Psych 56L/ Ling 51:
Acquisition of Language

Lecture 2
Introduction Continued

Announcements

Review questions for introduction available on website

Homework 1 available (start working on it): due 1/26/12

Remember to look at the reference material in addition to downloading the lecture notes

---

Investigating normal language development

Diary studies: keeping diaries of children's development. Charles Darwin did this with his son (Darwin, 1877), who seemed to follow the progression we now expect.

Other diary studies: Clara & Wilhelm Stern's 1907 *Die Kindersprache* and Werner Leopold's (1939-1949) four volume account of his daughter's acquisition of English & German.

Modern diary studies: Bowerman 1985, 1990; Dromi 1987; A. Gopnik & Meltzoff 1987; L. Bloom, 1993; Naigles, Vear, & Hoff 2002

A very modern diary study

http://www.ted.com/talks/deb_roy_the_birth_of_a_word.html
Beginning through about 4:15 (full video is about 17 minutes total)
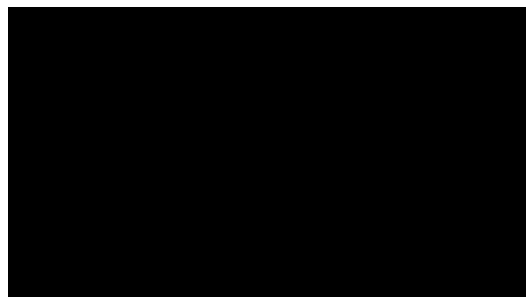
The question

"It is obvious that children have some quality of mind that explains why they learn to talk but kittens, for example, do not" - Hoff, p.254

Not obvious what this quality is.

Idea 1: Children have specialized (domain-specific) knowledge about how language works.

Idea 2: Children's domain-general cognitive processes allow them to acquire language while a kitten's do not.

Chomskyan Revolution

Chomsky 1957: *Syntactic Structures*
Innovation: What speakers do is not as interesting as the mental grammar that underlies what speakers do

So, if adults have a mental grammar that explains what they do when they talk, children must have a mental grammar that explains what children do when they talk.

New formation of language development: What are children's grammars like and how do they eventually achieve adult grammars?

Some Current Approaches

Language as a complex cognitive system that maps sounds to meaning
One idea for the mechanism behind this process: Language Acquisition Device

Information from the environment → [image] → Language Acquisition

Language Acquisition Device (unconscious process inside child's mind, used only for learning language)

Some Current Approaches

Language as a complex cognitive system that maps sounds to meaning
One idea for the mechanism behind this process: Language Acquisition Device

Linguistic approach
   Premise: LAD contains some domain-specific knowledge about the structure of language (this is often called Universal Grammar).

Knowledge specifically about human language

Focus: description of children's prior (innate) linguistic knowledge and how that knowledge interacts with the data from the native language to produce knowledge of the native language

Some Current Approaches

Language as a complex cognitive system that maps sounds to meaning
One idea for the mechanism behind this process: Language Acquisition Device

LAD + information from the environment
Basic premise: The language acquisition device provides a little bit of knowledge about how human languages work to get the child started. This allows the child to use her language input more effectively – to notice certain things more easily and to entertain only certain hypotheses about how language works.

Innate Linguistic Knowledge?

Why do children need this kind of head start?

Proposal: Input is too impoverished for children to converge on the right language rules without it. This is sometimes called the Poverty of the Stimulus.

So, children need something else *besides the data in the input* to help them decide against the wrong rules.
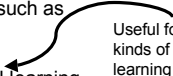
Some Current Approaches

Language as a complex cognitive system that maps sounds to meaning
Another idea for the mechanism behind this process: general learning abilities

Domain-general cognitive approach
   Premise: Language acquisition is no different from any other kind of knowledge acquisition; children can solve this problem in the same way that they solve other problems (such as perception, for example)

Focus: description of domain-general learning capacities that serve language development, and the sources of input those capacities use

Useful for all kinds of learning (ex: grouping things together into larger units)

Some Current Approaches

Language as a complex cognitive system that maps sounds to meaning
Another idea for the mechanism behind this process: general learning abilities

Domain-general cognitive approach
Basic premise: Abilities that are useful for other kinds of input besides language input are used to learn language. There is no knowledge or ability that is unique to language learning.

