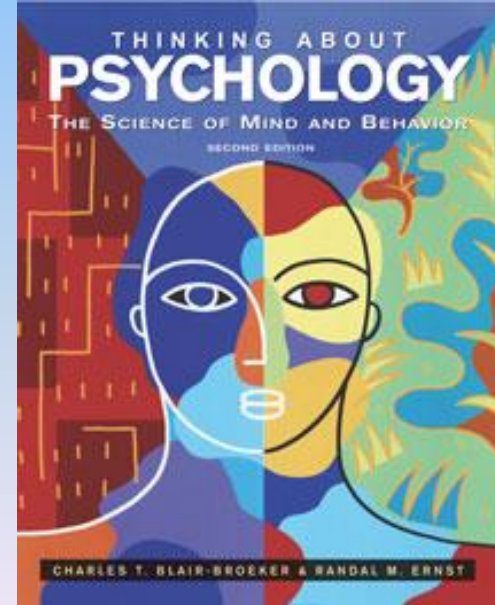


Thinking About Psychology: The Science of Mind and Behavior 2e

Charles T. Blair-Broeker
Randal M. Ernst



Cognitive Domain



Module 27

Thinking and Language

Module 27: Thinking and Language

Thinking

Cognitive Abilities

- All the mental activities associated with thinking, knowing and remembering

Module 27: Thinking and Language

Components of Thinking: Concepts

Concept

- A concept is a mental grouping based on a *shared similarity*.
- Your brain groups objects, events, and people that share some similar characteristics
- Your brain sorts information into conceptual categories – for example, for *trees*, or *bicycles*, or *balls*.



Mental Categories

- These *mental categories* let you make instant judgements about new objects you've never seen before.
- When you come across a new tree, you know in a split second that it belongs in the concept category of tree.
- You know this *because it is similar* (a bark-covered, wooden cylinder with branches and needles or, in the right season, leaves) to other trees you have seen

Prototype

- A *typical best example* that incorporates the major features of a concept.
- The closer the new object is to our prototype, the faster and more easily we can categorize it. Which more closely resembles a chair?



Whis is your prototype Tree?

- We are quicker to recognize an oak tree as a tree than we are to assign a tiny Japanese bonsai tree to this category.
- Both qualify as trees, but the oak tree is much closer to our prototype – it is somehow more *treelike* than a bonsai.



Which is more “birdlike”?



Which is more “fruitlike”?



Concept Hierarchy

- A means to keep mental information organized *from basic concepts to specific ones*
- For example, we have a concept hierarchy for organizing food in our culture. We begin by learning basic concepts like *bread* and *cake*.



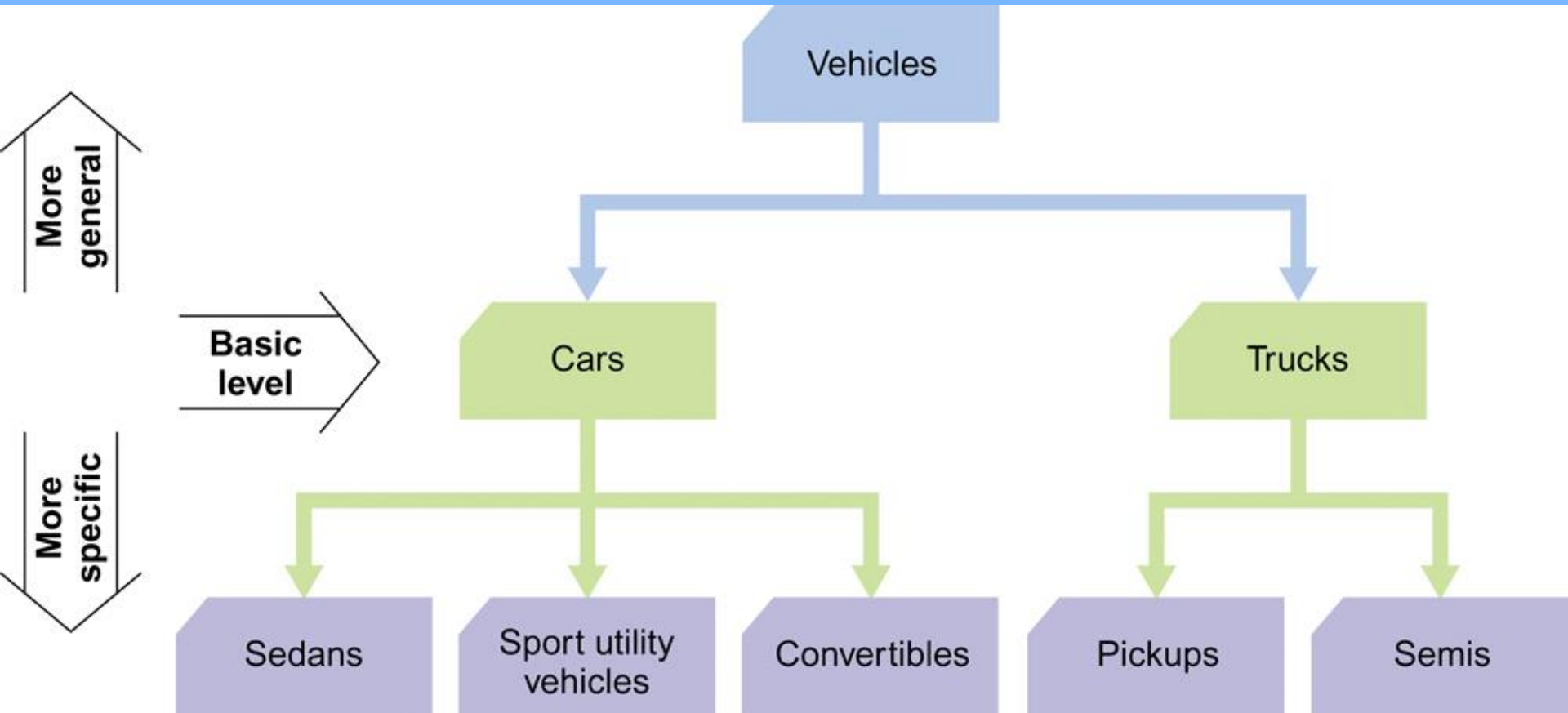
- We then connect those basic concepts to more specific ones that fit under each of the basic ones...
- *Bread* includes white bread, French bread, and banana bread and *Cake* includes angel food cake, sheet cake, and cupcakes



