Announcements
1. VOTE TOMORROW
2. NO CLASS MONDAY November 12
3. Discussion sections
   --This week: Normal Friday November 9th
   --Next week: None Tues-Fri (13th-16th)
   --Mon. 19th Discussions Exam Review
4. EXAM MONDAY NOV 19TH

Lecture Outline
Part 1: A bit of review: thinking
Part 2: Language
   a. structure
   b. forming meaning
   c. development
1. Judgment

– Drawing a conclusion from pieces of evidence or experiences
– Goal: extrapolate from evidence to reach a new conclusion

Two judgment heuristics

- Availability
- Representativeness

2. Decision-making

- How we use knowledge/evidence to make decisions about actions
- Goal: determine how to act/what to do
Framing

Loss aversion
– When outcomes described as potential losses, we’re more likely to take risks
– When outcomes described as potential gains, we’re less likely to take risks

Outcomes are the Same

A. A plan with no lifetime limit on benefits (80%)
B. A plan that limits total benefits in your lifetime to $1 million, but saves you $1000 per year. (20%)

A. A plan that limits the total amount of benefits in your lifetime to $1 million. (44%)
B. A plan with no lifetime limit on benefits, but costs you an additional $1000 per year (54%)

(You gain money because you get to keep money you normally pay)
(You “lose” money because you have to pay)
3. Reasoning

- Identifying implications that follow from a set of beliefs
- Goal: determine what specific outcome(s) should follow from a belief

Wason's (1972) Four Card Task

If a card has a vowel on one side, then it has an even number on the other side

A. A only     C. A & 7
B. A & 6      D. all cards

- A. need to turn A over, if not even number, then statement incorrect.
- B. Whether 6 has a consonant or vowel doesn't matter (rule didn't say anything about consonants and even #)
- C. J isn't a vowel, so who cares.
- D. 7 needs to be turned over to test the rule
Card Task Made Concrete

If patrons have a beer, then they have a stamp on their hand.

A. Has beer
B. Has beer, has stamp
C. Has beer, no stamp
D. All cards

4. Problem solving

- We know the "outcome" we want, what we do to achieve that outcome
- Goal: determine what steps to take to pursue desired outcome

Problem solving

- Often studied in terms of strategies we use
  - E.g., algorithms
Thinking and Emotion

- One example
  - Affective forecasting
    - We often overestimate how “sad” we will be about negative future events
    - We often overestimate how “happy” we will be about positive future events

Language

a. Structure (building blocks)

What is Language?

A set of symbols and principles for combining these symbols that allow for communication and comprehension
Building Blocks

- Phonemes
- Morphemes
- Syntax
- Prosody
- Pragmatics

The sound system of a language (phonemes)
How a language expresses meaning (morphemes, words)
The structure of language: Rules for combining words
How melody used to create meaning
How language is used

Building Blocks

Within each
- Comprehension (more Wernicke’s area)
  http://www.youtube.com/watch?v=dKTdMV6cOZw
- Production (more Broca’s area)
  http://www.youtube.com/watch?v=1apiTvEQ6ew&feature=fvwrel

Building Blocks
- Phonemes
Phonemes

- The smallest unit of sound that can be altered to change the meaning of a word

In English, gin, kin, pin, tin, win have different meanings because the initial phoneme is different

Physical apparatus for speech capable of producing hundreds of sounds
- Each language only uses a subset of all available
  - English = about 40
  - Farsi = about 32
- Languages overlap on some but not all phonemes
Phonemes

- If your language does not contain certain phonemes, it is difficult for you to hear and pronounce these.
- French “r” sound.
- English “r” and “l” sound.

http://youtube.com/watch?v=wrqQwLdME8

Example

- ‘R’ and ‘L’ phonemes in English don’t have meaning by themselves, but they change the meanings of words.
  - ‘red’ vs. ‘led’
- In Chinese, ‘R’ and ‘L’ are not used phonemes and they do not change the meaning of words.