Domain-general response to Poverty of the Stimulus

Maybe children don't need domain-specific knowledge to learn language. Maybe they just use the data available to them more cleverly than some researchers think they do.

Example:

Saffran, Aslin, & Newport (1996): 8-month-olds can (unconsciously) track probabilities between syllables in order to identify words in fluent speech in an artificial language

tu pi ro go la bu bi da ku pa do ti go la bu tu pi ro pa do ti

Domain-general response to Poverty of the Stimulus

Maybe children don't need domain-specific knowledge to learn language. Maybe they just use the data available to them more cleverly than some researchers think they do.

Example:

Denison, Reed, & Xu (2011): 6-month-old infants are able to create probabilistic expectations about their environment, based on their observations of their environment. For example, after seeing that a box is mostly filled with yellow balls, they are surprised when someone pulls four pink balls in a row out of the box.

Nature vs. Nurture

The debate in a nutshell

Is the development of language in children the result of humans' innate endowment (like upright posture & bipedal locomotion)? Or is it the result of circumstances in which children are nurtured (like table manners and formal math, which depend on particular experiences)?

Empiricism: all knowledge and reason come from experience
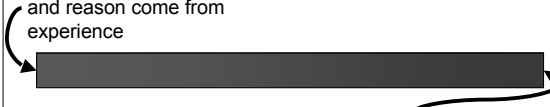
Nativism: mind has some pre-existing structure it imposes to interpret experience

Nativism: Why believe it?

(1) Children acquire language rapidly
(2) Children acquire language with very little conscious effort
(3) Children acquire language without explicit instruction for most of it

Nativism: mind has some pre-existing structure it imposes to interpret experience

---

Nativism: Why believe it?

"Language learning is not really something that the child does; it is something that happens to a child placed in an appropriate environment, much as the child's body grows and matures in a predetermined way when provided with appropriate nutrition and environmental stimulation." - Chomsky, 1973

Interactionist/Constructionist View

"We on the other side think that learning language is a long slog, which requires from the child a lot of work. And the child is working as hard as he can, fifteen, sixteen hours a day. We think it requires a relationship with an adult, and a whole set of cognitive abilities." - Snow, 1993

Interactionist/constructivist: language is constructed by the child from experience, and the input is crucial - but there may still be some innate knowledge contributing

---

Back to nativism: the nature of nature

There are different ways for something to be innate:

Knowledge itself is innate

Procedures for learning are innate (knowledge is the result from these procedures)

Back to nativism: the nature of nature

There are different ways for something to be innate:

Knowledge itself is innate: children have inborn knowledge of the general form of language (domain-specific knowledge)

Procedures for learning are innate (knowledge is the result from these procedures)

Why do we think knowledge could be innate?

Common properties of human languages: all languages of the world share structural properties. This could be due to innate biases about how languages are structured.

Evolution has equipped the human mind with other useful knowledge (ex: world is 3D, even though retinas process only 2D) - why not prior knowledge about language?

Back to nativism: the nature of nature

There are different ways for something to be innate:

Knowledge itself is innate: children have inborn knowledge of the general form of language (domain-specific capacities)

Procedures for learning are innate (knowledge is the result from these procedures): children have domain-general capacities that all contribute to language acquisition, such as symbolic representation, memory, chunking input into smaller parts, and probabilistic analysis.

Why do we think some learning procedures are innate?

Babies as statistical learners:

Statistical learning: keeping track of the relative frequency of two things (ex: how often they occur together)

Saffran, Aslin, & Newport (1996): 8-month-olds can (unconsciously) track probabilities between syllables in order to identify words in fluent speech in an artificial language

tu pi ro go la bu bi da ku pa do ti go la bu tu pi ro pa do ti

Why do we think some learning procedures are innate?