Organizational Hierarchies

- Grocery stores organize their products to take advantage of our understanding of broad categories, such as *frozen food* and *canned goods*. Libraries do the same with books.
- We develop similar hierarchies to deal with other concepts such as vehicles.

Concept Hierarchy



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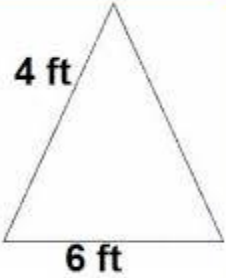
Problem Solving

Strategies for Problem Solving

- Problems exist when something *blocks* you from achieving a desired outcome.
- Problems can range from trivial to serious.
- We all have several strategies we apply when problems arise in our lives.
- Two broad categories are *algorithms* and *heuristics*.

Algorithms

$A = \frac{1}{2}bh$
 $A = \frac{1}{2} \times 6 \times 4$
 $A = \frac{1}{2} \times 24$
 $A = 12 \text{ ft}$



The diagram shows a triangle with a horizontal base labeled '6 ft' and a vertical height line from the top vertex to the base labeled '4 ft'.

- An Algorithm is a *logical, step-by-step procedure* that, if followed correctly, will eventually solve a specific problem.
- Mathematical formulas are examples of algorithms. For example, the formula for computing the area of a triangle ($\frac{1}{2}$ base X height) is an algorithm.

Algorithm = Guaranteed Solution

- This type of problem-solving strategy *guarantees a solution* to a problem
- For example, systematically trying *every possible combination* on someone's locker until you come across the correct one or *checking every shelf* of every aisle in a grocery store until you find the Gatorade, will eventually yield a solution, but only after a long and tedious process.
- Therefore, this is *not always the most efficient* method to solve a problem.

Heuristics

- Heuristics, on the other hand, are usually a lot *quicker*
- A rule-of-thumb problem solving strategy that makes a solution more likely and efficient but *does not guarantee a solution*

Heuristic = Shortcut

- These can be *handy shortcuts*, and when they work, we are likely to reuse them the next time we need to *save time* and increase our mental efficiency in a similar situation.
- For example, *checking the canned goods section* of a grocery store to find a particular brand of baked beans (*rather than checking every aisle*)
- Or using *spelling rules* such as “*i* before *e* except after *c*” (but doesn’t work for words like neighbor, weigh, or caffeine)

Insight

- Sometimes the solution to a problem *pops into your head* so quickly that you don't have time to use a problem-solving strategy
- This *sudden realization of the solution* to a problem is called insight
- “Aha” experience
- For example, word jumbles

