

Categories

- Allow us to predict information
- Allow us to communicate
- Allow for abstract thought

But what makes things a category?



Three approaches

- Classical approach
- Prototype approach
- Exemplar approach

Classical approach

- Based on defining features
 - Individually necessary
 - Jointly sufficient

Problems with classical approach

- Unable to come up with defining features for most concepts. (ex: "game")
- Graded structure, or typicality effects (Rosch)
- Unclear cases
- Disjunctive categories
- People list unnecessary features of categories
- Nested concepts

Prototype approach

- No necessary or sufficient features
- Features are salient and probabilistic
- Items classified based on similarity to a prototype stored in memory

Advantages to prototype approach

- Explains problems from classical approach
 - why we have not found necc/suff. conditions
 - typicality effects
 - why people list unnecessary features
 - unclear cases
 - disjunctive categories
 - nested features

Evidence for prototypes

- Posner & Keele created 4 different random dot prototypes



- Created instances of each category by randomly shifting the individual dots small amounts



Problems for prototypes

- Additional knowledge
- Contextual influences
- People know information about variability, as well as central tendency.
- Why do some categories seem natural to us but others do not?

Exemplar views

- Every instance of a category stored in memory, these are called exemplars.
- No pre-stored prototype.
- Items classified on the basis of their similarity to stored exemplars.

Problems for exemplars

- Has no way of explaining why birds, reptiles, & mammals all belong to a superordinate category (animal), but why we have no superordinate category including the exemplars "belts" and "gourds".
- Big memory load.

Evidence for exemplars

- Holyoak and Glass - Ss often reason by way of counterexamples
- Kahneman & Tversky - frequency of occurrence estimated by ease of retrieving exemplars
- Homa, Sterling & Treple - abstract patterns, like Posner & Keele

Hybrid models

- Perhaps the type of category determines the method of categorization.
- Or, perhaps classification requires that the example has the right explanatory relationship with the theory behind the concept.
- Problems - vagueness; not really testable.

Basic level categories



- What is this?
- Many possibilities
 - Frog
 - Amphibian
 - Animal
 - Hopping thing
 - Slimy thing
 - Egg-laying animal
 - Not-a-paper-clip
 - Frog or tie
 - etc.

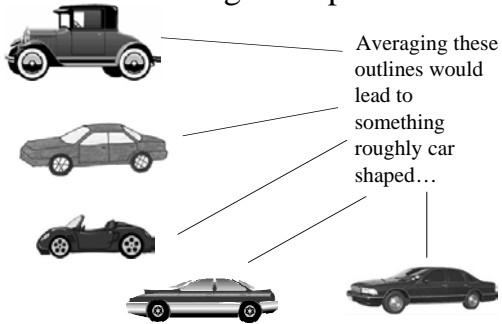
Basic level categories

<i>Superordinate</i>	<i>Basic Level</i>	<i>Subordinate</i>	
Furniture	Chair	Kitchen chair Living-room chair	
	Table	Kitchen table Dining-room table	
	Lamp	Floor lamp Desk lamp	
Mammal/Animal	Cat	Siamese Tabby	
	Dog	Lab	
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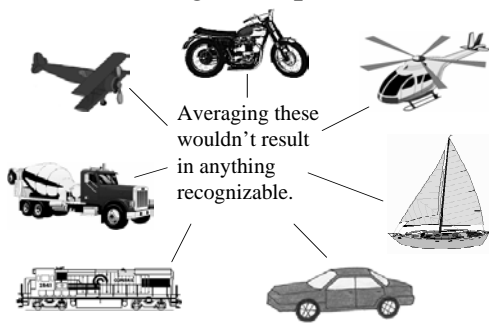
Basic Level

- Has largest increase in similarity
- Most common level named
- Faster at classifying pictures
- Faster to judge statements of category membership
- List most attributes
- Kids learn words earlier and use them in naming
- Averaged shapes can be identified

Averaged shapes



Averaged shapes, cont.



Why the basic level?

- Compromise between two different tendencies
 - high within category similarity
 - low between category similarity

Exceptions

- Atypical instances of a basic level are NOT classified faster at basic level
- Experts tend to categorize at subordinate level
- Animals don't use basic level

Which comes first - the category or the name?