Babies as statistical learners:

Statistical learning is domain-general.

Saffran, Johnson, Aslin, & Newport (1999): babies can track the probabilities between tones (not just between language stimuli like syllables)
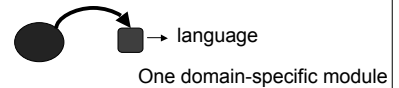
Denison, Reed, & Xu (2011): Infants can create probabilistic expectations about their environment (such as the color of balls in boxes), not just about language.
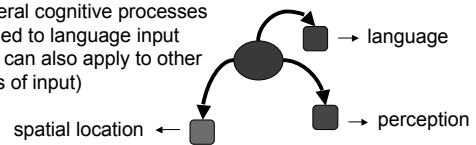

Back to nativism: the nature of nature

There are different ways for language acquisition to work:

→ language

One domain-specific module

General cognitive processes applied to language input (and can also apply to other kinds of input)

→ language

spatial location ←

→ perception

Back to nativism: the nature of nature

There are different ways for language acquisition to work:

Currently this debate between domain-specific and domain-general is going on for many areas of cognition, not just for language acquisition.
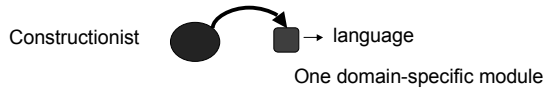

Quick Summary of Some Major Current Theories of Language Development

Generativist

Constructionist

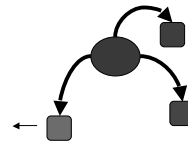## Quick Summary of Some Major Current Theories of Language Development

Generativist: Universal Grammar, which contains biases for language structure, is innate. Language experience triggers prior knowledge, which is domain-specific.
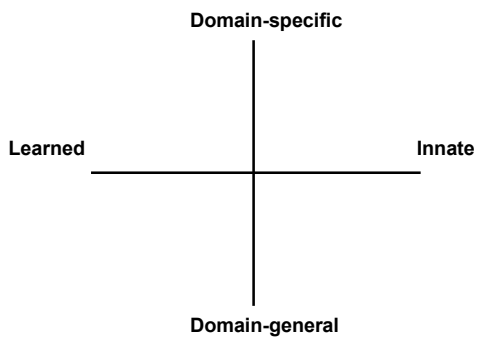
Constructionist ⬛→ language

One domain-specific module

Quick Summary of Some Major Current Theories of Language Development
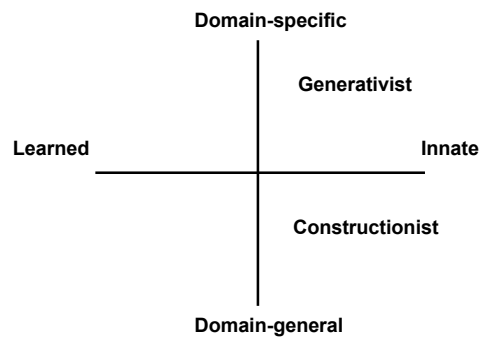
Generativist

Constructionist: language is constructed by the child using general cognitive learning procedures applied to language input. These are domain-general abilities used for language learning.