Testing phoneme comprehension in newborns

- One of few innate “skills” or “reflexes” in newborns is sucking.
  - Suck when interested, nervous, tired, or surprised, and when something is novel.
- “Habituation Paradigm”
Habituation

1. Give newborn pacifier that monitors sucking rate
2. Present phoneme [b] repeatedly until infant “bored”
3. Change phoneme [d] and present repeatedly, see if infant still “bored”

Sucking rate and phonemes

Phonemes in Different Languages

- Mehler:
  - 4-day-old French children heard repeated French sounds-monitored sucking
  - Switched to Russian sounds, see if sucking rate changed
  - Switched to English, see if sucking rate changed
Mehler: French 4-day-olds phonemes

- 4-day-old French children could discriminate phonemes in their language from foreign languages
- By approximately 1 year of age, French children could not
Speech Perception

- Infants (not adults) can perceive most and perhaps all phonemes found in human language
- Ability is quickly lost because some sounds not needed

Building Blocks

- Morphemes (and words)

Morphemes/Words

Morphemes: smallest meaningful combination of sounds (phonemes) in a language (more than just words)
- content morphemes
- function morphemes
Morphology & Word Formation

dog one morpheme
dogs [dog + s] two morphemes
(dog=content, s=function)
dislike [dis + like] two morphemes
(dis=function, like=content)

How many morphemes?
The boys walked to school

Words
Arbitrary symbols with referents or meanings assigned to them by users (single or combination of morphemes)

chien, dog, perro
Building Blocks

Syntax (phrases/sentences)

Syntax

Rules that specify how words can be combined into phrases and sentences that make sense

Which sentence is correct syntactically?

A. Colorless green ideas sleep furiously.

B. Sleep green furiously ideas colorless.
Syntax

- Grammar
  - does not depend on meaning
  - depends on rules and organization

Sentence

- Noun Phrase
  - Article
    - The
  - Noun
    - zebra
  - Verb
    - bit
- Verb Phrase
  - Article
    - the
  - Noun
    - giraffe

Building Blocks

- Prosody
Prosody
- Using melody to convey meaning
- With prosody, can form a question, a declaration, or a demand

http://www.youtube.com/watch?v=lih0Z2lIuUQ

Anne Fernald: “Motherese”
- Had women
  - Talk to 4-month old
  - Talk to another adult
  - Controlled for content
- Played audiotapes to infants on left or right
  - Coded whether infant looked toward motherese or other sound

# of times (15 max) infants looked toward Motherese Voice

# of trials looked toward motherese
Anne Fernald: “Motherese”

- Pattern holds regardless of
  - whether women’s or men’s voice and
  - Whether voice is male or female
- Negative tones in speech have opposite effect of motherese
  - Regardless of language, gender, etc.

[Link](http://www.youtube.com/watch?feature=endscreen&v=Vx3WxwNPlbA&NR=1)

Building Blocks

- Pragmatics
Pragmatics

- Rules (often unspoken) regarding how to use language appropriately to get what you want
- Culturally based practicalities of communicating
- A particularly sophisticated component of language, later developing

Pragmatics

- Davis
  - 4–8 year olds took part in experiment; at the end, received a prize (unwanted gift)
  - Assessed
    - Facial expressions after opened prize
    - Verbal responses after opened prize (e.g., "thank you")

Davis: Pragmatics

- Positive expressions
- Positive comments

- Boys
- Girls

- Bar chart showing comparisons between boys and girls on positive expressions and positive comments.
Building Blocks

- Phonemes
- Morphemes (and words)
- Syntax (phrases/sentences)
- Prosody
- Pragmatics

The phrase: “Say it like you mean it” from a parent to a child is most likely referring to

A. A correction of syntax
B. Correcting the child’s prosody
C. Correcting pragmatics in the child’s speech
D. A phonetic correction

Part 3
Nature v. Nurture Debate

Nurture (Locke, Hume, Bloomfield)
- Language is the result of experience
- Rules mastered the same way we master any new skill

Nature (Descartes, Chompsky)
- Children cannot learn language only as a result of experience
- Innate ability to abstract linguistic structure/rules

Language Acquisition, the basics

<table>
<thead>
<tr>
<th>Beginning Age</th>
<th>Language Production Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>Crying</td>
</tr>
<tr>
<td>6 weeks</td>
<td>Cooing</td>
</tr>
<tr>
<td>6 months</td>
<td>Babbling, followed by reduplicative babbling</td>
</tr>
<tr>
<td>8 months</td>
<td>Intonation babbling (first signs of prosody)</td>
</tr>
<tr>
<td>1 year</td>
<td>1 word</td>
</tr>
<tr>
<td>18 months</td>
<td>2 word utterances (&quot;telegraphic speech&quot;), overextensions</td>
</tr>
<tr>
<td>2 years</td>
<td>Word inflections (plurals, possessives), questions, negatives</td>
</tr>
<tr>
<td>3 years</td>
<td>Complete sentences</td>
</tr>
<tr>
<td>5 years</td>
<td>Rare or complex constructions (passive voice)</td>
</tr>
<tr>
<td>10 years</td>
<td>Mature, adult-like speech</td>
</tr>
</tbody>
</table>

Nurture Theories

- Two major ones
  - Imitation
  - Conditioning
How do children learn language?