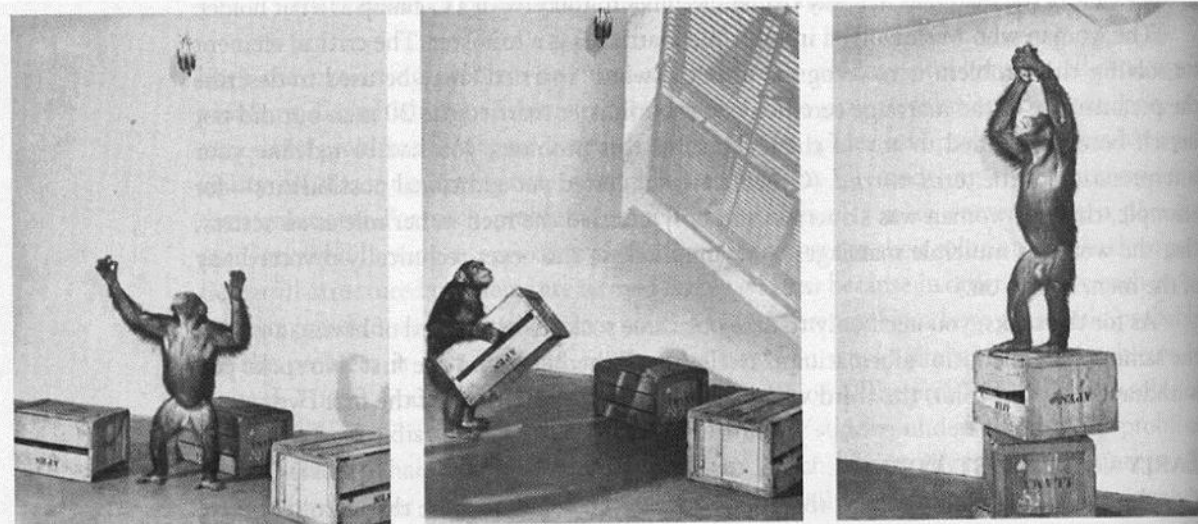
LYOGSPCYOH



Kohler Experiment

- In Kohler's classic study, a chimp *suddenly realized* he could stack several boxes to form a platform from which he could reach banana that had been suspended from the ceiling

Kohler (1945): monkey and banana problem.



Kohler observed that chimpanzees appeared to have an insight into the problem before solving it

Module 27: Thinking and Language

Problems Solving Problems

When your own thinking gets in the way

- A variety of normal tendencies can *hinder* our ability to solve problems effectively.
- Many of them give us tunnel vision, preventing us from searching for alternatives that might offer terrific solutions.
- Examples: *Fixation, Confirmation bias, Inappropriate use of heuristics, Overconfidence, and Framing*

Mental Set

- We have a tendency to approach a particular problem in a particular way.
- This is called a *mental set*.
- Mental sets are often *helpful* because they are *efficient* and may lead to a *rapid solution*.
- For example, many chess players have a particular move they like to open with because they have learned it usually leads to a win.

Fixation

- Sometimes, however, *mental set can get in the way*. Instead of becoming an efficient problem-solving strategy, it becomes a *fixation*.
- A fixation is a mental set that hinders the solution to a problem.

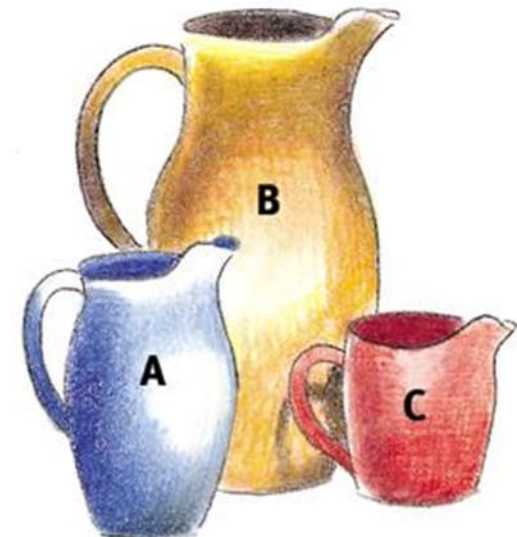
Thinking Outside the Box

- One needs to think beyond the mental set to solve the new problem when fixation occurs.
- “Thinking outside the box” means *breaking away from routine, conventional ways of thinking* – away from your mental set.
- Even though these old ways of thinking may have worked in the past, something new and different may now be required.
- For example, Henry Ford’s assembly line