- Whorfian hypothesis: the terms a language has is the basis for categorization
- Alternative: categories are built on perceptual and functional basis, and when necessary the culture will then invent a language label for the category

Color as a natural category

- Across languages, different numbers of words are used for basic color terms (Berlin & Kay)

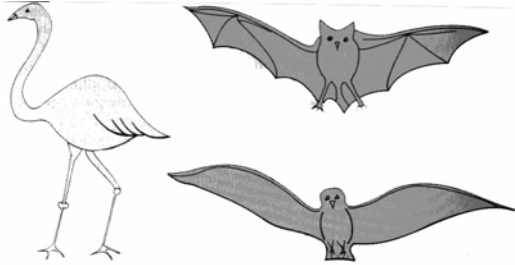
Sequence of color terms

- White/light + black/dark
- Red
- Green, blue, yellow
- Brown
- Purple, pink, orange, gray, light blue

Categories and perception

- Rosch studied the Dani people
 - have only 2 color terms, black & white
- Memory for colors and their choice for typical (focal) colors is the same as that of an English speaker.

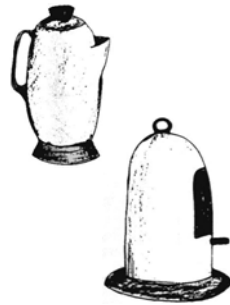
Children and categories



Source: L. Smith & D. Heise, Perceptual similarity and conceptual structure.

Artifacts

Doctors took a coffeepot that looked like this. They sawed off the handle, sealed the top, took off the top knob, closed the spout, and sawed it off. They also sawed off the base and attached a flat piece of metal. They attached a little stick, cut a window in it, and filled the metal container with birdfood. When they were done, it looked like this. After the operation, was this a coffeepot or a birdfeeder?



Source: F. C. Keil, Concepts, Kinds and Cognitive Development

Natural kinds

Doctors took a raccoon and shaved away some of its fur. They dyed what was left all black. Then they bleached a single stripe all white down the center of its back. Then, with surgery, they put in its body a sac of super smelly yucky stuff, just like a skunk has. When they were all done, the animal looked like this.

After the operation, was this a skunk or a raccoon?



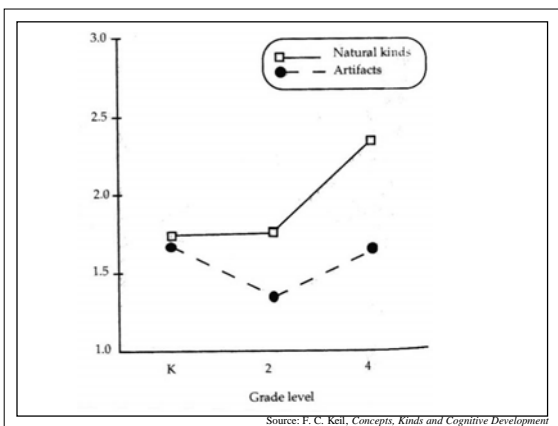
Source: F. C. Keil, Concepts, Kinds and Cognitive Development

Natural kinds vs. Artifacts

Doctors took this toy. You wind it up with a key, and its mouth opens and a little machine inside plays music. The doctors did an operation on it. They put on real feathers to make it nice and soft and they gave it a better beak. Then they took off the wind-up key and put in a new machine so that it flapped its wings and flew, and chirped.

After the operation, was it a real bird or a toy bird?

Source: F. C. Keil, *Concepts, Kinds and Cognitive Development*



Source: F. C. Keil, *Concepts, Kinds and Cognitive Development*

How children categorize

- Children know that appearances aren't everything, and that for animals generalizations should be based on membership in a category, not on appearance. But this ability increases with age - 4th graders better than 2nd graders, who are better than kindergartners.
- Children also shift from using characteristic properties to categorize to using defining ones.

Example 1

- (+c/-d) This girl hated a boy in her class because he was so mean and did really nasty things to her. She wanted to get him into trouble, so she told the teacher all the nasty things the boy had really done . . . Did she lie to the teacher?
- (-c/+d) This little boy always got good grades in school and prizes for being so smart. The other children were jealous of him because of it, and he didn't want to make them feel bad and wanted them to be his friends. So, one time, when he really got a good mark on a test, he told them he got a bad mark so they'd be his friends. Did he lie to them?

Source: F. C. Keil, *Concepts, Kinds and Cognitive Development*

Example 2

- (+c/-d) There's a lady who's the same age as your mommy. You see her a few times a year. She loves you very much. She likes to buy you clothes and take you shopping. And sometimes she lets you sleep over at her house. She's not your mommy's or daddy's sister (and she's not married to your mommy's or daddy's brother). Could she be your aunt?
- (-c/+d) There's this little girl that you've met once before. She wears her hair in braids and goes to school in California every day like you. She's your father's sister. Could she be your aunt?

Source: F. C. Keil, *Concepts, Kinds and Cognitive Development*