- Imitation (observational learning)
  - Infants hear sounds around them
  - Once vocal cords developed, they imitate the sounds

Imitation

- If children are imitating, why does speech progress (one word, telegraphic, etc.)?
- If children imitate, why do they make systematic errors?

Syntactic Overregularization

- kicked, played → goed
- dogs, cats → sheeps
Semantic Overextension

<table>
<thead>
<tr>
<th>Child’s word</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doggie</td>
<td>cows, dogs, pig, goat, any 4-legged animal</td>
</tr>
<tr>
<td>that</td>
<td>is not a cat</td>
</tr>
<tr>
<td>fly</td>
<td>all small insects, small size specks of dirt, crumbs, own toes</td>
</tr>
<tr>
<td>Baba</td>
<td>bottle, water, milk, juice, the beach, pool, cup, any liquid</td>
</tr>
</tbody>
</table>

Semantic Underextension

‘daddy’ refers only to my father
‘school’ refers only to her sister’s classroom

Imitation

If just imitation, how can children produce entirely new sentences?
How do children learn language?

Conditioning (operant, reinforcement)

- Infants hear speech sounds,
- Infants repeat speech sounds--"rewarded through attention"
  - "Dadadada"
  - "Oh, dada, that's right, dada. Here is dada. Good boy, dada."
- Reinforcement helps children elaborate on sounds that gradually become words

Conditioning

Can explain how children learn "vocabulary" but not other aspects of language

Mothers more likely to reinforce true, but grammatically incorrect ideas than grammatically correct but false ideas

- (in adults, speech more likely to be grammatical than correct)

Parents Rarely Correct Children's Grammar

2 year old: "Mama isn't boy, he a girl."
Mother: "That's right."
2 year old: "... and Walt Disney come on Tuesday."
Mother: "No, he doesn't."
Parents may reinforce incorrect grammar (if idea is true)

Child: “Barney be going soon?”
Mom: “That’s right. Good job. Barney will be over in a little while. Then we need to go to the store.”

Correcting Children’s Grammar Doesn’t Help Much

Child: My teacher holded the baby rabbits and we patted them.
Mother: Did you say, your teacher held the baby rabbits?
Child: Yes.
Mother: What did you say she did?
Child: She holded the baby rabbits and we patted them.
Mother: Did you say she held them tightly?
Child: No, she held them loosely. (Bellugi, 1971)

Conditioning

- Despite linguistic environment being fragmented, reinforcement being inconsistent, and children receiving little feedback, tremendous consistency in how they learn language
  - Similar developmental course
  - Children utter new sentences for which they have never been reinforced
Nature

- We are born with an innate capacity to acquire language
- Universal Grammar: Common structure underlying all human languages.
- Language Acquisition Device (LAD, Chomsky): Innate sensitivity to features important in all human languages.

Nature: Critical Period

- Critical Period: Limited time span within which a particular species-specific behavior develops
- Sensitive Period: Relatively limited time span with which behavior largely develops

- Genie: found age 14
  - Lived with blind mother and father
  - Chained to crib, physically punished if made sound
  - Mute, no language comprehension
  - 2 years after rescued, could utter strings of phrases but little understanding of structural rules (e.g., question words absent)

- Isabelle: found age 6 1/2
  - Lived with deaf-mute incarcerated mother
  - No exposure to language, made unintelligible sounds
  - Within 2 years of rescue, could produce and comprehend fairly complex sentences, and spoke following standard grammar rules
  - Eventually acquired full adult-like speech in complexity
Nature: Critical Period

- If not exposed to a language before "critical period" is over, full proficiency can never be attained
- The exact cut-off age is not certain but is before puberty
- Suggests there is innate process that requires exposure for structure to develop correctly