Luchins Water Jar Problem

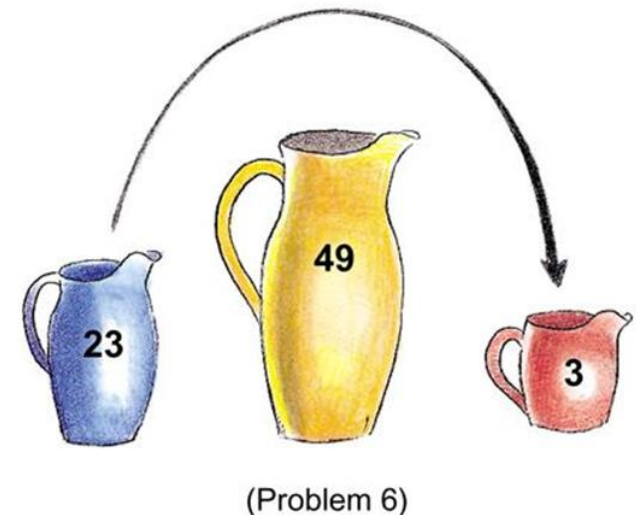
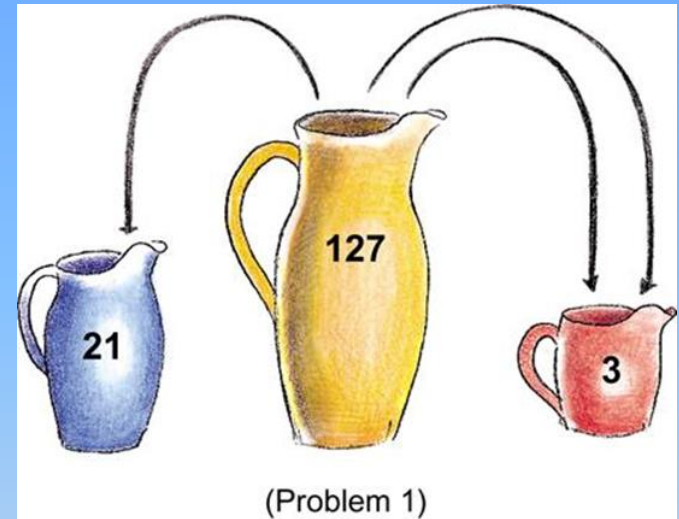
- Can you measure out the amount of water in the right-hand column, using any of the three jars (A, B, and C) with volumes as shown in the middle column?

Problem	Given jugs of these sizes			Measure out this much water
	A	B	C	
1	21	127	3	100
2	14	46	5	22
3	18	43	10	5
4	7	42	6	23
5	20	57	4	29
6	23	49	3	20
7	15	39	3	18



Luchins Water Jar Problem

- Problems 1 through 7 can all be solved by filling Jar B, then pouring off enough water to fill Jar A once and Jar C twice (desired volume = $B - A - 2C$ or just $A - C$ for problem 6 or $A + C$ for problem 7)



Functional Fixedness



- This is the tendency to think of things *only* in terms of *their usual functions*.
- What if you need to remove a screw, but don't have a screwdriver?
- If you have trouble thinking of other things that can be used to perform this function, you are experiencing functional fixedness.

Overcoming Functional Fixedness

- If you are mentally flexible enough to realize that *a coin, a butter knife, the edge of a credit card, or a paper clip* can all be used as a substitute screwdriver, then you have overcome functional fixedness.



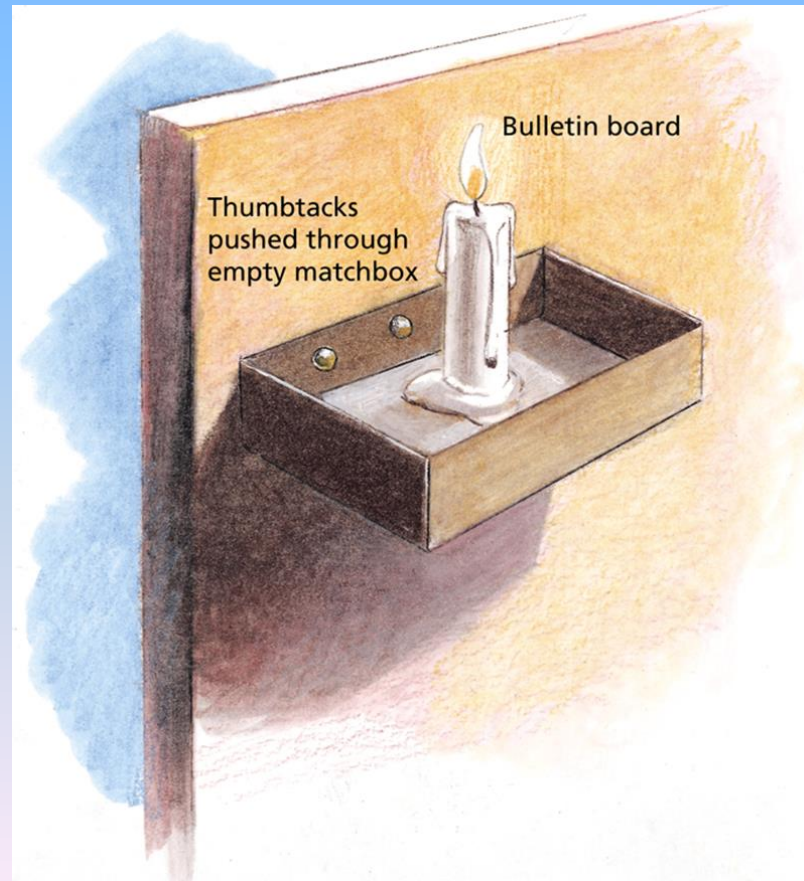
Functional Fixedness



Can you think of a way to use these materials to mount the candle on a bulletin board?