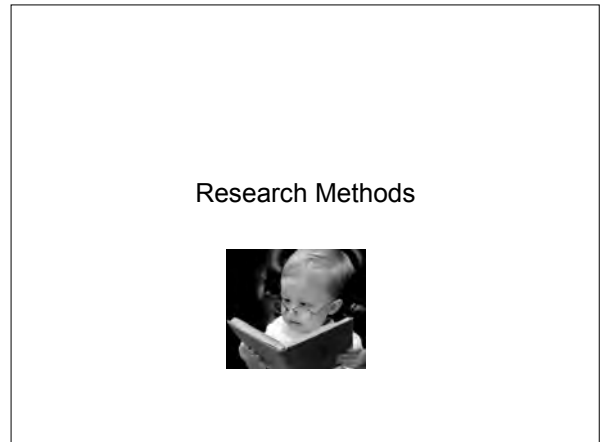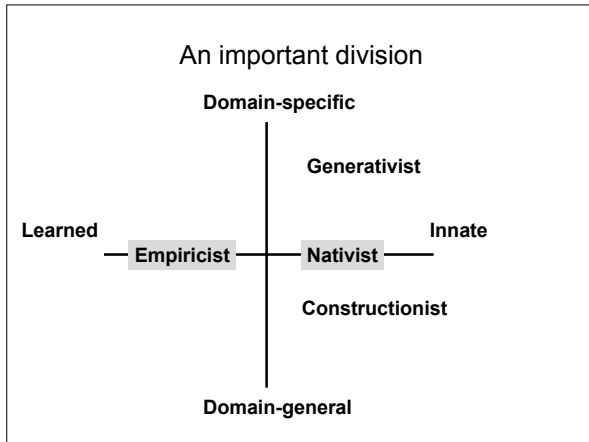## An important division

Domain-specific

Learned   **Innate**

Domain-general

An important division

Domain-specific

Generativist

Learned   **Innate**

Constructionist

Domain-general

An important division

Domain-specific

Generativist

Learned —————— **Empiricist** —— **Nativist** —— **Innate**

Constructionist

Domain-general

Research Methods

Research Methods

Important: do cross-linguistic and cross-cultural research. Even if language is universal, there are individual differences in language development and there may be more than one route to acquisition success. Also, there may be influence from different cultures on the language learning environment for children.

Research Methods

Analyzing samples of spontaneous speech from children:

Video/audio recordings of spontaneous speech samples

CHILDES Child Language Data Exchange System

Used to find out the nature of language children produce. Ideally, sample is representative of everything child says - but hard to do in practice. (Deb Roy's work is a notable exception.)

Because of this, it is hard to make claims that children don't use/know a particular structure based on its absence in spontaneous speech samples. It could be that they simply didn't say that structure when they were being recorded.

Research Methods

Analyzing samples of spontaneous speech from children:

Video/audio recordings of spontaneous speech samples

CHILDES Child Language Data Exchange System
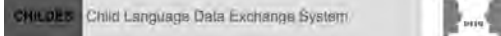
Difficulty: Have to transcribe recorded speech. May take between 5 and 20 hours to faithfully transcribe 1 hour of child speech.

Why?
   Conversational speech does not often use complete sentences.
   Child pronunciation is often not adult-like - and the non-adult-like parts are usually what researchers are interested in.

Research Methods

Getting standardized assessments of children's performance

Use coding systems like Mean Length of Utterance (MLU), which correlates with measures of children's grammatical and phonological development. This is done by tracking the average number of meaning-bearing units (morphemes) in the child's speech.
   Ex: "He likes me" = 4 morphemes ("he", "like", "-s", "me")

Use estimates that caregivers provide of children's performance, such as the MacArthur-Bates Communicative Development Inventories (CDIs): 8-16 months, 16-30 months, 30-36 months. These include checklists of words, gestures, and word combinations children use or comprehend.

Use examiner-administered tests like the Peabody Picture Vocabulary Test, which assesses vocabulary comprehension.

Research Methods

Computational Modeling (Digital Children)

Create a computer program that takes the data children hear as input and see if it can learn the same knowledge children do from that input. Usually, the program will implement some learning theory's assumptions about how learning works, and therefore test that theory empirically.

Ex: Learning to identify words in fluent speech (word segmentation) [Swingley 2005, Gambell & Yang 2006, Pearl, Goldwater, & Steyvers 2011]

Ex: Learning referential meaning, such as what *one* refers to in "Look at the purple goblin - and there's another one behind Jareth, too." [Foraker et al. 2009, Pearl & Lidz 2009, Pearl & Mis 2011]

Questions?

You should now be able to answer all of the review questions for the introductory material, and the first 3 questions of HW1.