MYSTERY WORDS (WORD LEARNING)

1-Line Summary

This demo is about how children learn the meanings of words – it shows how hard the problem can be and some of the strategies kids use.

Background:

How do you figure out what a new word means? For young children who know relatively few words, this is a problem they encounter all the time. However, children learn words quite quickly – by the time they are 5 years old, they typically know around 10,000 (and college educated adults often know more than 100,000). One of the big problems for word learning is that the world is a very rich and complicated place and it can be difficult to know what exactly someone is referring to. Researchers have identified several strategies that help children through this problem, a few of which are being shown in the demo.

Readings

Introductory

http://en.wikipedia.org/wiki/Vocabulary_development

Bloom, P. & Markson, L. (1998) Capacities underlying word learning. *Trends in Cognitive Science 2*, 67 – 73.

Advanced

Trueswell, Medina, Hafri & Gleitman (2013). Propose but verify: fast mapping meets cross-situational word learning. *Cognitive Psychology 66*, 126 – 156.

Yurovsky, D. & Frank, M. C. (2014). Beyond naïve cue combination: Salience and social cues in early word learning. *Proceedings of the 36th Annual Meeting of the Cognitive Science Society.*

Materials:

The pictures you need for each part are the file called "Mystery Words-Materials". There are 18 pages in the file: Page 1 is the Gavagai picture, pages 2 – 9 are for the Mystery Pairs game, p. 10 is the first part of the Jabberwocky poem, and pages 11 – 18 are for the Sentence Cues game.

The Interaction:
> *The pitch* – Do you want to see how kids learn new words?

> *Using the materials* – There are three parts to the interaction, and you can do as many or few as you want. If you do all three, we recommend this order.

• First, try to get people to see what the problem is.
> The Gavagai picture shows a typical scene in the world. Tell people that someone has said the word "Gavagai" and ask them what they think it might mean. **There isn't a right answer to this one!** The point is that there are lots of things it *could* mean. If people get stuck, suggest some alternatives – pick out actions (playing, sitting), properties (red, small), or more complicated things (messy, afternoon).

• Second, play the Mystery Pairs game.
> Flip through each picture pair and ask people to guess what the mystery word means. It also helps if you ask people explain their choices – How did they know? Were they guessing? How sure are they about their choice?   For some pictures (like the very first one) all you can do is **guess** – that's OK, it's actually a strategy kids use sometimes.
> Another strategy on display is called **Cross-Situational Observation** which means that people remember what they saw/heard in each trial and compare across the trials (the situations). Tracking what you've seen and remembering things is an important element of word learning.
> A third strategy on display is called **Mutual Exclusivity** which means that we expect every word to have only one meaning and every object to have only one label. That means that if you're confident about what a *dax* is, having a dax present with a new label will suggest the new label goes with the other object. This situation comes up a few times in the picture set.
> One more strategy that is implicitly in here is **Whole Object Bias**. Pretty much everyone will assume that the mystery word applies to one of the two whole objects on the page – people won't guess that it applies to one of the sub-parts (e.g. the thingies that dangle off it) or to the whole set of objects.

• Third, play the Sentence Cues game.
> One other major strategy for learning words is to use the way a word is used in context to figure out what kinds of things it can mean. You can see this by looking at the passage from the Lewis Carroll's Jabberwocky – ask people if they know what *slithy* and *toves* mean? Based on the part of speech, people will have strong intuitions about whether something is an object, an action or a property. Many people also have more specific ideas about what the words mean (*slithy* doesn't sound like a nice property); some of these ideas come from the broader context, but some also come from analogies to the sounds of other words (what else sounds like *slithy*?).

Once you've set people up with Jabberwocky, play the Sentence Cues game. These items are adapted from work done on **Syntactic Bootstrapping** which is the formal name for using sentence context to help you with word meanings. The Cues game asks people to guess the meaning of a mystery VERB with increasing amounts of context – just a picture, a picture + some nouns that go with the mystery verb, a picture + sentences containing the mystery verb (Jabberwocky style but with real nouns). The more context you have, the easier it is to guess the verb's meaning.

Messages:
Critical take home: Word learning is hard, and children use lots of strategies to figure out word meanings.

But wait, there's more: Children don't have to choose between strategies – they use lots of different strategies – sometimes they even use more than one at the same time! In addition to the strategies noted above. For example, children often use Social Cues, such as where people are looking when they are providing a label.

And still more: These games made word learning a lot easier than it is in the real world! Ask people to think about what would make it harder. For example:
        • In the real world, we don't usually just get 2 choices for each word to choose from like you do in the Mystery Pairs game.
        • And the real world also doesn't stand still (like it does in the Gavagai picture and the Sentence Cues game). One thing that can make some words (including lots of verbs) especially hard to learn is that you can miss them – e.g. "Did you see me snap?"
        • These games ask people to learn nouns and verbs – these are sometimes called Open Class words because languages have a lot of them and they are open to adding more (when you invent a new machine, we add the name for it – think of faxes, iPads, and rollerblades). But languages have lots of other kinds of words in them as well which raise very different word learning problems. Think about how you would learn the meaning of a preposition (in, on, over, under), or a determiner or quantifier (the, a, some, many). Some of these strategies will still help, but not all!

And one more thing: What's with all the funny words? Most research looking at word learning uses nonsense words – in fact the nonsense words used in the binder are famous ones from previous studies. The reason researchers use nonsense is because they want to be 100% positive that the participants don't know the meanings before they do the study.

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Homework:
Word learning isn't just for kids! Adults also learn new words all the time. Ask people if they've learned any new words recently and to think about how they did it (Guessing? Sentence context? Explicit definitions?).

Target Audience:
The Mystery Word game is based on research that was done on children as young as 4 years old all the way through adults. It should work well with many ages. It works well with groups since people can share their ideas about what the words mean and how they know that.

Tips From the Field:

• People really don't like guessing as a strategy, which is something the games ask them to do. Be super encouraging at that stage of the games.

• It's fun to ask people how many words they think they know (it goes well either as a lead-in to the demo or as a way to conclude it). But be aware that most people don't really have a good idea about the right order of magnitude for their vocabularies. You can help out by offering some ballpark numbers ("Do you think you know around 10 words? 100? 1000? 10,000? 50,000? 1000,000?"). If you start small, many people will radically under-estimate their vocabularies and then you can tell them how much more they really know!

Acknowledgements:

• Thanks to Tim Ray (5700 class, Fall 2014) for suggestions for improving this demo.

• The different tasks come from famous studies in the field: *Gavagai* is a famous example from the philosopher W.V.O. Quine. In his original set-up, the word was supposed to mean "Rabbit"; The Mystery Pairs pictures are adaptations of pictures created by Nancy Kaniwsher at MIT and the general set-up for that game is based on research by Psychologists at Stanford, Dan Jurafsky & Michael Frank; The Sentence Cues game is based on a famous study by the Linguist & Psychologist Lila Gleitman, from the University of Pennsylvania.