Functional Fixedness

- If you could not imagine using the box as anything other than a container to hold matches, functional fixedness impaired your problem-solving ability.



Confirmation Bias

- Tendency to focus on information that *supports preconceptions* and not notice that which refutes it



- Can affect jurors in criminal trials who each create their own stories to explain what happened and then may only pay attention to testimony that supports their theory

Module 27: Thinking and Language

Counterproductive Heuristics

Availability Heuristic



- Estimating the likelihood of events *based on their availability in our memory*
- Can be correct or incorrect
- For example, if you hear thunder, you may be quick to assume that rain will follow because you have *many instances available in your memory* when thunder signaled rain.

Not always accurate



- Sometimes, however, the information available in our memory *is not such a good indicator*.
- Available images can *distort our thinking*. Many people buy lottery tickets regularly because images of winners *lead them to believe winning big is more likely than it actually is*. They don't show the much more common losers.

Works in Reverse too



- Likewise, someone who has *just seen a report of a shark attack or plane crash* on the news might not want to swim in the ocean or fly in an airplane even though the likelihood of those things actually happening to them are extremely small.

Overconfidence

- More often than not, people overestimate the likelihood that they are correct.
- Overconfidence occurs when our *confidence is greater than our accuracy*.
- Even when participants claim to be 100% certain of their answers, they are right only 85% of the time.

“Everything takes longer than it takes”

- Overconfident planning leads people to think that they can get a lot more done than they think they can.
- One study showed that students typically took twice as many days to complete a project as they originally predicted it would take them.

Why are we overconfident?

- Being falsely overconfident may be a *way to protect our well-being*.
- Overconfidence is associated with happiness and making tough decisions more easily.
- This overconfidence *allows us to think everything will work out*, and belief in our own judgment can keep us from fretting and stewing about things.

Framing

- Framing is the *way we word or present an issue*
- This can dramatically influence our decisions and our judgment

How framing affects our opinions

- For example, you could say that condoms have a *95% success rate* or that they have a *5% failure rate*. The two statements are equally true.
- However, 90% of college students who read only the first statement rated condoms as effective and only 40% did after reading the second statement.

Module 27: Thinking and Language

Language

Language

- Our spoken, written, or gestured words and the ways we combine them to communicate meaning
- Human culture as we know it would not exist without language, which *lets us transmit our ideas* across barriers of time and space.

Module 27: Thinking and Language

Building Blocks of Language

Phoneme

- We build our language from basic elements and follow rules to determine how we can combine the pieces
- The basic building block of spoken language is the phoneme, *the smallest distinctive unit of sound*
- Phonemes are *spoken* sounds, not written symbols or words (except for “a” and “I”)
- They don’t usually have meaning in and of themselves – (the *p* sound or the *f* sound)

Phoneme

- English has *about 40 phonemes*.
- Some languages have hundreds of phonemes, including clicks or sounds
- As a young baby you could produce all the phonemes of all the languages of the world, but by your 1st birthday you lose this ability and only start to use those of your native language.

Why we speak with accents

- If you are a Japanese speaker, you may find distinguishing the English *r* and *l* sounds challenging because these sounds are not part of the Japanese language.
- Likewise, it is hard for us to pronounce German's breathy *ch* sound (as in *Ich*, the German word for I)
- And German speakers struggle with the English *th* and thus pronounce *this* as *dis*

Morpheme

- Though phonemes don't have meaning (with the exception of *I* or *A*), they can be combined to form a *morpheme*.
- A morpheme is the the smallest unit that carries meaning in a language
- May be a word or part of a word
- The word *water* is made up of four phonemes: *w*, *a*, *t*, and *r* (the written *e* has no sound of its own in this word)

