “If this spot in front of you is ‘today’, where is ‘tomorrow’?”, they tend to point to a place to the right of that point, but speakers of Mandarin are more likely to point down.

Goluboy vs Siniy

- Russian speakers make a distinction between light blue ('goluboy') and dark blue ('siniy').
- Russian speakers are better at discrimination tasks involving objects of different shades of blue.
- However, when asked to do a verbal interference task (such as counting numbers), this advantage disappears, while with a non-verbal interference task
- This suggests that the language processing centers of the brain are involved in color discrimination.

German and Spanish Keys and Bridges

- Many languages assign a 'gender' to nouns.
- In German, 'key' is male, but in Spanish, it's female. When asked to describe a key:
 - German speakers tended to use words like: "hard," "heavy," "jagged," "metal," "serrated," and "useful"
 - Spanish speakers used words like "golden," "intricate," "little," "lovely," "shiny," and "tiny."
- In German, 'bridge' is female, but in Spanish it's male. When asked to describe a bridge:
 - German speakers used words like "beautiful," "elegant," "fragile," "peaceful," "pretty," and "slender"
 - Spanish speakers used words like "big," "dangerous," "long," "strong," "sturdy," and "towering."

Languages and RPI

- So, too bad there are no languages at RPI.
- Bummer!