Multiple Morphemes

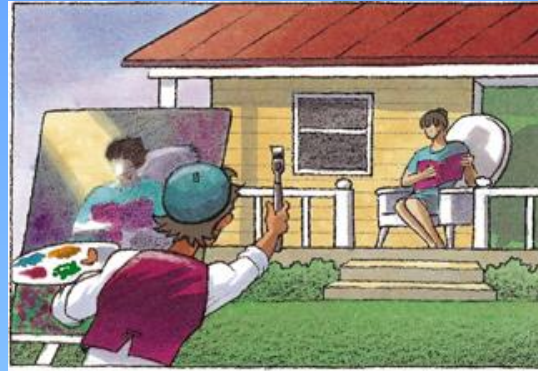
- Words often have more than one morpheme
- For example, *waterfall* has two: water and fall
- The word *watered* also has two: water and the *ed* suffix
- Morphemes can also be added at the beginning of words as a prefix like *un* in *unwind*
- English has about 100,000 morphemes and this allows almost infinite flexibility in spoken language

Grammar

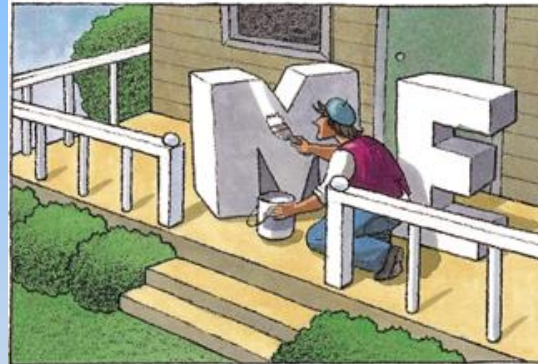
- Just stringing several words together does not create a sentence.
- To have a sentence, you must follow the rules of *grammar*, a system of rules that govern how we can combine phonemes, morphemes and words to produce meaningful communication.
- Despite these elaborate rules, language can still be unclear (see next slide)

Grammar - Context

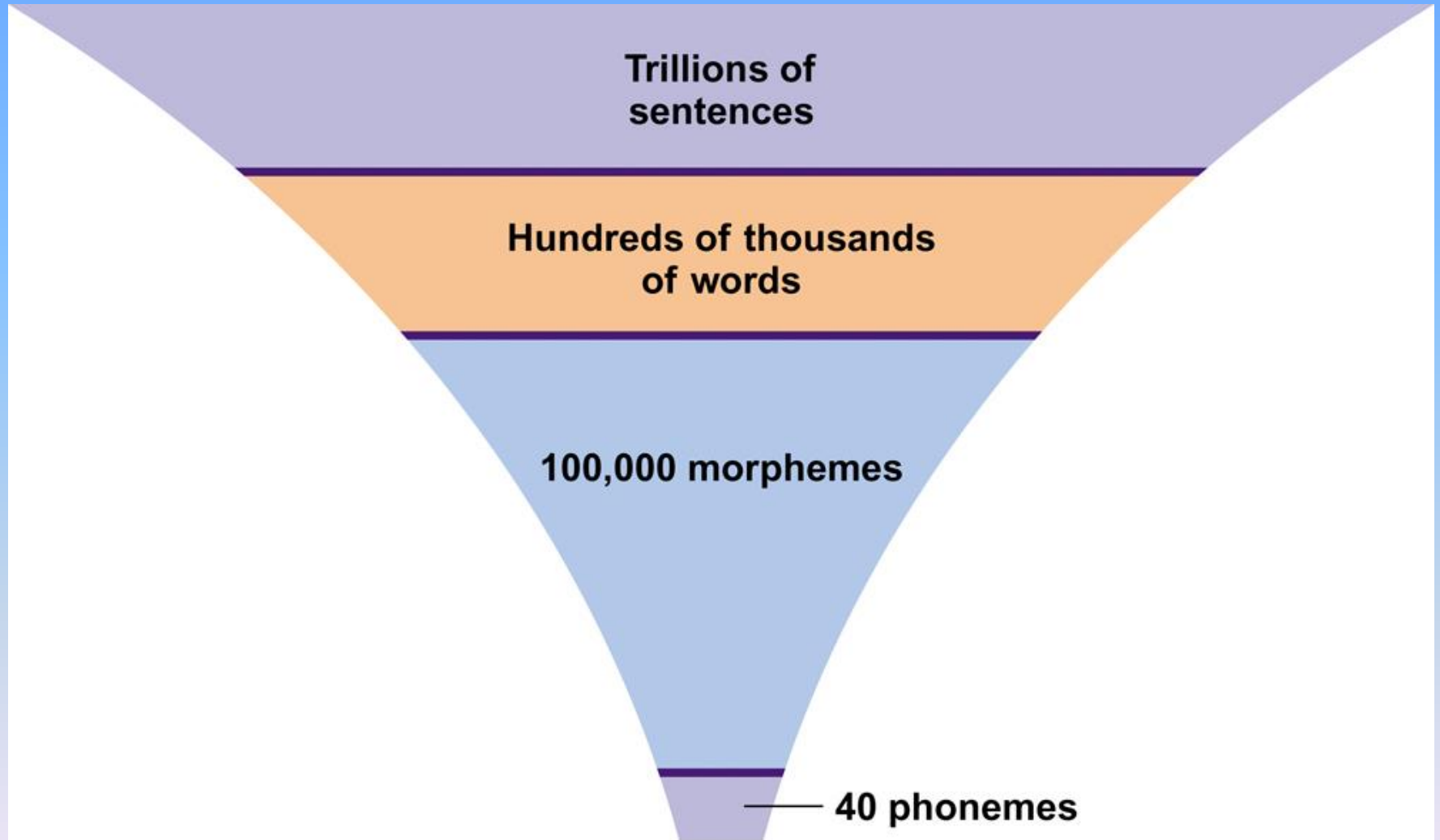
The artist painted me on the porch.



Despite being grammatically correct, this sentence is open to several interpretations.



Structure of Language



All represented by combinations of 26 letters

Module 27: Thinking and Language

Language Acquisition

Noam Chomsky (1928-)



- Linguist who argues that children have a *predisposition* to learn language
- A person's brain is *hardwired* to learn vocabulary and the rules of grammar just like a bird is hardwired to fly
- This is the *nature* argument – we are *born* with this ability

B.F. Skinner and Language

- Skinner believed language was the result of *learning* through:
 - *Association*: linking certain sounds with certain people or objects
 - *Imitation*: doing what we see others doing
 - *Reinforcement* or *punishments*: hugs, smiles, etc.
 - This is the *nurture* argument – we learn language; we're not born with it

Nurture or Nature?

- So who is right?
- They are *both* partially right and both partially wrong.
- Chomsky's view that we are born with a predisposition to learn language helps explain why *all languages* have complex sets of rules.
- Skinner's view that we learn language through association, imitation, and rewards helps explain why we speak the language we hear at home.

Module 27: Thinking and Language

Language Stages

Language Acquisition Stages

- How and when do children master language?
- Just like we go through a *maturational sequence* of learning to walk, we also go through one for learning to talk
- Three-step process:
 - Babbling
 - One-Word Stage
 - Two-Word Stage



Babbling

- By 4 months of age, babies can spontaneously babble phonemes.
- Will babble *all the phonemes of the world* initially, but will begin to babble only the phonemes of the language they hear spoken at about 1 year of age
- By 10 months old, an expert can tell what language is spoken in the home just by listening to the babbling baby

Babbling

Table 27.1

Stages of Language Development

**Age in Months
(Approximate)**

4

Achievement

Babbling of many speech sounds

One-Word Stage

- By about their first birthday, babies begin to use their ability to produce sounds to communicate *meaning*
- In this stage, the child starts with one-syllable words like *ma* or *da* and quickly improves to using *one word* to convey a complete thought or idea (thing or action) like *kitty* or *run*

One-Word Stage

Table 27.1

Stages of Language Development

**Age in Months
(Approximate)**

Achievement

4

Babbling of many speech sounds

12

One-word expressions

Two-Word Stage

- By their 2nd birthday, most babies have reached the two-word stage.
- Now they can build *two-word sentences*, showing an appreciation of the rules of grammar of their native language
- For example, English-speaking children put adjectives before nouns (*big house*) and Spanish speakers put the noun first (*casa grande*)

Expanded Language

- After 24 months, children build on the phonemes, morphemes, words, and grammatical rules they have already mastered to *develop longer and more complex sentences*.
- Vocabulary grows at an amazing pace, with the average child learning *5,000 words/year* or 13 words/day! (most outside of school)
- By the time you graduate high school, you will have a vocabulary of 60,000 words

Two-Word Stage

Table 27.1

Stages of Language Development

Age in Months (Approximate)

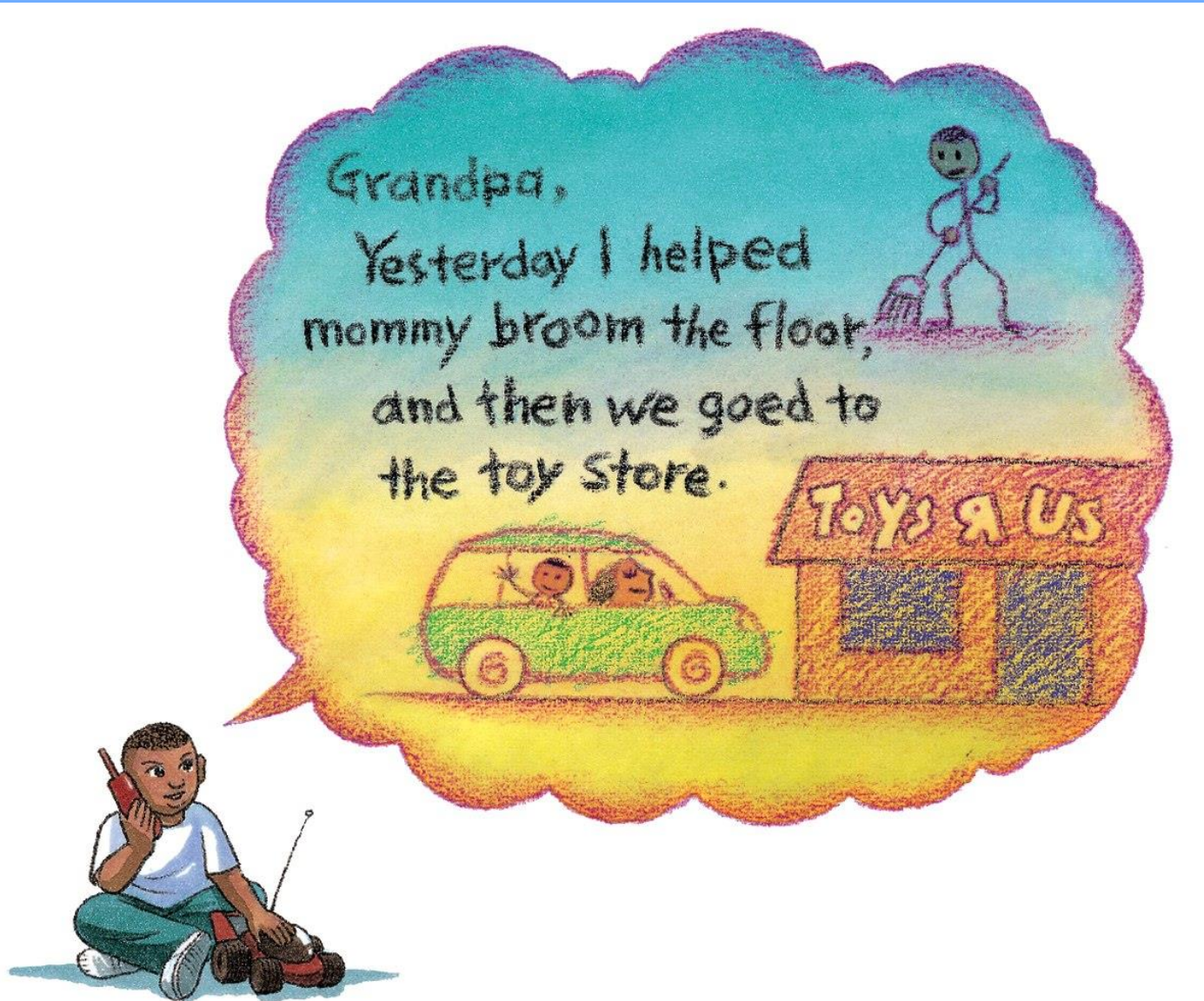
Achievement

4	Babbling of many speech sounds
12	One-word expressions
24	Two-word sentences
24+	Rapid development of complete sentences

Overgeneralization

- Occurs when children *apply a grammatical rule they have learned too broadly*
- For example, turning nouns into verbs
- A child who knows what a broom is may say he is *brooming*, rather than *sweeping*
- Likewise, children will say that they *goed* to the store rather than *went* to the store.

Overgeneralization



Spoken not Written

- While it is cute and amusing, this overgeneralization points to the brain's ability to soak up language rules
- This easy learning of language applies only to *spoken* language.
- We must go to school to master *written* language - reading and writing.

Is it ever too late to learn language?

- While young children easily learn spoken language at an early age, this becomes more difficult after about age 10, when a critical developmental window seems to slam shut (the *critical period* theory)
- Linguists argue that foreign languages should be taught much earlier than middle school
- Chomsky's *nature* argument suggested that once we hit puberty it may be too late to learn language (*Genie* case - raised in isolation through first decade of life- never spoken to or learned to speak)

Whorf's Linguistic Relativity Hypothesis

- Benjamin Whorf was a linguist who believed that language does more than just describe a person's culture.
- Whorf argued that a person's *language may also shape a person's thoughts and perceptions.*

Eskimo Language

- For example, Eskimos (Inuits) have many different words for snow. In contrast, English has the one word – “snow”.
- We have the same word for falling snow, snow on the ground, snow packed hard like ice, slushy snow, wind-driven flying snow – whatever the situation may be.
- To an Eskimo, this all-inclusive word would be almost unthinkable: he would say that falling snow, slushy snow, and so on are *completely different* and he would use different words for them and other kinds of snow.

The End